Hays County, Texas

2011 Hazard Mitigation Plan Update

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Section 2
Executive Summary

Hays County, Texas developed its first Hazard Mitigation Plan in 2006 because of increasing awareness that natural and man-made hazards, especially floods, had the potential to affect the County and its citizens. An approved hazard mitigation plan is a requirement in order for the County to remain eligible for some types of grants that are administered by the Texas Division of Emergency Management (TDEM), the Texas Water Development Board (TWDB) and the Federal Emergency Management Agency (FEMA). The abbreviation *HMP* is used throughout the update in place of Hazard Mitigation Plan. The term *planning area* is also used occasionally – this refers to the boundaries of the County.

The 2006 HMP was prepared by a Mitigation Planning Committee (MPC), consisting primarily of representatives from various Hays County departments, and also included partners that represented industry, academia, and the private sector. During the early phase of the planning process, the MPC invited outside organizations such as the Lower Colorado River Authority (LCRA) and Texas Water Development Board (TWDB) and adjacent communities to participate in the planning effort.

The 2011 Plan update was completed using a Mitigation Planning Committee (MPC) that included representatives from numerous County departments, and a Stakeholders group. The overall process and schedule are discussed in Section 4 of the update, *Planning Process*.

Hays County has experienced multiple hazard events between 1965 and 2010. Since 1965, Hays County has received seven major Presidential Disaster Declarations. These events are summarized as part of Table 12. Of the seven Disaster Declarations, five of these events were floods, one was for a tornado, and one for a wildfire. The County has been impacted by six recent flood events, occurring in 1997, 1998, 2001, 2002, 2004, and 2007.

The original Hazard Mitigation Plan set the stage for long-term disaster resistance through identification of actions that will reduce the exposure of people and property to natural hazards. The MPC reviewed all the actions from the original HMP, and provided status information as part of Section 7, the *Mitigation Strategy.* That section also includes actions that have been added as part of the 2011 update.

This HMP update has several inter-related purposes:

- Provide overviews of the hazards that threaten the County
- Characterize the people and property at risk from the hazards
- Describe the planning process
- Identify vulnerabilities and assess risks from specific hazards
- Identify and prioritize mitigation action items

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Copies of the adopted Plan update are available for review at the Hays County Office of Emergency Management.

2.1 Organization of the Plan

The Hays County Hazard Mitigation Plan Update is organized to parallel the structure provided in the Interim Final Rule (IFR). The Plan has ten main sections and 18 appendices (A through R).

Section 1	**Table of Contents**
Section 2	**Executive Summary**
Section 3	**Background**
Section 4	**Planning Process**
Section 5	**Hazard Identification and Profiling**
Section 6	**Vulnerability Assessment and Loss Estimation**
Section 7	**Mitigation Strategy**
Section 8	**Integration with other Plans**
Section 9	**Approval and Adoption**
Section 10	**Plan Monitoring and Maintenance**

There are references to the IFR throughout the HMP update. Although key elements and information from the original plan have been maintained as part of the update, the structure has been significantly modified to better follow the IFR and FEMA crosswalk.

2.2 Background

The purpose of a mitigation plan is to rationalize the process of identifying and prioritizing actions that reduce (mitigate) the effects of natural hazards on a community. This document characterizes natural hazards in Hays County, and includes:

- Identification of natural hazards that impact Hays County
- A risk assessment that describes potential losses to physical assets, people and operations
- A set of goals, objectives, strategies and actions that will guide the County's mitigation activities
- A detailed plan for implementing and monitoring the HMP

In addition to the required general hazard descriptions, this Plan update focuses on four hazards with the highest potential for damaging physical assets, people and operations in Hays County. These are: floods, tornadoes, winter storms, and hail. The vulnerability assessment/loss estimation and goals sections reflect this emphasis, which was the result of careful consideration and a qualitative ranking process carried out by the MPC, as described later in the plan.

2.3 The Planning Process

Section 4 provides details about the process that was used to develop this Plan update. The process closely follows the guidance in the FEMA "386" series of planning guidance, which recommend a four-stage process for developing mitigation plans.

Step 1 Organize resources
Step 2 Assess risks
Step 3 Develop a mitigation plan
Step 4 Implement the plan and monitor progress

As part of the planning process for the 2011 Update, the initial draft of this Plan was presented at a public meeting on April 26, 2011. The public was provided a second opportunity to review and comment on the Plan update at the point of the final draft stage when it was posted on the Hays County website and a printed copy was made available for review at the Office of Emergency Management.

2.4 Hazards and Risks

Sections 5 and 6 of this Plan update include detailed descriptions of the process that was used to assess and prioritize Hays County's risks from natural hazards, as well as quantitative risk assessments for the County as a whole. There are also more detailed assessments for a subset of the most significant hazards. A total of 11 hazards were initially identified and profiled by the MPC. The hazards included:

1. Floods (Riverine and Shallow)
2. Tornadoes
3. Severe Thunderstorm/High Winds
4. Dam Failure
5. Winter Storm, Extreme Cold, Ice Storm
6. Wildfire / Brush Fire
7. Tropical Storms and Tropical Cyclones
8. Drought
9. Seismic/Earthquake
10. Hail Storm
11. Extreme Heat

As part of this 2011 update, some of the hazards in the first-generation (2006) document were deleted. By consensus of the MPC, the man-made hazards *terrorism, mass casualty incident, water supply interruption,*

transportation accident (rail, truck, aircraft), hazardous materials incident, and *urban fire* are not included in this update. The list of 11 natural hazards above are profiled in Section 5. The MPC then used a qualitative ranking system with five criteria to identify the hazards with the most potential to impact the County. The criteria included: (1) history, (2) potential for mitigation, (3) presence of susceptible areas, (4) data availability, (5) federal disaster declarations and local emergency declarations. This classification allowed the County to focus its update efforts on the most significant hazards. The ranking and criteria are also discussed in detail at the end of Section 5.

Table 1
Hays County: Hazard Ranking

Hazard	Rationale	Sources	Disposition
Flood	Widespread impacts, history of occurrences in the County, significant annual damages	FEMA Flood Insurance Studies, FEMA Flood Insurance Rate Maps, FEMA Public Assistance records, FEMA National Flood Insurance Program claims data, US Army Corps of Engineers (USACE), and National Oceanographic and Atmospheric Administration (NOAA), studies and records. NOAAs National Climatic Data Center (NCDC).	Profile and risk assessment
Tornado	High annual probability, widespread impacts, losses generally limited except in most extreme events.	NOAA, NCDC, National Weather Service (NWS) – Houston/Galveston, Texas Office	Profile and risk assessment
Hail Storm	High annual probability of site-specific events, with moderate impacts	NOAA, NCDC, National Weather Service (NWS) – Houston/Galveston, Texas Office	Profile and risk assessment
Winter Storms	Low annual probability with the potential for widespread impacts	NOAA, NCDC, National Weather Service (NWS) – Houston/Galveston, Texas Office	Profile and risk assessment
Severe Thunderstorms/ High Winds	High annual probability, widespread impacts, losses considered moderate except in most extreme events.	NOAA, NCDC, National Weather Service (NWS) – Houston/Galveston, Texas Office	Profiled, but not part of detailed risk assessment
Wildfire	High annual probability of site-specific events, with moderate impacts	NOAA and National Climatic Data Center (NCDC) records,	Profiled, but not part of detailed risk assessment
Drought	High annual probability, but impacts generally limited.	NOAA – NCDC	Profiled, but not part of detailed risk assessment
Dam Failure	Low annual probability, but potential for locally significant consequences.	Texas Commission on Environmental Quality (TCEQ) - Dam Safety Program	Profiled, but not part of detailed risk assessment
Extreme Heat	Low to medium annual probability, with impacts generally limited	NOAA – NCDC	Profiled, but not part of detailed risk assessment

Hazard	Rationale	Sources	Disposition
Seismic/Earthquake	Very low annual probability, some potential for significant consequences.	United States Geologic Survey (USGS)	Profiled, but not part of detailed risk assessment
Coastal Storms – Wind (Hurricanes and Tropical Storms)	Relatively high annual probability with moderate to severe impacts, potential for widespread losses, history of occurrences in the County	NOAA, NCDC, National Hurricane Center	Profiled, but not part of detailed risk assessment

Based on qualitative ranking above, the Hays County MPC recommended including the following four hazards in the more detailed risk assessments in Section 6:

- **Flood**
- **Tornado**
- **Hail**
- **Winter Storm**

Risks

Risk is a numerical calculation of expected future damages. Although the range of events from extreme heat to drought all have some potential to affect the County, floods, tornadoes, hail, and winter storm are clearly the most significant hazards, so these hazards were selected for much more detailed assessments and estimations of future damages. Section 6 includes details about calculation methodologies and results of the risk assessment, which are also summarized below in Table 2.

Table 2
Summary of Hays County Risk Assessment
by Asset and Hazard Type (50 and 100-year horizons)

Asset	# of Properties	Hazard	Planning Horizon	Risk
Residential repetitive loss properties	30	Floods	100-year	$600,667
Residential severe repetitive loss properties	1	Floods	100-year	$67,028
County Population	157,107	Tornado wind	50-year	$132,576,995
County facilities	25	Tornado wind	50-year	$1,727,536
All Public and Private Assets	n/a	Hail Storm	100-year	$33,751,205
All Public and Private Assets	n/a	Winter Storm	100-year	$7,644,643

Section 6 also includes a detailed risk assessment of the National Flood Insurance Program (NFIP) Repetitive Loss and Severe Repetitive Loss properties within the planning area. This section also includes risk assessments for the tornado, and coastal storms hazards.

2.5 Summary of Goals, Objectives, Strategies and Actions

Section 7 of the Plan update, *Mitigation Strategy*, describes the County's priorities for mitigation actions. The section prioritizes the actions, describes the funding required, notes potential sources of funding, the level of support, and the estimated timing of the action. The section also includes the County's hazard mitigation goal statement, objectives, and strategies. The original Plan included seven mitigation goals. These seven goals from the 2006 Plan were discussed and reviewed at the initial MPC meeting held on February 2, 2011. The goals from the 2006 version were circulated to the MPC for comment. After careful analysis, the Committee determined that the original goals from the 2006 Plan were appropriate to include in the 2011 update.

Section 7 also includes two subsections outlining Hays County's mitigation objectives and strategies. Objectives are well-defined intermediate points in the process of achieving goals. Strategies are specific courses of action to achieve objectives. The list of strategies and objectives can be found in Section 7.5. That section also provides the status of all the actions that were listed in the 2006 mitigation plan.

2.6 Approval and Adoption Processes

Section 9 discusses Approval and Adoption of the updated Plan. The Hays County Commissioners Court was responsible for approving and adopting the Hays County 2011 Hazard Mitigation Plan Update. The Commissioners Court reviewed and approved the Plan update on [insert date].

2.7 Implementation Process

Through the mitigation planning process, Hays County agencies that are involved in managing hazards and implementing measures to minimize future risk considered a range of mitigation actions. Actions were identified and prioritized, and are shown in Table 53.

For each mitigation action, Table 53 of the plan identifies the lead agency, support agencies, priority level, and time period for implementation. Each lead agency is responsible for factoring the action into its work plan and schedule over the indicated time period. Annual reports on the status of implementation, including obstacles to progress, will be submitted by lead agencies to the Hays County Office of Emergency Management (OEM).

2.8 Integration with other Plans

Section 8 describes how mitigation is integrated with other plans and processes in the County.

2.9 Monitoring and Updating Processes

Section 10 (Plan Monitoring and Maintenance) describes the schedule and procedures for ensuring that the County's Mitigation Plan remains current. The section identifies when the Plan must be updated, and who is responsible for monitoring the Plan and ensuring that action items are implemented. This section also provides a combination of cyclical dates (oriented toward FEMA requirements) and triggering events that will initiate amendments and future updates to the Plan. The Hays County Office of Emergency Management is responsible for monitoring the Plan update and initiating the cyclical update process.

Section 3
Background

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3.4 The Texas State Hazard Mitigation Plan

3.1 Introduction

In the year 2000, the U.S. Congress passed legislation known as the *Disaster Mitigation Act of 2000.* Also called *DMA2K,* the legislation established a requirement that jurisdictions nationwide must develop and implement natural hazard mitigation plans in order to remain eligible for various FEMA grant programs, including those that provide funding for hazard mitigation projects.

In April 2003, Hays County initiated the development of its first hazard mitigation plan, or HMP. The original HMP, required for participation in the Hazard Mitigation Grant Program (HMGP), was prepared the Hays County Mitigation Planning Committee. The initial Hays County HMP was approved in 2006, and established the County's long-term strategy for reducing its risks from natural hazards. A copy of the original Plan is available through the Hays Office of Emergency Management.

In 2010 FEMA provided a grant to Hays County to update its original HMP. See Section 4 for details about the Plan update process.

Scope of the Plan

The original Hays County HMP was a concerted effort to develop an all-hazards, county-wide approach to disaster damage reduction. In order to focus on a process needed to attain a sustainable future for the community, the county employed a FEMA-approved process to identify and assess all potential hazards that may affect the community and to develop an Action Plan to address the hazards. The original Plan was completed in August 2006, and has been used to better articulate accurate needs for the community based on a process that involves all stakeholders including the general public, government, business and industry.

The 2011 Hays County HMP update included reevaluation of the original hazards, the risk assessment, mitigation goals, strategies, and mitigation priorities. As part of the update process, these sections of the Plan were re-assessed to identify changes and updates that may have occurred since approval and adoption of the original Plan.

The following 13 incorporated municipalities lie within Hays County:

1. Austin (not included in this HMP update)
2. Bear Creek
3. Buda
4. Creedmoor (not included in this HMP update)
5. Dripping Springs
6. Hays
7. Kyle
8. Mountain City
9. Niederwald
10. San Marcos
11. Uhland
12. Wimberley
13. Woodcreek

With the exception of the City of Austin and Creedmoor, all incorporated municipalities in Hays County participated in the Plan update. The City of Austin is almost entirely located in Travis County and has its own mitigation plan. This update includes a summary of past hazards and risk assessment for the 11 participating municipalities indicated above. Individual Appendices are dedicated to the municipalities.

3.2 Hays County Government Organization

All Counties in Texas were created by the State Constitution. Counties are considered subdivisions of the State and are mandated by law to provide certain core services. Additionally, (through specific enabling legislation) the Legislature permits the County to provide other services. The services and responsibilities of Texas counties are described in detail in the *Guide to Texas Laws for County Officials* published by the Texas Department of Housing and Community Affairs.

The Hays County Commissioners Court is the elected representative body of the county government. The Court consists of five members, including one commissioner for each of the four precincts, and a County Judge who presides over the Court. Primary responsibilities of the Court include the following

- County government administration
- Construction and maintenance of county roads, parks and facilities
- Criminal justice system oversight and
- Public health and safety ordinance authority as allowed by State law

County Commissioners are responsible for managing the public roadway system, which includes an associated drainage infrastructure. The county manages its roadway system under a consolidated precinct system rather than individual precinct road administration.[1]

With respect to planning for and responding to natural hazard events, the key departments of the Hays County organization are described below. A mission statement or general description is provided for each department.

- **Emergency Management.** The Hays County Office of Emergency Management (HCOEM) serves the citizens of Hays County by directing and coordinating emergency management and homeland security programs to prevent/mitigate, prepare for, respond to, and recover from emergencies and disasters.
- **Development Services Department.** The Hays County Development Services Department has responsibilities in many areas of long-range planning, permitting, mapping, and inspection. Development services has jurisdiction in all unincorporated areas of the county, and within some cities within which Hays County has entered into inter-local agreements. This department also reviews, permits, inspects land development construction activities for various development regulations including the Hays County Flood Damage Prevention Ordinance (Chapter 735). Outside the municipal ETJs, the County administers a single process for all construction permit applications. Floodplain and subdivision reviews are performed county-wide, but only activity within the permit area is reported.
- **Fire Marshal.** To prevent fires in the unincorporated areas of Hays County through the aggressive investigation of fire and explosive incidents, quality fire and life safety inspections, data collection and analysis, and public fire safety education. The goal is to protect and serve the residents and visitors of Hays County by working with State, County, Federal, and Local Fire and Law Enforcement Agencies.
- **Sheriff's Office.** The Sheriff's Office of Hays County works to protect the lives, property, and rights of all people in the county.
- **Transportation Department.** This division is responsible for maintaining and improving County roads, County road signs and right-of-way areas.

In the areas related to stormwater, the county currently has authority to regulate floodplain and subdivision development, on-site sewage facilities, and auto yards. Subdivisions in municipal extra-territorial jurisdictions (ETJs) must be administered through the county and/or municipality, or a combination of the two.[2]

[1] Hays County Storm Water Management Program 2011.
[2] Hays County Storm Water Management Program 2011.

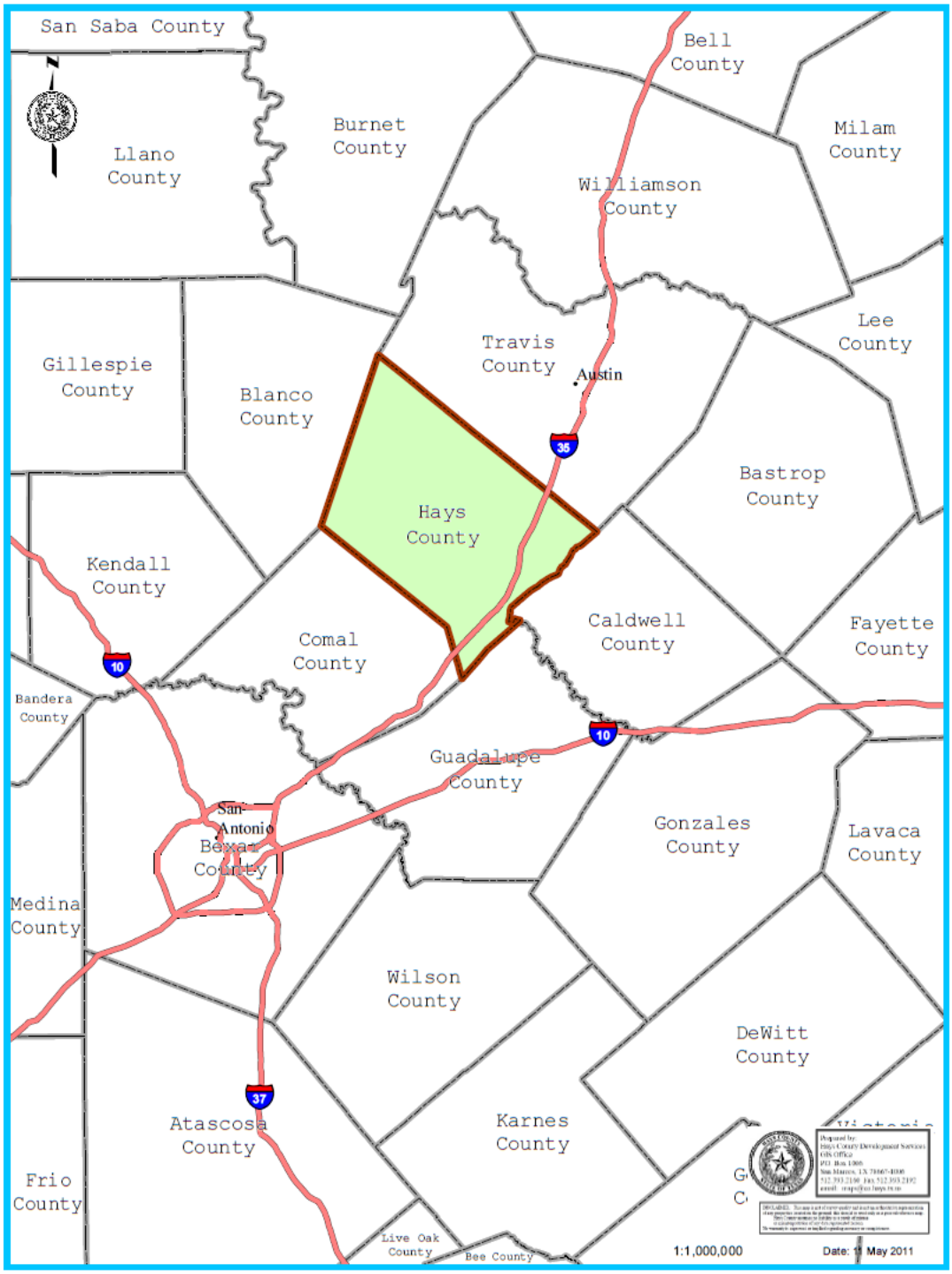
3.3 Background

Prior to addressing the hazards the jurisdiction faces, this Plan presents a brief overview of Hays County, taking into account the geography, history, climate, transportation, community assets, and population and growth.

3.3.1 Geography

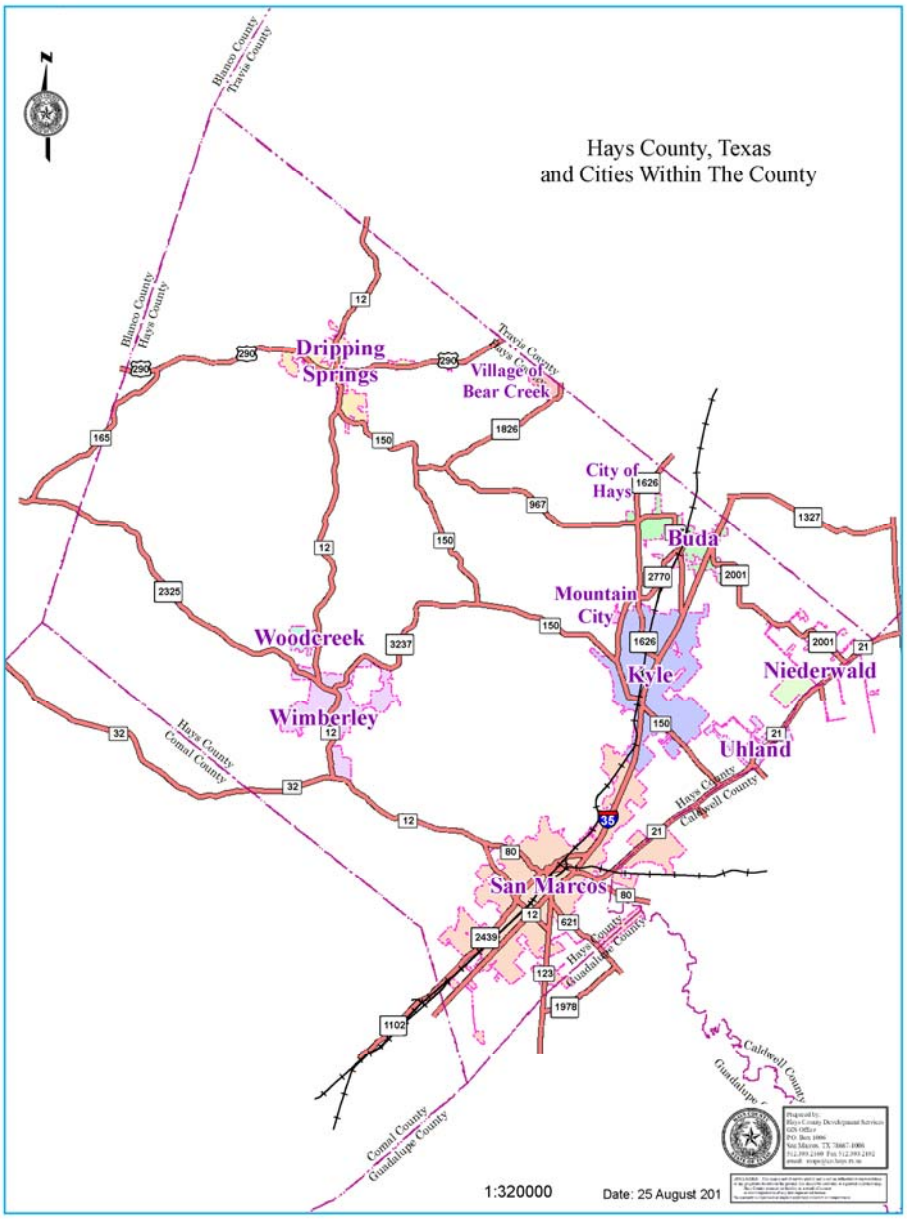
Geographically, Hays County is located in south-central Texas, and comprises approximately 678 square miles. It is bordered by Travis County to the northeast, Blanco County to the west, Comal County to the southwest, and Caldwell and Guadalupe Counties to the southeast. It is situated between the major urban centers of Austin and San Antonio in the heart of the Texas Hill Country. Figure 1 is a map of central Texas, identifying Hays County, Texas.

Figure 1
Hays County - Location Map
(Source: Hays County Development Services – GIS Office)



As mentioned earlier in this section, there are 12 incorporated municipalities located, or partially located, in Hays County. Of this total, 11 municipalities participated in the Plan update. Figure 2 is a map of Hays County and the 11 participating municipalities.

Figure 2
Hays County, Texas Map
(Source: Hays County Development Services – GIS Office)



The geography of Hays County is defined by the Balcones Escarpment, which cuts an arc from near the northeast corner of the county, through the City of San Marcos, to a point near the southeast corner of the county. The northwest portion is characterized by rugged hill country, with ranching/grazing land uses. The highest elevation in the area is about 1,200 feet above sea level (NGVD 1929). Blackland Prairie soils, farming, and elevations of 400 feet represent the area below the fault, roughly the southeast quarter of the county. Portions of the Pedernales River, Barton Creek and Onion Creek flow in the northern portion of Hays County, while the Blanco River and its tributaries, including the San Marcos River, drain the southern portion. The soils of the area are well drained, shallow, stony clays with moderate to slow permeability.

3.3.2 History of Hays County

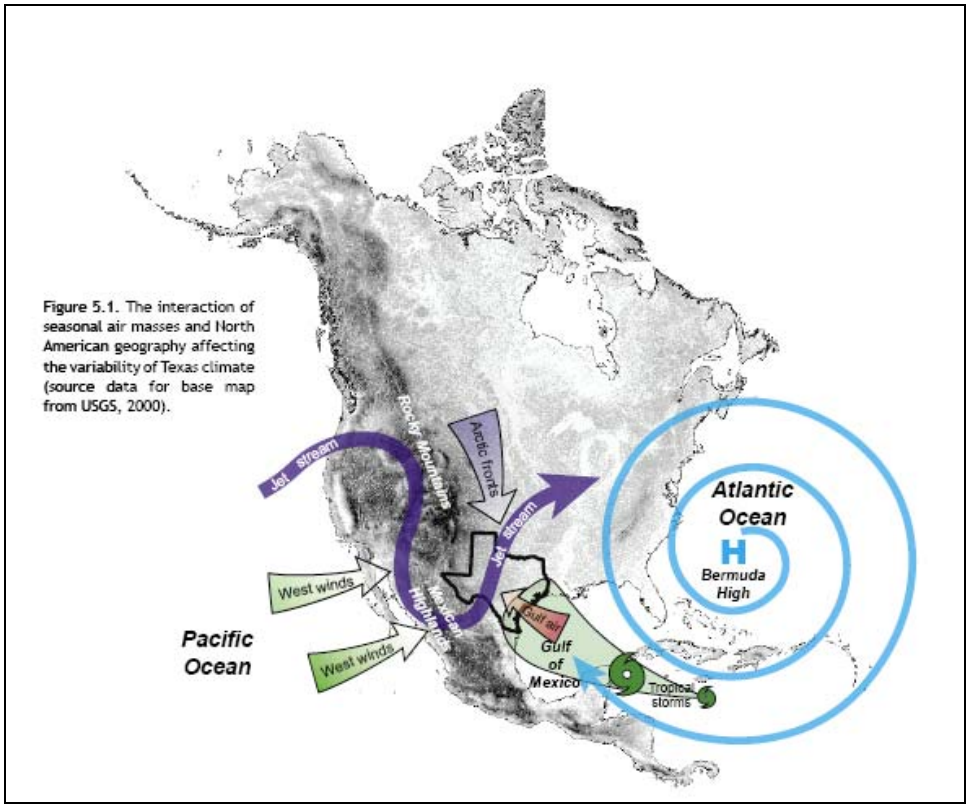
On March 1, 1848, the state legislature formed Hays County from territory formerly part of Travis County. Hays County is named after Captain John Coffee "Jack" Hays, a legendary Texas Ranger and one of the best-known and respected Texans of his day.[3] The early settlers of Hays County were a mix of old Texans and Georgia and Arkansas immigrants. During the 1970s and 1980s growth in the northern and eastern parts of the county was influenced by the expanding Austin metropolitan area and the Austin-San Antonio urban strip along Interstate Highway 35. In 1973 Hays County became part of the Austin Metropolitan Statistical Area.[4] Hays County's population has grown from fewer than 500 residents at its inception to 157,107 (2010 Census) and continues to be one of the fastest-growing counties in Texas.

3.3.3 Climate

The climate in Texas varies depending on the landscape. Variability is due primarily to interactions between the State's unique geographic location and the movement of seasonal air masses, such as arctic fronts, subtropical west winds, the jet stream, tropical storms and a subtropical high pressure system known as the Bermuda High. The Gulf of Mexico is a dominant geographical feature, and provides the major source of moisture for the State. The Rocky Mountains direct the arctic cold fronts southerly into the State during the late fall, winter and early spring months. Pacific moisture is carried into the State by subtropical depressions moved eastward by the westerlies during the summer. During the spring and fall months, warm, dry air from the high plains of northern Mexico is pulled into the State by the jet stream, where it collides with humid air from the Gulf of Mexico being funneled in by the western limb of the Bermuda High, resulting in the formation of severe thunderstorms and tornadoes.[5] Figure 3 is a map of North America showing how the interaction of seasonal air masses and geography affect the variability of Texas climate.

[3] Official Website of Hays County. Living and Visiting - About Hays County
[4] Texas State Historical Association. The Handbook of Texas Online – Hays County.
[5] Texas Water Development Board, State Water Plan, 2007.

Figure 3
Seasonal Air Masses Affecting Texas Climate
(Source: Texas Water Development Board, State Water Plan, 2007)



Hays County is located in the South Central Climatic Region also known as the Texas Hill Country, and is subject to frequent periods of drought. The climate of central Texas is considered humid subtropical, with hot summers and relatively mild winters. A wide variation between maximum and minimum temperatures is experienced due to the interplay of warm and humid weather moving northward from the Gulf of Mexico and strong, polar fronts from the north. Prevailing winds are from the southeast and frequently persist for several days. The strongest winds are from the north, with recorded wind speeds in excess of 50 miles per hour.

Generally, the heaviest precipitation occurs with thunderstorms in late spring or early fall, and is also sometimes associated with tropical systems and hurricanes moving through the region. Rainfall averages about 33 inches per year and, although evenly distributed, the heaviest occurs in late spring or early fall, with much of it a direct result of thunderstorm activity associated with seasonal cold fronts.

3.3.4 Transportation

The major highway transportation corridor through Hays County is Interstate Highway 35 (IH-35) which travels across the southeastern portion of Hays County. In the northern part of the County, U.S. Highway 290 runs in an east-west direction. Two State Highways also travel through a portion of the county, State Highway 21 and State Highway 80. Train service in Hays County is provided by the San Marcos Intermodal Station, served by Amtrak. See Figure 2 for a map of Hays County showing major transportation routes.

3.3.5 Community Assets

As of Spring 2011, Hays County had 47 public facilities. The following table summarizes the facilities. The table shows that the Civic Center has the highest square footage of public facilities in Hays County. The Civic Center in San Marcos is approximately 96,000 square feet, with a building replacement value of $5,159,300. Although the Civic Center is the largest building, the Jail has the highest building replacement value ($15,933,300).

Table 3
Summary of Hays County Public Facilities
(Source: Hays County)

Occupancy	Location	City	Year Built	Square Footage	Building Construction Class	Stories	Structure Replacement Value	Contents Replacement Value
Annex Offices	102 N Lbj Drive	San Marcos	1900	15,062	HTB	3	$2,923,300	$200,000
Civic Center	1249 Civic Center Loop	San Marcos	1974	96,304	NC-ICM	1	$5,159,300	$420,000
Communication Building	Fm 3237	Wimberley	1980	56	C	-	$0	$16,200
Constable PCT #2	401 North Rebel Drive	Kyle	1986	874	BV	1	$55,200	$10,000
County Clerk & Records Dept.	137 N Guadalupe Street	San Marcos	1950	8,280	NC-B	2	$783,500	$150,000
County Courts Bldg	110 E Martin Luther King	San Marcos	1968	39,546	NC-B	1	$4,147,200	$1,500,000
County Health Department	401A Broadway	San Marcos	2002	9,120	NC-ICM	1	$1,066,800	$80,000
Courthouse	111 E. San Antonio	San Marcos	1908	22,284	NC-B	3	$6,603,600	$500,000
Election Office	401 C Broadway	San Marcos	1975	1,800	NC-ICM	1	$151,000	$150,000
Election Office (2)	401 C Broadway	San Marcos	2005	2,000	NC-ICM	1	$144,400	$1,500,000
Environmental Health	1251 Civic Center Loop	San Marcos	1995	5,070	NC-ICM	1	$269,900	$75,000
Extension Office	1253 Civic Center Loop	San Marcos	1994	5,000	NC-ICM	1	$266,200	$60,000
Hays County Commissioner (3)	109 East Hopkins St	San Marcos	1901	-	B	1	$0	$25,000
Health Department	150 East Lockhart Street	Kyle	1960	3,572	CD	2	$337,100	$50,000
It Shop	3413 Hunter Road	San Marcos	1902	1,750	NC-ICM	-	$0	$100,000
Jacobs Well Stewardship Ctr.	109 Wood Acre Drive	Wimberley	1975	8,614	B	2	$1,000,000	$0
Jail	1307 Uhland Rd.	San Marcos	1988	88,273	NC-B	1	$15,933,300	$490,600
Jail - Classroom	1307 Uhland Rd.	San Marcos	1995	1,357	IC	1	$55,600	$7,000
Juvenile Detention Center	2250 Clovis Barker Rd.	San Marcos	1985	40,533	NC-ICM	1	$6,550,100	$260,000
JDC -Classroom	2250 Clovis Barker Rd.	San Marcos	2009	1,640	CD	1	$153,900	$40,000
Juvenile Probation Dept.	302 W. San Antonio	San Marcos	1953	3,300	HTB	1	$247,200	$50,000
K-9 Unit	1307 Uhland Rd.	San Marcos	1995	1,357	IC	1	$55,600	$7,000

Occupancy	Location	City	Year Built	Square Footage	Building Construction Class	Stories	Structure Replacement Value	Contents Replacement Value
Log Home	2400 South Stagecoach Trail	Kyle	1887	1,168	CD	1	$94,600	$25,000
Five Mile Park Soccer Complex	4440 Old Stage Coach Road	San Marcos	2010	2,520	B	1	$450,000	$25,000
Maintenance Department	2019 Clovis Barker	San Marcos	1902	6,200	NC-ICM	-	$0	$100,000
Five Mile Park Soccer Complex	4440 Old Stage Coach Road	San Marcos	2010	1,200	ICM	1	$29,900	$0
Museum	131 N. Guadalupe Street	San Marcos	1950	7,436	SFR	2	$847,000	$100,000
Office Building	1691 Carney Lane	Wimberley	2006	160	CD	1	$5,200	$0
Office Building (Transfer Station)	20290 Ranch To Market Rd 150	Driftwood	2002	192	CD	1	$6,200	$0
Old Jail	170 Fredicksburg Street	San Marcos	1888	1,806	HTS	2	$271,200	$0
Park Office, Camp Jacob	221 Wood Acre Drive	Wimberley	1975	875	CD	1	$100,000	$10,000
PCT #2 Offices	111 N. Front St	Kyle	1902	8,098	NC-B	-	$0	$30,000
PCT #5 Office Building	500 Jack C. Hays Trail	Buda	1986	5,905	NC-ICM	1	$529,500	$60,000
Precinct 4 Office Building	195 Roger Hanks Parkway	Dripping Springs	2008	6,296	SFR	1	$1,900,000	$80,000
Public Safety Building	1303 Uhland Road	San Marcos	1978	10,450	HTB	1	$1,319,500	$367,900
Recycling Processing	20290 Ranch To Market Rd 150	Driftwood	2006	1,800	NC-ICM	1	$49,900	$54,000
Re-Cycling Processing	1691 Carney Lane	Wimberley	2006	840	NC-ICM	1	$23,300	$35,000
Road & Bridge Shop	2171 Yarrington Rd	Kyle	2003	17,208	NC-ICM	1	$1,203,600	$95,000
Road & Bridge Supervisor Building	2171 Yarrington Rd	Kyle	2006	1,200	NC-ICM	1	$49,000	$0
Road And Bridge PCT #3	830 Jacobs Well	Wimberley	2006	3,200	NC-ICM	1	$69,000	$5,000
Road and Bridge Precinct #3, Storage	830 Jacobs Well	Wimberley	2006	440	CD	1	$9,700	$0
Road Crew Office	20290 Ranch To Market Rd 150	Driftwood	1999	1,488	CD	1	$55,000	$0
Road Crew Office - Storage	20290 Ranch To Market Rd 150	Driftwood	2009	1,200	NC-ICM	1	$43,700	$0

Occupancy	Location	City	Year Built	Square Footage	Building Construction Class	Stories	Structure Replacement Value	Contents Replacement Value
Sentry Gate, Camp Jacob	221 Wood Acre Drive	Wimberley	1901	48	CD	1	$3,500	$0
Sheriff's Office Auto Shop	1305 Uhland Rd	San Marcos	1993	10,000	NC-ICM	1	$670,800	$136,000
Storage	401 North Rebel Drive	Kyle	1980	726	CD	1	$24,800	$0
Grand Total	**-----**	**-----**	**-----**	**446,249**	**-----**	**-----**	**$53,729,500**	**$6,813,700**

Figure 4 is a map of the public facilities located within Hays County. The map shows the majority of public facilities are located in the City of San Marcos and along Interstate 35. Additional public facilities are located in or near the Village of Wimberley, the City of Woodcreek, and the City of Dripping Springs.

Figure 4
Hays County Public Facilities Map
(Source: Hays County, GIS Department)

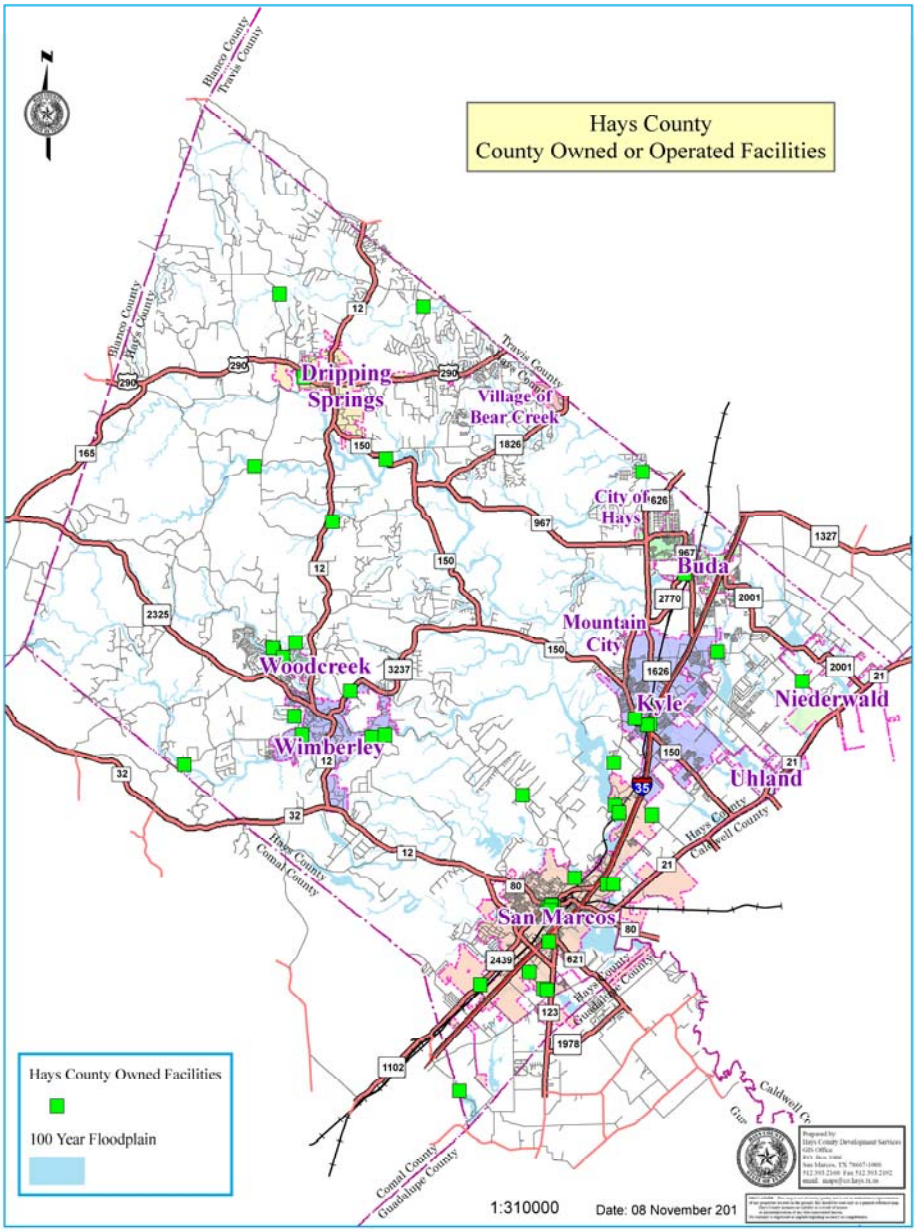


Figure 5 is a map of the Hays County public facilities located in the San Marcos and Kyle areas.

Figure 5
Hays County Public Facilities Map – San Marcos / Kyle Area
(Source: Hays County, GIS Department)

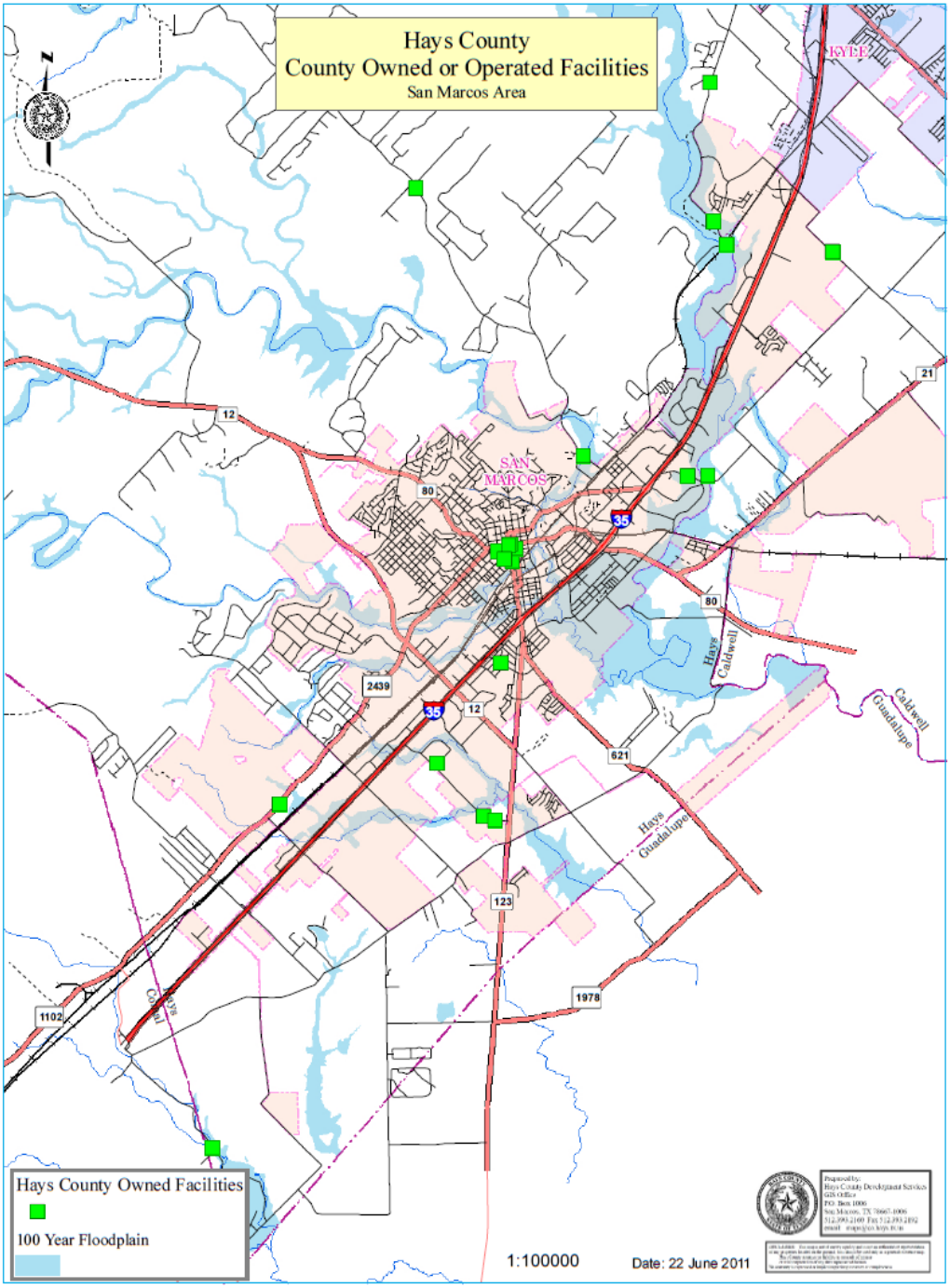


Figure 6 is a photograph of the Hays County Courthouse in San Marcos, Texas.

Figure 6
Hays County Courthouse
(Source: Wikipedia – Hays County)

3.3.6 Population and Growth of the Planning Area

Population

Hays County has experienced major development and population growth over the past 20 years. For the period from 1990 to 2000, Hays County experienced 48.7% population growth. During this time period the population increased from 65,164 to 97,589. As of the 2010 US Census, the Hays County population was 157,107, a 61% increase from 2000.

Within Hays County there are a total of 12 incorporated areas. Of this total, 11 municipalities participated in the 2011 Plan update. The City of Austin, which is mainly located in Travis County, did not participate in the original Plan or update. As of the 2010 US Census, population in the incorporated areas of the county ranged from 217 to 44,894. The incorporated communities participating in the Plan update accounted for a population of approximately 88,992, or 56.6% of the County population. Table 4 provides the population totals for the cities and towns located in Hays County (participating in the Plan update).

Table 4
Hays County: Population of the Incorporated Areas, ordered by Population
(Source: 2010 U.S. Census Bureau Estimate)

City/Town	Population
San Marcos	44,894
Kyle	28,106
Buda	7,295
Wimberley	2,626
Dripping Springs	1,788
Woodcreek	1,457
Uhland	1,014
Mountain City	648
Niederwald	565
Bear Creek	382
Hays	217
Total	**88,992**

Growth

Hays County is geographically situated among several of the fastest growing counties in Texas. The County's population growth rate per decade is a strong indicator of the county's continuing growth. Between 1990 and 2000, Hays County grew at a decadal rate of nearly 50%. Results from the 2010 US Census indicate a slightly higher rate of growth between 2000 and 2010. Comparably, Hays is ranked in the top half of the fastest growing counties in the area for both the 1990 – 2000 and 2000 – 2010 comparison periods. Table 5 provides population growth comparisons for Hays County and seven other counties in the region. The Table indicates that Hays County is ranked second in percentage growth between 2000 and 2010. During this time period Hays County's population increased approximately 61%, only behind Williamson County which grew at a rate of 69%.[6]

[6] Regional Economic Development: An Economic Base Study and Shift-Share Analysis for Hays County, Texas. James Paul Quintero, Texas State University, 2007

Table 5
County Population Growth Comparisons – Central Texas
(Sources: Regional Economic Development: An Economic Base Study and Shift-Share Analysis for Hays County, Texas, 2010 US Census)

County	1990 Population	% Growth (Decade)	2000 Population	% Growth Decade	2010 Population
Hays	65,164	48.7%	97,589	60.9%	157,107
Bastrop	38,263	50.9%	57,799	28.3%	74,171
Bexar	1,185,394	17.5%	1,392,931	23.1%	1,714,773
Caldwell	26,392	22.0%	32,194	18.2%	38,066
Comal	51,832	50.5%	78,021	39.0%	108,472
Guadalupe	64,873	37.2%	89,023	47.7%	131,533
Travis	576,407	40.9%	812,280	26.0%	1,024,266
Williamson	139,551	79.1%	249,967	69.0%	422,679

Building permits are one indicator of growth and development trends. Development in Hays County has been slowly decreasing over the past five years. Table 6 provides the total number of building permits for new residential construction issued by the County for the period 2006 to 2010, and shows that permits peaked in 2006, and have since been declining consistently. The table also shows the number of permits issued within the floodplain. The table indicates that only six (less than 1 percent) of the 2,295 permits issued in Hays County between 2006 and 2010 were located within the floodplain.

Table 6
Residential Building Permits: Unincorporated Hays County, 2006-2010
(Source: Hays County Development Services)

Year	Single Family Home	Mobile Home	Total Residential Permits	# In Floodplain
2006	573	21	594	0
2007	546	41	587	2
2008	496	40	536	1
2009	346	14	360	3
2010	195	23	218	0
Grand Total	**2,156**	**139**	**2,295**	**6**

Over the past 15 years the total number of business establishments and the number of employees in the county have steadily increased. In 1990, the U.S. Census Bureau estimated that there were approximately 11,300 privately employed persons in the county. That figure nearly tripled to 31,466 in 2005. Figure 7 charts the number of business establishments and employees in Hays County.

Figure 7
Business Development in Hays County, Texas
(Source: Regional Economic Development: An Economic Base Study and Shift-Share Analysis for Hays County, Texas)

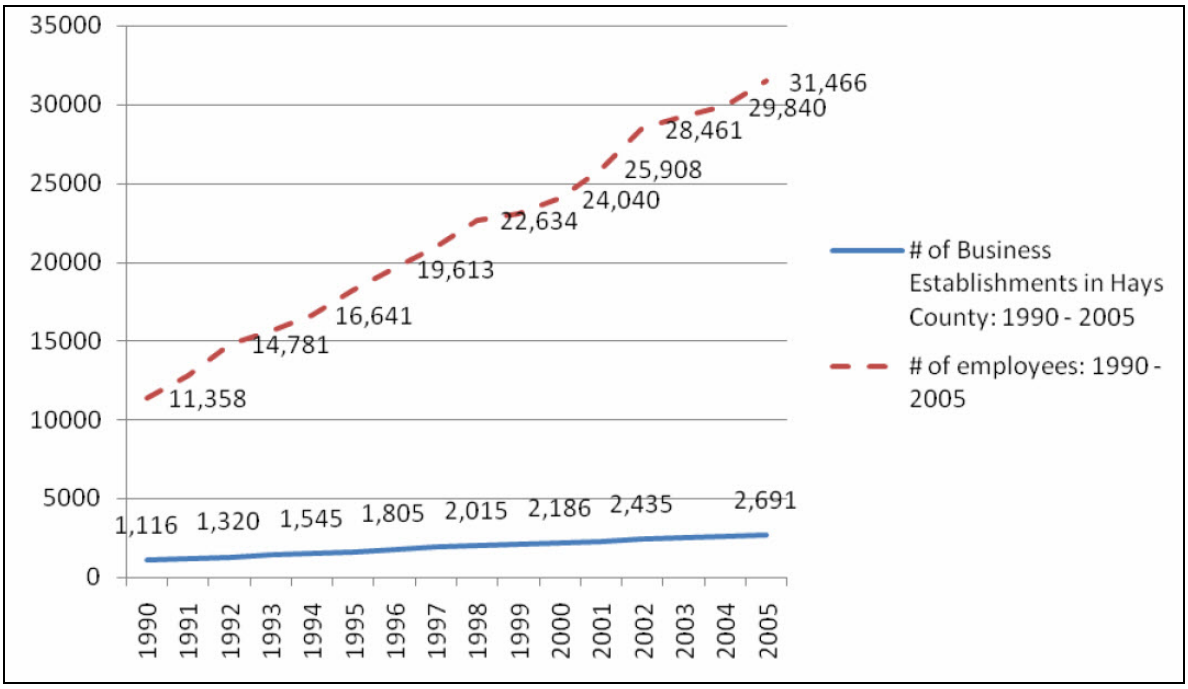


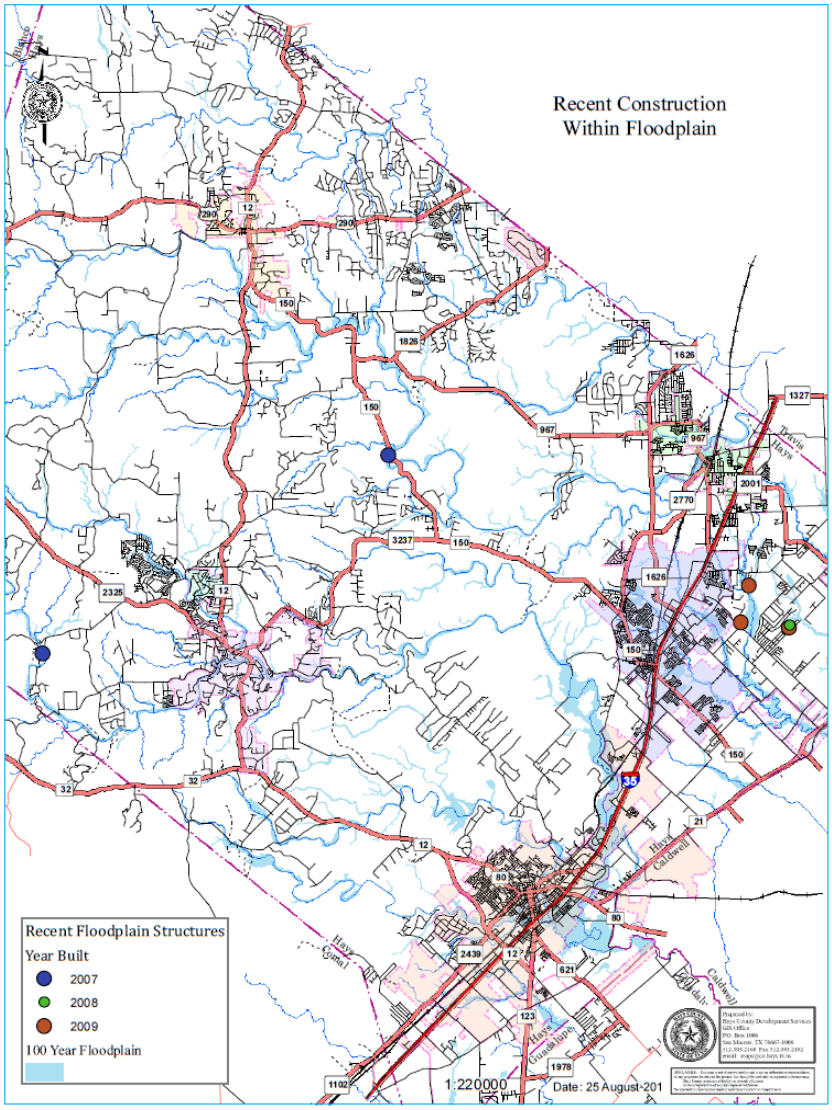
Table 7 lists the top five employers in Hays County based on a Regional Economic Development Study completed in 2007 by Texas State University. The table shows that Texas State University is the largest employer in the county, with other major employers including Prime Outlets, Tanger Outlets, and the San Marcos Consolidated Independent School District.

Table 7
Top Five Employers in Hays County, Texas
(Source: Regional Economic Development: An Economic Base Study and Shift-Share Analysis for Hays County, Texas)

Rank	Name	City	Product or Services	No. of Employees
1	Texas State University	San Marcos	University	6,406
2	Prime Outlets	San Marcos	Retail	2,000
3	Tanger Factory Outlet Center	San Marcos	Retail	1,540
4	San Marcos Consolidated ISD	San Marcos	Public school system	1,081
5	Grande Communications	San Marcos	Communication Services	850

Although the majority of development over the past few years in Hays County has occurred outside of the floodplain, a small percentage of construction has occurred within the 100-year floodplain. Figure 8 shows recent construction within the floodplain. Construction is color coded by year for 2007, 2008, and 2009. Between 2007 and 2009, six structures in Hays County have been constructed within the floodplain.

Figure 8
Hays County Recent Construction in Floodplain
(Source: Hays County, GIS Department)



3.4 The Texas State Hazard Mitigation Plan

The State of Texas has long been aware that it is exposed to a variety of natural hazards. Of particular concern are flood hazards associated with thunderstorms, hurricanes, and tropical storms. This subsection briefly summarizes the 2010 State of Texas Hazard Mitigation Plan.

Originally prepared by TDEM to fulfill the requirements set forth by Congress in the Stafford Act (Section 409), the State's Hazard Mitigation Plan was completed in 2004 and was updated in 2007 and again in 2010 to satisfy new planning requirements prompted by the Disaster Mitigation Act of 2000.

The State's Plan acknowledges that people and property in Texas are at risk from a variety of hazards that have the potential to cause widespread loss of life and damage to property, infrastructure, and the environment. The Plan "establishes hazard mitigation goals, strategies, and specific measures designed to reduce the occurrence or severity of the consequences of hazards." It also documents procedures for implementation and administration of certain mitigation grant programs.

The State Hazard Mitigation Team is designated to coordinate and influence mitigation and is composed of several agencies that participate on the Emergency Management Board. Primary agencies are the Texas Division of Emergency Management; Texas Water Development Board Texas Department of Housing and Community Affairs; Texas Parks and Wildlife Department; Texas Department of Environmental Quality (formerly the Texas Natural Resource Conservation Commission); Texas Department of Transportation, General Land Office; Railroad Commission of Texas; Texas Department of Insurance; Texas Forest Service; and Texas Engineering Extension Service;. Brief summaries of each of these primary agencies are provided in the State Plan, noting key natural hazard mitigation measures associated with each agency. For the most part, existing measures are ongoing agency functions and responsibilities.

As currently structured, the State's Hazard Mitigation Plan contains attachments outlining specific strategies for dealing with hazards related to floods, tornadoes, hurricanes and tropical storms, wildfires, and drought. Strategies particularly pertinent to local jurisdictions are described below:

Flood Mitigation

Historically, floods are and continue to be one of the most frequent, destructive, and costly natural hazards facing the State of Texas, constituting over 90% of the disaster damage in the State. Texas, on average, suffers approximately 400 floods annually, double the number of the second highest State. State mitigation strategies include: Mitigating severe repetitive loss properties (SRL) either by elevation or acquisition (according the 2010 State Hazard Mitigation Plan, there were 3,162 properties on the SRL list); redirecting $6.1 million in taxes and license fees collected by TDI biannually and give to TWDB so they can fund floodplain management training compliance functions and other mitigation activities, and; adopting a No Adverse Impact Policy to ensure that future development activity both in and out of the floodplain be part of mitigation planning.

Tornado Mitigation

Tornadoes occur annually and most frequently in the northern two-thirds of the State caused by cool frontal systems that enter from the north and west, and in the remainder of the State primarily caused as a cascading hazard from

tropical storms. State Strategies include: Adopting and enforcing building codes and/or design criteria for construction of storm shelters and the construction of safe rooms; promoting and provide for expanded coverage options for standard peril and windstorm insurance coverage for public and private property, and; promoting and providing enhanced statewide awareness concerning the risks and consequences of tornadoes.

Hurricane/Tropical Storm Mitigation

Texas has experienced 23 Federal disaster declarations due to hurricane/ tropical storm events, the most recent events being Hurricane Rita (DR-1607, September 2005), Hurricane Dolly (DR-1780, July 2008), Hurricane Ike (DR-1791, September 2008), and Hurricane Alex (DR-1931, September 2010). State Strategies include: Continuing to fund Coastal Erosion and Response Act Projects, and; continuing to promote the Hurricane Local Grant Program.

Wildfire Mitigation

With the semi-arid climate of the western, southern and panhandle counties of the State, wildland fires are most common in the spring and summer months, but can occur at anytime during the year. These wildland fires can have significant economic impact to local and regional economies. Threats to improved structures are a growing problem. State Strategies include: Providing Urban Forestry Grants to improve community forestry programs; establishing and implement burning standards; continuing Urban Wildfire Interface, a traveling exhibit maintained by the Texas Forest Service (TFS), and; continuing maintenance of the TFS website that contains fire safe mitigation initiatives.

Drought Mitigation

Given the expanse of the land mass within Texas and the geographic location of two-thirds of the counties in Texas are located either in an arid or semi-arid climate, roughly those west of a North-South line formed by Interstate Highway 35, are almost always in varying stages of drought. During the past 15 years, the worst droughts in Texas occurred in 1996, 2000, 2002, 2006, and 2009. In addition to these events, the drought of 2011 is by many measures the worst in 50 years. Mitigation Strategies include providing training and education programs for EMCs. The Texas Department of State Health Services maintains a web site that provides tips and actions for citizens, governments and medical facilities.

Section 4
Planning Process

Contents of this Section

4.1 Interim Final Rule Requirements for the Planning Process
4.2 Agencies and Organizations Addressing Hazard Mitigation
4.3 Federal Mitigation Planning Requirements
4.4 Description of the Planning Process
4.5 How the Public and Jurisdictions were involved
4.6 Other Local Planning Mechanisms
4.7 Review and Incorporation of Plans, Studies, Reports and other Information

An important step in the lengthy process of improving resistance to hazards is the development of a Hazard Mitigation Plan. The 2006 Hays County *Hazard Mitigation Plan (HMP)* was prepared in accordance with the guidelines provided by the Federal Emergency Management Agency (FEMA), advice from the Texas Division of Emergency Management (TDEM) and the Texas Water Development Board (TWDB), and steps outlined in guidance documents for the National Flood Insurance Program's (NFIP) Community Rating System.

The original *Hazard Mitigation Plan* served several purposes. It set the stage for long-term disaster resistance through identification of actions that will, over time, reduce the exposure of people and property to hazards. Further, the Plan established or maintained eligibility for certain mitigation grant funds.

Sections of the Plan update provide overviews of the natural hazards that threaten the county. This updated version of the Plan also identifies the people and property exposed to those hazards, the planning process, how hazards are recognized in the county's normal processes and functions, and priority mitigation action items. The hazards summary and disaster history help to characterize future hazards. In terms of sheer numbers, more severe storm incidents occur than any other natural hazard. However, when magnitude of past events, the number of people and properties affected, and the severity of damage is taken into account, flood hazards clearly are the most significant natural hazard to threaten Hays County. Therefore, the original Plan (and this update) have special emphasis on flood hazards.

This Plan update acknowledges that many buildings were built before the adoption of regulations for development in floodplains of the county's waterways. Current regulations require new development to recognize reasonably anticipated flood hazards. Older buildings, then, may reasonably be expected to sustain more property damage than new buildings.

As part of the 2011 Plan Update, portions of the original HMP were preserved, including some of the terms and language. The update process also included a Mitigation Planning Committee, or MPC, which carried out most of the planning duties, and a Stakeholders group, which was responsible for reviewing the document at key points, and providing feedback.

4.1 Interim Final Rule Requirements for the Planning Process

IFR §201.6(c)(1): [*The Plan shall document] the planning process used to develop the Plan, including how it was prepared, who was involved in the process, and how the public was involved.*

IFR §201.6(b): *In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:*

(1) An opportunity for the public to comment on the Plan during the drafting stage and prior to Plan approval;
(2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and
(3) Review and incorporation, if appropriate, of existing Plans, studies, reports, and technical information.

IFR §201.6(c)(4)(ii): [*The Plan shall include] a process by which local governments incorporate the requirements of the mitigation Plan into other planning mechanisms such as comprehensive or capital improvement Plans, when appropriate…*

4.2 Agencies and Organizations Addressing Hazard Mitigation

Mitigation of flood hazards traces its roots to Congressional deliberations about how to address continued and repetitive flood disasters throughout the first half of the 20th Century. The National Flood Insurance Program (NFIP), authorized in 1968, prompted state and local government actions primarily intended to recognize and account for flood hazards in decisions on local development. It was not until 1988 that the concept of mitigation planning was articulated in a statute, known as "Section 409" planning. In 2000, the statute was revised under the Disaster Mitigation Act of 2000.

At the federal level the Federal Emergency Management Agency (FEMA) administers mitigation programs that foster planning and project implementation to address existing risks. At the State and regional levels, several agencies and organizations sponsor programs that bear on hazard mitigation. The following sections provide an overview of existing Texas agencies, organizations, and programs addressing hazard mitigation.

Texas Division of Emergency Management

The Texas Division of Emergency Management (TDEM) is designated by the Governor as the State's coordinating agency for disaster preparedness, emergency response, and disaster recovery assistance. TDEM is also tasked with coordinating the state's natural disaster mitigation initiatives, chairing the State Hazard Mitigation Team, and maintaining the State of Texas Emergency Management Plan. DEM fosters local mitigation planning and administers Hazard Mitigation Grant Program funds provided through FEMA.

Texas Water Development Board

The Texas Water Development Board (TWDB) administers a variety of programs related to water. The TWDB is the agency charged with statewide water planning and administration of financial assistance programs for the planning, design, and construction of water supply, wastewater treatment, flood control, and agricultural water conservation projects. TWDB administers funding from FEMA under the Flood Mitigation Assistance Program. In 2007, TWDB also became the State Coordinating Agency for the National Flood Insurance Program. In this capacity, TWDB assists communities with floodplain mapping matters and interpretation and enforcement of local floodplain management regulations. Prior to 2007, this function was with TCEQ.

Texas Commission on Environmental Quality

The Texas Commission on Environmental Quality (TCEQ) deals with permitting, licensing, compliance, enforcement, pollution prevention, and educational programs related to preservation and protection of air and water quality and the safe disposal of waste. With regard to natural hazard mitigation, TCEQ runs programs that deal with dam safety, and flood control and floodplain management.

4.3 Federal Mitigation Planning Requirements

In 2000, the U.S. Congress passed the Disaster Mitigation Act of 2000 (DMA2K), which among other features, established the requirement that State and Local governments must have FEMA-approved Hazard Mitigation Plans (HMPs) in order to be eligible for some types of federal assistance, including mitigation grants. The Act authorizes up to seven percent of HMGP funds available to a State after a disaster to be used for the development of State, tribal, and local mitigation Plans.

In addition to the Disaster Mitigation Act of 2000, mitigation planning requirements are set forth in various FEMA policies and guidance documents, including the Interim Final Rule of February 26, 2002, and the “386” series of mitigation planning how-to guides. The following series of bullets briefly describes the FEMA’s six hazard mitigation programs, all of which require some form of mitigation plan in order for communities to be eligible for grants. Although the programs differ in their eligibility requirements, funding amounts, etc., requirements related to mitigation planning are substantially similar. In 2008-2009, requirements for all the mitigation grant programs except for the Hazard Mitigation Grant Program were unified under the Hazard Mitigation Assistance (HMA) program guidance.

- **Flood Mitigation Assistance Program (FMA).** To qualify to receive grant funds to implement projects such as acquisition or elevation of flood-prone homes, local jurisdictions must prepare a mitigation Plan. The Plan must include specific elements and be prepared following the process outlined in the NFIP’s Community Rating System.
- **Hazard Mitigation Grant Program (HMGP).** To qualify for post-disaster mitigation funds, local jurisdictions must have adopted a mitigation Plan that is approved by FEMA.
- **Pre-Disaster Mitigation Grant Program (PDM-C).** To qualify for pre-disaster mitigation funds, local jurisdictions must adopt a mitigation Plan that is approved by FEMA.
- **FEMA/NFIP Severe Repetitive Loss Program (SRL).** The SRL program was authorized by the Flood Insurance Reform Act of 2004 to provide funding to reduce or eliminate the long-term risk of flood damage

to residential structures under the NFIP which have suffered repetitive losses. SRL properties have at least four NFIP claim payments over $5,000, with at least two of the claims within a 10 year period. SRL properties are also residential structures that have at least two separate claim payments made within a 10 year period with the cumulative amount of the building portion of the claims exceeding the value of the property. States are required to have SRL mitigation plans in order for local communities to be eligible for grant funds through this program.

- **FEMA/NFIP Repetitive Flood Claim Program (RFC).** The RFC program was authorized by the Flood Insurance Reform Act of 2004 to assist States and communities reduce flood damages to properties that have at least one NFIP claim payment. Various hazard mitigation activities are eligible including acquisition, elevation, and dry floodproofing of residential structures.
- **NFIP Community Rating System (CRS).** The CRS offers recognition to communities that exceed minimum requirements of the National Flood Insurance Program. Recognition comes in the form of discounts on flood insurance policies purchased by citizens. The CRS offers credit for mitigation plans that are prepared according to a multi-step process.

4.4 Description of the Planning Process

How the Plan was Prepared and Updated

The original Hays County Hazard Mitigation Plan was prepared in accordance with the process established in the FEMA (Publication 386-series) How-To Guides, as well as the requirements of the February 26, 2002 Interim Final Rule (IFR). The process established in the How-To guides has several steps.

Step 1 Organize resources
Step 2 Assess risks
Step 3 Develop a mitigation plan
Step 4 Implement the Plan and monitor progress

As part of the 2011 update, certain elements of the original Plan have been retained, while outdated information has been either summarized or removed. In some cases the updated Plan includes references to information in the original Plan, which may be reviewed by contacting Hays County. For the current version, there is a particular focus on incorporating new hazard information, updating the risk assessment, providing status for actions listed in the original plan, identifying new actions, and describing meetings and presentations held as part of the update.

Step 1 Organize Resources

The first element in the planning process was to identify the groups that would carry out various responsibilities during the update. The County determined that a Mitigation Planning Committee (the MPC, comprised of officials from the County and various jurisdictions) would be responsible for completing most of the initial work in developing the update. The MPC met several times during the plan development, and regularly reviewed and commented on various versions of the document. The MPC also identified a Stakeholders Group comprised of community organizations, academia, and businesses, among others. This group was charged with reviewing parts of the update at several points in the process.

The Hays County Commissioners Court was responsible for review and adoption of the document. Because this is a multi-jurisdictional plan, each of the jurisdictions that are included were also required to review and adopt the overall document, as well as the dedicated appendices. Early in the update process, Hays County secured the services of a professional planning consultant (Jeffrey S. Ward & Associates, Inc.) to facilitate the update process.

Purpose and Composition of the Hays County Mitigation Planning Committee (MPC)

The Mitigation Planning Committee (MPC) is the group that had direct responsibility for much of the Plan development, with technical support from the consultants. The MPC made key decisions about many aspects of the process and document, including the composition of the Stakeholder group, the structure of the HMP, the schedule for developing the document, the hazards that are included in the update, and prioritized mitigation strategies and actions. The group met four times during the update process. During the meetings, the MPC was provided copies of the draft document, and given detailed briefings about the status of the plan, including various technical elements such as the risk assessment. The composition of the Mitigation Planning Committee is shown in Table 8.

Table 8
2011 Hays County Hazard Mitigation Plan Update, Mitigation Planning Committee

Team Member	Title	Jurisdiction
Mike Beggs	Emergency Management Coordinator	City of Buda
Stanley Fees	City Engineer	City of Buda
Jon Thompson	Planning Director	City of Dripping Springs
Mike Warnken	Mayor	City of Hays
Ken Bell	Fire Marshal/EMC	City of San Marcos
Richard Crandal	City Administrator	City of Niederwald
Gib Watt	Assistant to EMC	City of San Marcos
Kathy Woodlee	Flood Plains	City of San Marcos
Karen Gallaher	City Administrator	City of Uhland
Erick Eskelund	Mayor	City of Woodcreek
Don Ferguson	City Manager	Wimberley
Pieter Sybesma	City Administrator	City of Woodcreek
Rick Tarr	Mayor	City of Mountain City
Lucy Johnson	Mayor	City of Kyle
Bruce Upham	Mayor	Village of Bear Creek

Team Member	Title	Jurisdiction
Steve Floyd	Environmental Health/GIS Coordinator	Hays county
Jeff Hauff	Hays County Grants Administrator	Hays County
Jeff Turner	Emergency Management Coordinator	Hays County
Tom Pope	Flood Plain Administrator	Hays County
Tim Vandevorde	Hays County Road & Bridge Dept.	Hays County
Jeff Ward	Consultant	JSWA

Mitigation Planning Committee (MPC) Meeting Schedule

The MPC met four times during the Plan update. The MPC meeting dates are provided below.

Meeting 1 February 2, 2011
Meeting 2 April 26, 2011
Meeting 3 June 23, 2011
Meeting 4 November 9, 2011

A brief summary of each meeting can be found in this section under *Step 3, Develop the Mitigation Plan Update*. Detailed meeting minutes are located in Appendix L of the Plan update.

MPC members had an opportunity to provide input and feedback on the content and process of the Plan update during these meetings. The Stakeholders group was periodically contacted by email to review and provide comments on meeting minutes, the updated Plan structure, as well as the draft and final Plan updates. Copies of all meeting agendas, sign-in sheets, and minutes can be found in Appendix L of the updated HMP.

Purpose and Composition of the Stakeholders Group

In accordance with FEMA requirements, the County identified interested groups, neighboring communities, businesses, academia and other organizations and individuals with an interest in the Hays County Plan Update. These groups comprised the Stakeholders. The Stakeholders were provided regular updates on the planning process, and given the opportunity to review and provide input on the Plan at key points in its development. Members of the Stakeholders group were also invited to attend and participate in all public meetings.

As drafts of the Plan update were prepared, the County used email to distribute them to Stakeholders, and requested that they provide comments. The group was requested to provide feedback through email or by telephoning the Hays County Emergency Management Coordinator or a member of the consultant team. The consultant was responsible for archiving the comments and incorporating them (as appropriate) into the HMP.

Table 9
Hays County Hazard Mitigation Plan Update, Stakeholders Group

Group Member	Title	Organization
Rex Isom	Executive Director	Hays County Soil and Water Conservation District
Johnie Halliburton	Executive Manager	Plum Creek Conservation District
Denise M. Trauth	President	Texas State University
		EMS/ESD
Clay Huckaby	Fire Chief	Buda Fire Department
Tim Gothard	Chief	Driftwood Fire Department ESD 6
Glenn Whitaker	Fire Chief	Kyle Fire Department
Larry Marcum	Chief	North Hays County VFD
Lee Stephens	Fire Chief	San Marcos Fire Department
Tom Partin	Chief	San Marcos/Hays County EMS
David Smith	Chief	South Hays Fire Department
Ken Strange	Director	Wimberley EMS
Carol Szichos	Chief	Wimberley Fire and Rescue
		ISDs
Jeremy Lyon	Superintendent	Hays Consolidated Independent School District (includes 13 Elementary, 5 Middle and 4 HS)
Mark Eads	Superintendent	San Marcos Consolidated Independent School District (6 Elementary, 2 Middle and 2 HS)
Dwain York	Superintendent	Wimberley Independent School District (2 Elementary, 1 Middle and 1 HS)
Mark Herrick	Superintendent	Dripping Springs Independent School District (3 Elementary, 1 Middle and 1 HS)
Buck Ford	Superintendent	Blanco ISD
Marc Walker	Superintendent	Comal ISD
David Shanley	Superintendent	Johnson City ISD
Bill Taylor	Administrator	Upper San Marcos Watershed Reclamation and Flood Control District
Dianne Wassenich	Program Director	San Marcos River Foundation

Group Member	Title	Organization
Melinda Mallia	Environmental Project Manager	Travis County
Tom Bonn	Judge	Caldwell County
Bill Guthrie	Judge	Blanco County
Mike Wiggins	Judge	Guadalupe County
Sherman Krause	Judge	Comal County
Rebecca S. Motal	General Manager	Lower Colorado River Authority
Bill West	General Manager	Guadalupe-Blanco River Authority

Step 2 Assess Risks

The risk assessment (also sometimes termed the vulnerability assessment and loss estimation) forms the basis for the Hazard Mitigation Plan by quantifying and rationalizing information about how natural hazards affect the county. The processes used to complete the hazard identification and risk assessments and the results of these activities are described in detail in Sections 5 and 6 of this Plan update. The assessment determined several aspects of the risks of natural hazard faced by the County and each jurisdiction:

- The natural hazards that are most likely to affect the county
- How often hazards are expected to impact the county
- The expected severity of the hazards
- What areas of Hays County are likely to be affected by hazards
- How county assets, operations, people and infrastructure may be impacted by hazards
- The expected future losses if the risk is not mitigated

Through a qualitative ranking (explained in detail in Section 5), the MPC reduced the initial hazard profile list from eleven to four. These are the predominant risks to the area: floods, tornadoes, hail and winter storm. The planning team completed detailed vulnerability and loss assessments for each of these most significant hazards (in addition to the detailed hazard histories, impacts, and probabilities that are discussed for the larger range of hazards in Section 5). These findings were presented to the MPC, discussed by the group, and reviewed by the Stakeholders as the basis for later phases of the planning process. The results of the vulnerability assessment/loss estimation were also made available to the public during the presentation noted elsewhere in this Plan.

Step 3 Develop the Mitigation Plan/Update

The process employed to develop the original Hays County Plan was based entirely on the FEMA 386-series of guides that describe mitigation planning procedures. In addition to being based on the How-To guidance, the 2011 process followed the FEMA document titled *Local Multi-Hazard Mitigation Planning Guidance (July 1, 2008)*. This document describes the Local Hazard Mitigation Plan regulations from the 44 Code of Federal Regulations (CFR) Part 201, and is FEMA's official source for defining the requirements for original and updated local hazard mitigation plans. Throughout the Plan update, cross references to Interim Final Rule (IFR) and FEMA crosswalk criteria have

been added to clarify the requirements that are being addressed. The mitigation planning regulation at 44 CFR 201.6 (d) (3) states:

> *A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and re-submit it for approval within five years in order to continue to be eligible for mitigation project grant funding.*[7]

Early in the planning process, the MPC and consultant team completed a detailed review of every section of the existing plan, and prepared a comprehensive gap analysis. The purpose of this analysis was two-fold. First, it identified all the areas in the 2006 HMP where specific updates were required. For example, census figures, the numbers and locations of county-owned buildings (and those owned by the various jurisdictions), impacts of recent hazard events, and so forth. The second purpose of the gap analysis was to ensure that the updated Plan is fully compliant and responsive to recent FEMA guidance, specifically the "Blue Book" of July 2008.

The MPC met four times during the update process. The initial MPC meeting took place on February 2, 2011 at the San Marcos Activity Center. The group discussed a range of topics including: the purpose of the Plan update; MPC members and Stakeholders; the planning process and mitigation strategies section, and the Request For Information (RFI) document. The purpose of the meeting was to begin the planning process, to make decisions about contents of the Plan update, and to assign specific tasks to county and local staff and consultants. The MPC used the gap analysis to outline the update process and tasks. Each section of the original plan was reviewed and analyzed in detail to determine which areas needed updates. As reported in the minutes of the meeting, the group reviewed a proposed outline and structure for the update, and agreed that the most efficient way to proceed was to consider the HMP a new document, and take from the original plan only that information that is still current and applicable to the County.

The second MPC meeting was held on April 26, 2011 at the Hays County Development Services building. The MPC discussed numerous agenda items including the status of the RFI, mitigation action items, development of the jurisdictional appendices, and mapping needs for the Plan update. The purpose of the meeting was to review the first draft of the update and to discuss the proposed schedule for completing the update. The team reviewed the status of all remaining tasks, such as collecting any remaining data and integrating the information into the plan update.

On June 23, 2011 the third MPC meeting was held at the Hays County Development Services building. One of the main objectives of the meeting was to review the status of the RFI, and discuss the remaining items needed to complete the Plan update. Appendix L, *Mitigation Planning Committee Meeting Minutes,* of the updated Plan includes minutes and attendees of all meetings.

On November 9, 2011 the fourth meeting was held. One of the main objectives of the meeting was to review the draft plan and provide any remaining updates required before releasing to the public for review and comment.

The Plan update process took place in these steps:

1. Detailed review of the 2006 version of the County HMP/gap analysis
2. Update planning process and non-technical sections

[7] *Local Multi-Hazard Mitigation Planning Guidance, July 1, 2008*

3. Update technical sections (Hazard Identification and Risk Assessment (HIRA) and mitigation strategy)
4. Review of complete first draft
5. Modifications based on review, Stakeholder feedback
6. Presentation to public
7. Compile and incorporate feedback from public
8. Prepare final draft
9. Second public presentation in conjunction with the December 8, 2011 LEPC meeting
10. Compile and incorporate feedback from public
11. Prepare and submit final draft to Texas Department of Emergency Management (TDEM)
12. Modifications based on State review
13. Re-submit to State to verify changes
14. Submit to FEMA Region 6 for review and comment
15. Modifications based on FEMA review
16. Secure Letter of Approvability from FEMA
17. Final approval and adoption

Step 4 Implement the Plan and Monitor Progress

The 2011 County HMP must be updated every five years in order for the County to maintain its eligibility for various FEMA grant programs. During this five year period, the Plan will be periodically reviewed to ensure compliance with FEMA and the State of Texas requirements for Plan maintenance. The procedures for these reviews are described in Section 9, *Plan Monitoring and Maintenance*. After the 2011 Plan update is approved, the county will implement specific actions to achieve the goals and objectives described in Section 7 (Mitigation Strategy). In addition to listing the mitigation strategies and actions the County is pursuing, the section describes the progress the county has made towards reaching the individual goals since the Plan was originally adopted.

The Hays Commissioner's Court governs the county and has the final decision on what projects are funded and initiated. The Commissioner's Court will coordinate with the Emergency Management Coordinator (or a designee) when initiating the strategies and actions that are outlined in Section 7 of this HMP.

4.5 How the Public was Involved

During the 2011 Plan update, the public was involved by requesting their attendance and participation at public presentations held on April 26, 2011 at the Hays County Court House. Drafts of the Plan were available for public review, and the public was invited to provide input on the document. The ads explained the purpose of the meeting, and provided the date, time, and location of the meeting place.

The public had a second opportunity to review the final draft Plan prior to approval by the State and FEMA when the document was posted on the County website and a paper copy placed in the County Office of Emergency Management. The County placed an advertisement in the local paper explaining that the County's HMP update was in the final draft stages and available for review. The County encouraged members of the public to review the draft and provide feedback. The advertisement can be found in Appendix M. The dates for posting the document on-line and placing the paper copy at the OEM office are:

Presentation/meeting #1 (initial draft)	April 26, 2011
Public Review #2 (final draft)	December 8, 2011
Posted on County web site and at OEM Offices	November 25 to December 25, 2011

The MPC also identified local Civic Groups located in Hays County. These groups were notified via letter/email about the public presentation, and the availability of the draft Plan update on the County's website and at the OEM. Copies of the civic group letters are included in the Plan update as part of Appendix M. The Civic groups are listed in Table 10.

Table 10
Hays County Organizations Invited to Participate in the Plan Update

Organization	Group Member
Texas State University	Denise M Trauth, President
Pedernales Electric Cooperative	RB Sloan, Chief Executive Officer
Blue Bonnett Electric Cooperative	Mark Rose, General Manager and CEO
Lower Colorado River Authority	Rebecca S. Motal, General Manager
Aqua Texas	Nicholas DeBenedictis, Chairman, President and CEO
Centerpoint Energy	David M. McClanahan, President and Chief Executive Officer
Time Warner	Gordon Harp, Regional Vice President of Operations
Wimberley Valley Water Supply	Garrett Allen, General Manager

Civic Group	Group Member
Rotary Club of Dripping Springs	Bonnie Rose
The Rotary Club of San Marcos	Jimmy Cobb, President
Rotary Club of Wimberley	Jenelle Flocke
Dripping Springs Chamber of Commerce	Kim Johnson
Wimberley Chamber of Commerce & Visitor Center	Carrie Harris, Executive Director
San Marcos Chamber of Commerce	Brian Bondy, IOM , President
Kyle Chamber of Commerce	Ray Hernandez, Executive Director
Buda Chamber of Commerce	Richard (Dick) Schneider
Wimberley Lions Club	Beverly Nesmith
Dripping Springs Lions Club	Sharon Goss
Buda Lions Club	
San Marcos Lions Club	Larkin Smith
Kyle Lions Club	

Section 5
Hazard Identification and Profiling

Contents of this Section

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5.4.7 Tropical Storms and Tropical Cyclones
5.4.8 Drought
5.4.9 Seismic/Earthquake
5.4.10 Hail Storm
5.4.11 Extreme Heat

5.5 Methodology for Identifying Natural Hazards for Additional Analysis

During the 2011 Plan update some parts of the original County HMP were preserved, although these were limited. Where applicable, portions of the historical hazard data have been retained. As required by federal planning guidelines, one of the key elements of the 2011 HMP update was to describe the events and effects of natural hazards on the county since the original version of the Plan was developed and adopted.

As part of the 2011 Plan update, the structure of the hazards included in the original Plan was slightly modified and several man-made hazards originally profiled are not included in the updated version. The MPC determined that man-made hazards *terrorism, mass casualty incident, water supply interruption, transportation accident (rail, truck, aircraft), hazardous materials incident*, and *urban fire* would not be part of the update. Additional modifications to the original list of hazards included profiling *dam failure* and *hail storms* as separate hazards. The Hail hazard, originally included under the *severe thunderstorms/hail/lightning* hazard, is now profiled as a separate hazard. In addition, *dam failure* has been added as a separate hazard. The original Plan included a subsection for “high hazard dams” under the flood hazard.

Each of the hazard-specific sections noted above has four subsections: *Description of the Hazard; Location of the Hazard; Severity and Extent of the Hazard, and; Impact of the Hazard on Life and Property*. These subsections address FEMA crosswalk requirements, and each includes a range of information for this purpose. For the 11 hazards profiled, links to websites have been included at the end of the *Description of the Hazard* subsection. These links provide additional information related to the general description of each hazard that can affect Hays County.

5.1 IFR Requirement for Hazard Identification and Profiling

IFR §201.6(c)(2)(i): *[The risk assessment shall include a] description of the … location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.*

5.2 Hazard Identification

In accordance with IFR requirements, and as part of its efforts to support and encourage hazard mitigation initiatives, Hays County's Mitigation Planning Committee (MPC) prepared this general assessment of the hazards with potential to impact the county. The following subsections provide an overview of past hazard events in Hays County, and brief descriptions of the potential for future losses. Section 6 (Risk Assessment) includes much more detailed information about county vulnerabilities and potential future losses from natural hazards. The term "planning area" is used frequently in this section. This term refers to the geographic limits of the county.

Overview of Hays County's Natural Hazard History

A variety of sources were researched to identify past natural hazard events for Hays County. These included National Oceanic Atmospheric Administration's (NOAA) National Climatic Data Center (NCDC) database and the National Hurricane Center's Hurricane Tracker database. Review of these sources (and others) indicated that between 1950 and 2010, Hays County has experienced the following range of natural hazard events:

- 84 Floods (Riverine and Shallow Flooding)
- 83 Hail storms
- 58 Severe storms / high winds
- 25 Tornadoes (11 F0s, 8 F1s, 5 F2s, and 1 F3s)
- 11 Winter storm/extreme cold/ice
- 7 Droughts
- 2 Wildfires
- 0 Tropical storms
- 0 Dam failures
- 0 Earthquakes

All the queries of the NCDC database used the maximum possible period (1950 to the present day). Although the NCDC queries extended back to 1950, in many cases information in the database begins in the 1990s, and

the reason for this is not explained on the site. It is assumed that events occurred well before the 1990s in most cases, but the information is apparently not archived in the NCDC system for some hazards, or the reporting tool limits the query output. The result of this is that there is occasionally some inconsistency in the periods reported in this mitigation Plan update. Where possible, this information is supplemented from other sources.

Numerous federal agencies maintain a variety of records regarding losses associated with natural hazards. Unfortunately, no single source is considered to offer a definitive accounting of all losses. The Federal Emergency Management Agency (FEMA) maintains records on federal expenditures associated with declared major disasters. The U.S. Army Corps of Engineers (USACE) and the Natural Resources Conservation Service (NRCS) collect data on losses during the course of some of their ongoing projects and studies. Additionally, NOAA and the NCDC collect and maintain data about natural hazards in summary format. The data includes occurrences, dates, injuries, deaths, and costs. The basis of the cost estimates, however, is not identified.

In the absence of definitive data on some of the natural hazards that may occur in Hays County, illustrative examples are useful. In 1965, the federal government began to maintain records of events deemed significant enough to warrant declaration of a major disaster by the U.S. President. Since 1965, Hays County has received seven major Presidential Disaster Declarations. These are listed below in Table 11. Of the seven Disaster Declarations, five of these events were floods, one was a tornado event, and one was a wildfire. This list is intended to highlight significant hazards that have occurred here in the past, not catalog every event. A number of these events caused property damage and injuries.[8] These figures and events are discussed in more detail in the hazard-specific subsections that follow.

[8] National Oceanic and Atmospheric Administration (NOAA) – National Climatic Data Center

Table 11
Natural Hazards and Declared Major Disasters in Hays County (1965 to 2010)
(Sources: Public Entity Risk Institute (PERI) website, FEMA, Hays County FIS, NCDC database)

Date	Event Type	Event Description
May 14 and 15, 1970 FEMA -DR-286	Severe Storms and Flooding	Heavy rain began in the Sink, Purgatory, Limekiln, and Willow Springs watersheds near San Marcos near 6:00 PM May 14, 1970. By 3:00 PM May 15, rainfall would range from 6.0 in. at the Sink and Purgatory Creek headwaters to 18.0 in. at radio station KCNY in downtown San Marcos. The heaviest period was midnight to 6 AM of the 15th. Disastrous flooding began after 8 AM and crested near 11 AM of the 15th. Four-hundred five homes were severely flooded, and many more businesses and public buildings. Three elementary schools were flooded, and students from one were rescued from the roof by helicopter. Two children drowned when the small aluminum boat they were being rescued in overturned. The Aquarena Springs Administrative Building had 6 ft of water in it. The National Guard was de-activated as their facilities flooded. The armory had several feet of water in it. Many hundreds of cars were washed about and destroyed as tens of ft of turbulent flow covered many city streets.
May 20, 1972 FEMA -DR-333	Severe Storms and Flooding	On May 11, 1972, a series of intense thunderstorms formed southwest of New Braunfels, Texas, and moved northeastward along the Balcones Escarpment. Reports from local residents indicated that the storm only lasted four hours and spread an average of roughly eight inches of rainfall over 300 square miles. Rainfall totals of up to 16 inches were recorded in central Texas. In San Marcos maximum rainfall totals were near six inches.
August 10, 1980	Tornado	As Hurricane Allen made landfall in South Texas, the storm spawned tornadoes across central Texas. At least 24 tornadoes were reported across central & south Texas. In Hays County, a tornado produced damage along a path 24 miles long and 33 yards wide. The tornado caused an estimated $25 million in damages.
December 26, 1991 FEMA DR-930	Severe thunderstorms	Known as the “Christmas Flood of 1991,” a large storm moved inland from the Gulf of Mexico with heavy rains causing flooding in and around the Austin, Texas area on December 18th. By the following day, the rainfall continued over a greatly expanded area, bringing tremendous stream flow rates and flooding to the area. Record peak discharges were recorded at many creek gaging stations across Central Texas.
June 7, 1997 FEMA DR-1179	Severe Storms and Flooding	Heavy rains produced three to four inches of rains over a period of less than four hours. Widespread flash flooding occurred along the Blanco River across southern Hays County from Blanco to Wimberley. The NCDC reported that over 40 homes were flooded as a result of the heavy rainfall. The flooding caused two fatalities, seven injuries, and $2.5 million in property damage.

Date	Event Type	Event Description
October 17, 1998 FEMA DR-1257	Severe Storms and Flooding	A series of storms moved across the central and south regions of Texas, dropping up to 22 inches of rain in some areas and spawning several tornados. In southern Hays County rainfall totals ranged from 15 – 22 inches. In Hays County, flooding along the San Marcos River was most devastating to the eastern part of San Marcos, with many permanent homes flooded and several mobile homes washed from their sites.
November 15, 2001	Tornado	Two tornadoes touched down 2.5 miles north of Kyle, Texas. The tornadoes caused extensive tree damage with the tops of trees sheared off. In total, over 100 homes were damaged (two of which were destroyed), by the tornadoes. As many as 20 businesses suffered damage. In Hays County, the tornadoes caused approximately $500,000 in damages.
November 15, 2001	Severe Storms and Flooding	Flash flooding was widespread across the county, with the worst problems in the Wimberley area. Minor flooding was reported in San Marcos, and hundreds of people were evacuated away from flood prone areas. Property damage in Hays County totaled $200,000.
July 4, 2002 FEMA -DR-1425	Severe Storms and Flooding	Heavy rains fell over a four-day period causing damage to homes, roads, and bridges.
June 2, 2003	Severe Thunderstorms/High winds	A line of thunderstorms formed along a cold front in central Texas and moved quickly southward. As the storms moved through Hays County, they produced a downburst that struck the town of San Marcos and spread southeastward into Caldwell County. In San Marcos many business signs and awnings were damaged along with roof damage to several businesses. In San Marcos, damages were estimated at $7 million.
April 20, 2006	Hail Storm	Severe thunderstorms produced extremely large hailstones that caused extensive damage to the San Marcos Tanger Outlet Mall and Prime Outlet Mall. The NWS inspection team indicated the severe wind and hail had caused the worst damage in an area enclosed by Wonder World Drive, Posey Road, Hunter Road, and CR 266 which is also known as Old Bastrop Highway. Damages from this storm were estimated at $100 million with up to 10,000 vehicles damaged and another 7,000 vehicles in homes in the area.
January 11, 2006 FEMA-DR-1624	Wildfire	Extreme Wildfire Threat was declared for all 254 Texas Counties creating eligibility for Category “B” Emergency Protective Measures on or after December 27, 2006.

Natural Hazard Related Deaths, Injuries and Property Damage

According to the NCDC database, Hays County has experienced five deaths and 293 injuries from natural hazards in the period from 1950 to 2010.[9] Property damage from natural hazards in the County during this same time period was estimated at slightly more than $299.63 million.

5.3 Losses Due to Major Disasters

No definitive record exists of all losses from disasters in Hays County. For the United States as a whole, estimates of the total public and private costs of natural hazards range from $2 billion to over $6 billion per year. Most of those costs can only be estimated. In most declared major disasters, the federal government reimburses 75% of the costs of cleanup and recovery, with the remaining 25% covered by states and local jurisdictions.

FEMA's estimate of its expenditures in the State of Texas for flood disasters alone for the period from 1991 through 2001 exceeded $6.8 billion. This period includes Tropical Storm Allison, which inflicted damages in excess of $1 billion. These costs, which do not include costs incurred by other federal agencies or by state and local agencies, include those associated with:

- Public assistance for debris removal, emergency works, roads and bridges, flood control facilities, public buildings and equipment, public utilities, and parks and recreational facilities.
- Assistance paid out for individual and family grants, emergency food and shelter, and other assistance to individuals.
- Funds set aside to support hazard mitigation grants.

As mentioned above, at the time of the 2011 mitigation plan update Hays County has been part of seven past Presidential Disaster Declarations. Estimated damages for these seven disasters are summarized below in Table 12. The last columns show total damages for the events (including all areas that received disaster declarations, inside and outside Texas).

Table 12
Estimated Damages for Federally Declared Disasters In Hays County, Texas (1965 to 2010), Ordered by Event Date
(Source: FEMA Disaster Database)

FEMA Disaster (DR) #	Event Date	Event Type	Total Damages (2009 $)
FEMA DR-286	May 14 and 15, 1970	Tornadoes, windstorms, and flooding	$30,058,974
FEMA DR-333	May 20, 1972	Severe storms and flooding	$11,614,939
FEMA DR-930	December 26, 1991	Severe thunderstorms	$38,168,436
FEMA DR-1179	July 07, 1997	Severe storms and flooding	$19,537,040
FEMA DR-1257	October 17, 1998	Severe storms and flooding	184,673,340
FEMA -DR-1425	July 4, 2002	Severe storms and flooding	unknown

[9] National Oceanic and Atmospheric Administration (NOAA) – National Climatic Data Center

FEMA Disaster (DR) #	Event Date	Event Type	Total Damages (2009 $)
FEMA -DR-1624	January 11, 2006	Wildfire	$46,966,613

5.4 Overview of the Type and Location of Natural Hazards that can affect Hays County

As a first step in the plan update process, the Mitigation Planning Committee (MPC) discussed the hazards that that were included in the first-generation HMP. Based on this discussion and consideration of the hazards that currently have potential to affect the county, the MPC determined that the following hazards will be included in the 2011 HMP update.

1. Floods (riverine and shallow)
2. Tornadoes
3. Severe thunderstorm/high winds
4. Dam failure
5. Winter storm, extreme cold, ice storm
6. Wildfire / brush fire
7. Tropical storms and tropical cyclones
8. Drought
9. Seismic/earthquake
10. Hail storm
11. Extreme heat

The following section profiles the hazards listed above, including descriptions of each hazard, location of the hazard, severity of the hazard, impacts on life and property, and past occurrences.

For each hazard profiled in Section 5.4, the planning team assigned a high, medium, or low probability of future occurrences. The hazard probability was assigned based on calculating the annual percent probability of occurrence by dividing the number of previous events by the duration in years of historical data. Table 13 summarizes the annual percent probability ranges for assigning the low, medium, and high probabilities. Note that the percent ranges in the table below are not exact probabilities, but are intended to be used as a general guide for future planning purposes. Also note that future probability is only one component of the risk calculation. Some hazards, such as dam failure and earthquakes have a low probability but potentially very high impact on life and property in the planning area, and risk studies and mitigation strategies must be based on detailed engineering study that is outside the scope of this plan update.

Table 13
Annual Percent Probability Ranges

Probability	Annual Percent Probability Range (%)
Low	1-9
Medium	10-24
High	25-100

5.4.1 Floods

(Riverine Flooding and Shallow Flooding)

Description of the Flood Hazard

Flooding is defined as the accumulation of water within a water body and the overflow of excess water onto the adjacent floodplain. Hundreds of floods occur each year, making them one of the most common hazards in all 50 states and U.S. territories. Floods are also the most widespread of all natural disasters except fire. Flooding typically results from large-scale weather systems generating prolonged rainfall. Most communities in the United States have experienced some kind of flooding after spring rains, heavy thunderstorms, or winter snow thaws.

Flooding typically falls into one of three major categories

- Riverine flooding
- Coastal flooding
- Shallow flooding

Hays County is vulnerable to both riverine flooding and shallow flooding. Riverine flooding occurs when rivers, creeks, streams, or ditches (channels) receive too much water, the excess flows over its banks and onto the adjacent floodplain. The floodplain is the land adjoining the channel of a river, stream, or other watercourse or water body that is susceptible to flooding. Flooding is a natural event for rivers and streams (often called "overbank" flooding).

Flash floods fall under the riverine flooding category and involve a rapid rise in water level, high velocity, and large amounts of debris, which can lead to significant damage that includes tearing out trees, undermining of buildings and bridges, and scouring new channels. The intensity of flash flooding is a function of the intensity and duration of rainfall, steepness of the watershed, stream gradients, watershed vegetation, natural and artificial flood storage areas, and configuration of the streambed and floodplain. Dam failure and ice jams may also lead to flash flooding.

Flooding can also can be the result of ponding or overland ("sheet") flow when rainfall rates temporarily exceed the drainage capacity of an area. In overbank events, excess water from snowmelt, rainfall, or storm surge accumulates and overflows onto banks and adjacent floodplains. In ponding events, water temporarily accumulates in an area until normal drainage allows it to flow away. Overland or sheet flow floods occur when intense rainfall occurs, and water simply runs across the ground, in extreme cases at depths of more than a foot and at relatively high velocities. For additional information about floods visit NOAAs *Flood Monitor* page located at http://www.noaawatch.gov/floods.php.

Location of the Flood Hazard

As descibed in Section 3.3.1, Geography, Hays County is located in south-central Texas and is bordered by Travis County to the northeast, Blanco County to the west, Comal County to the southwest, and Caldwell County to the southeast. Portions of the Pedernales River, Barton Creek and Onion Creek flow in the northern portion of Hays County, while the Blanco River and its tributaries, including the San Marcos River, drain the southern portion.

Hays County is particularly susceptible to flash floods. Urban and small stream (flash) flooding from relatively brief but heavy rainfall is a common occurrence across the county. Rainfall amounts of one inch or more per hour lasting for less than one hour will generally cause this kind of flooding. In most cases, flooding is confined to streets, underpasses and parking lots. When heavy rains continue for more than two hours, storm drainage systems can become overtaxed and the water initially held in the streets and ditches overflows onto citizens' property and even into some homes. Occasionally injury or even death can be attributed to a flash flood event. This usually happens when motorists fail to leave vehicles that have stalled due to rapidly rising water and the water continues to rise above the height of the vehicle.

The drastic changes in elevation across the county yield very steep channel slopes, which cause rapid runoff and high peak discharges. These factors present a danger due to high velocity stream flows, most pronounced in the Blanco River. Of the part of the river within the county, two-thirds of its length flows greater than 10 feet per second, and the remaining portion flows between five and ten feet per second. There are also several other creeks and rivers with moderate to high and high velocities over a considerable fraction of their reach.

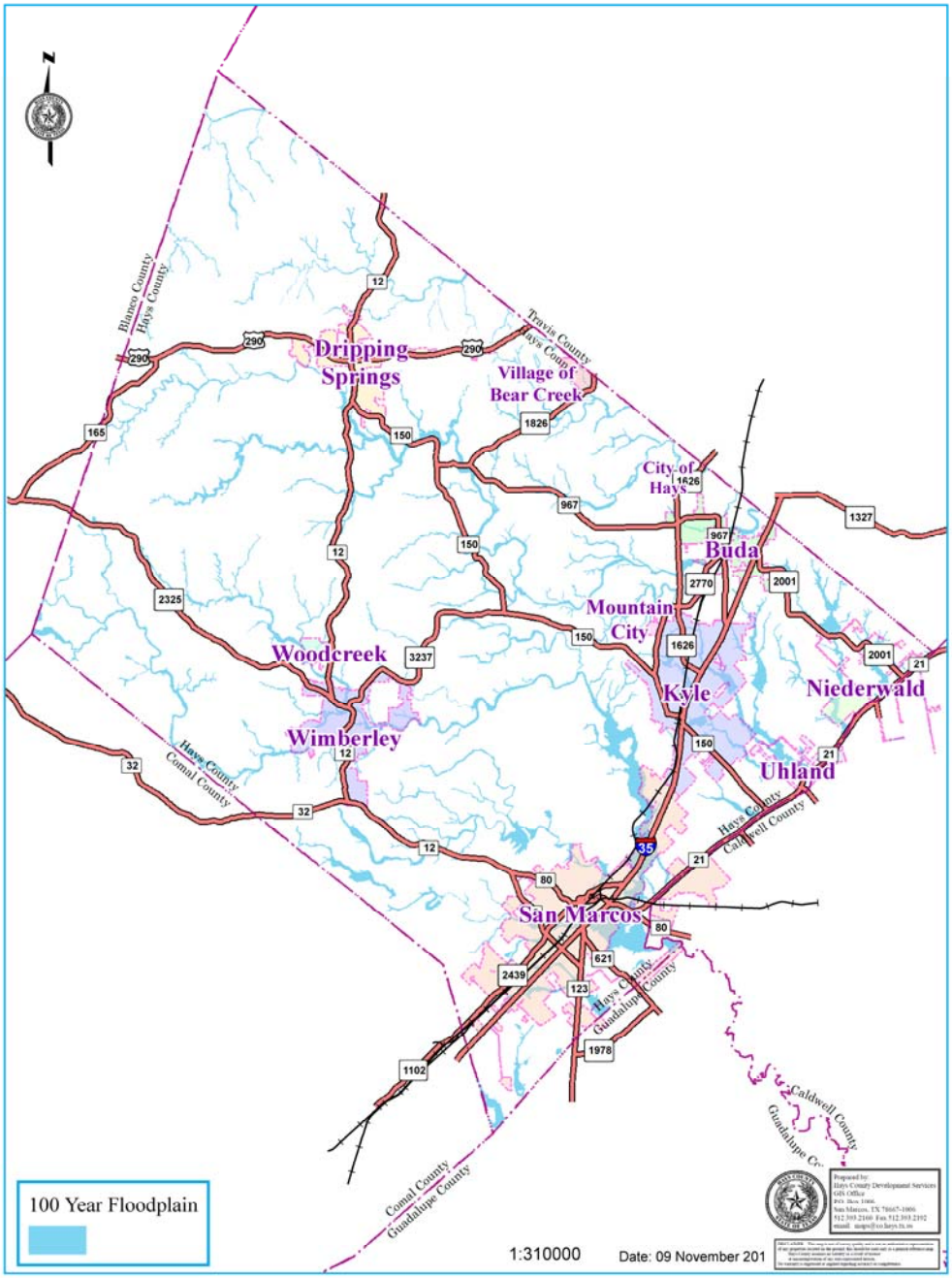
The Flood Insurance Rate Maps (FIRMs) prepared by FEMA provide an overview of flood risk, and can also be used to identify the areas of the county that are vulnerable to flooding. FIRMs are used to regulate new development and to control the improvement and repair of substantially damaged buildings. Flood Insurance Studies (FISs) are often developed in conjunction with FIRMs. The FIS typically contains a narrative of the flood history of a community, and discusses the engineering methods used to develop the FIRMs. The study also contains flood profiles for studied flooding sources and can be used to determine Base Flood Elevations (BFE) for some areas.[10]

The most recent FIS for Hays County is dated September 2, 2005. This FIS was prepared for both the incorporated and unincorporated areas of the county. The study compiles all previous flood information and includes data collected on numerous waterways. The September 2, 2005 FIS updates the previous version dated February 19, 1998.

Review of the Hays County FIS and FIRM indicates that flood prone areas of the county are predominately located along the Blanco River and its tributaries. Figure 9 identifies the Special Flood Hazard Areas (or 100-year floodplain) for Hays County. At 55.72 square miles (to included incorporated areas), the 100-year floodplain makes up 8.26 percent of the total land area in the county (total land area is 679 square miles).

[10] FEMA –Flood Insurance Study definition

Figure 9
Hays County Floodplain Map (Effective FIRM - September 2, 2005)
(Sources: FEMA, Hays County Development Services – GIS Office)



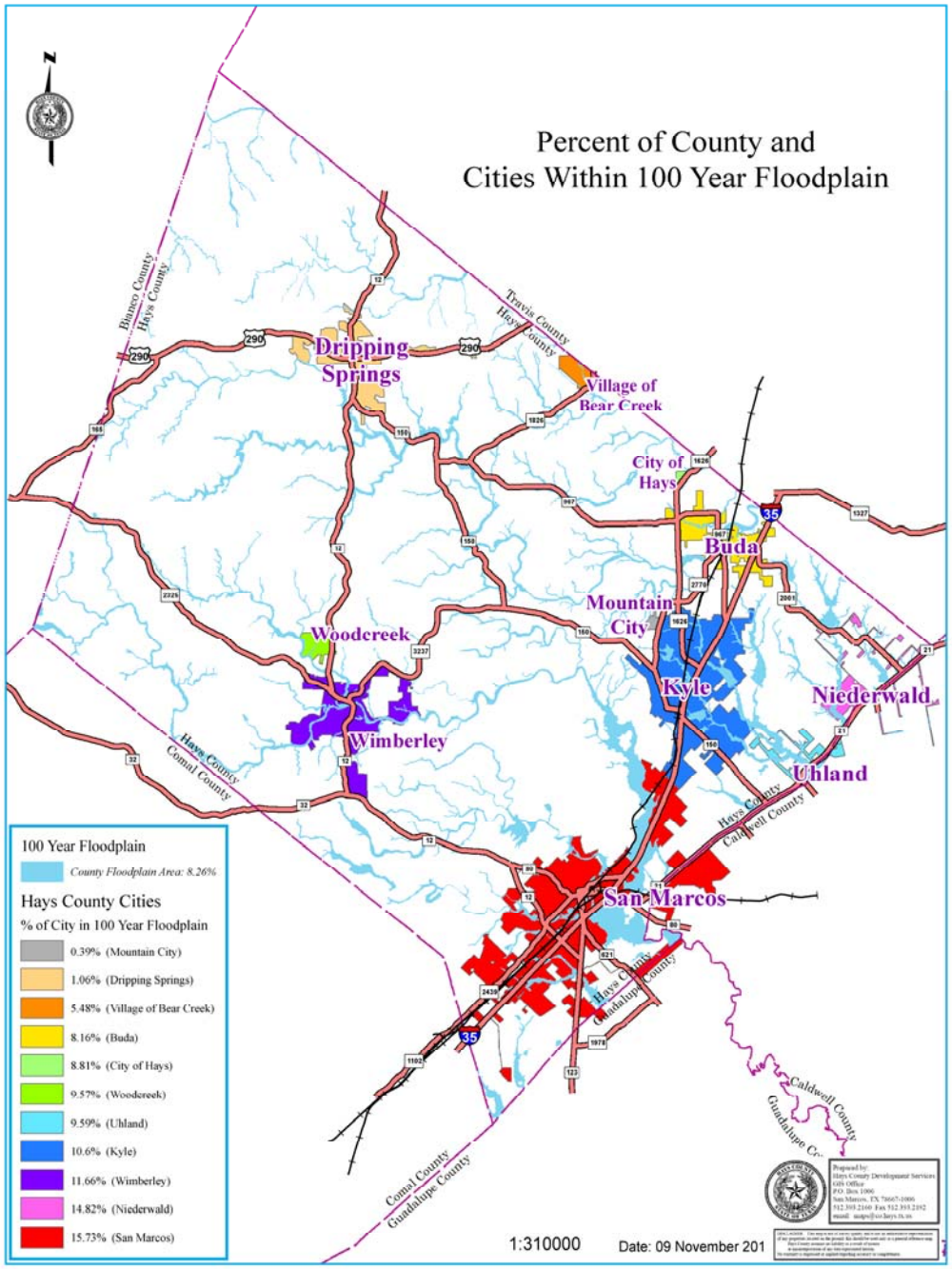
The next table shows the numbers of parcels in each community in Hays County with some contact with the 100-year floodplain and the percentage of parcels in contact with the 100-year floodplain. The flood risk in these communities is discussed in much greater detail in Section 6 of the Plan update, and in the jurisdiction-specific appendices. This data should not be considered a direct proxy of flood risk because in many cases even though parcels may be exposed to floodplain, there may (a) be only small portions of parcels touching the floodplain, and (b) there may be no structures or infrastructure on the parcels. The table is presented graphically in Figure 10 on the following page.

Table 14
Hays County: Parcels in Contact with 100-year Floodplain, ordered by Percent in Floodplain

Community	Parcels in Floodplain	Floodplain Area (Square Miles)	Percent area in Floodplain
San Marcos	1,500	5.07	15.734%
Niederwald	10	0.50	14.818%
Wimberley	760	1.05	11.661%
Kyle	530	1.99	10.597%
Uhland	20	0.20	9.587%
Woodcreek	80	0.10	9.570%
City of Hays	5	0.02	8.812%
Hays County	8,000	55.72	8.26%
Buda	150	0.42	8.160%
Bear Creek	40	0.06	5.477%
Dripping Springs	2	0.06	1.065%
Mountain City	3	0.002	0.392%

Figure 10 shows the percent of 100-year floodplain for each municipality in Hays County. The map indicates that the City of San Marcos has the highest percentage of 100-year floodplain (15.73%).

Figure 10
Hays County Percent of 100-year Floodplain By Municipality
(Sources: FEMA, Hays County Development Services – GIS Office)



Severity and Extent of the Flood Hazard

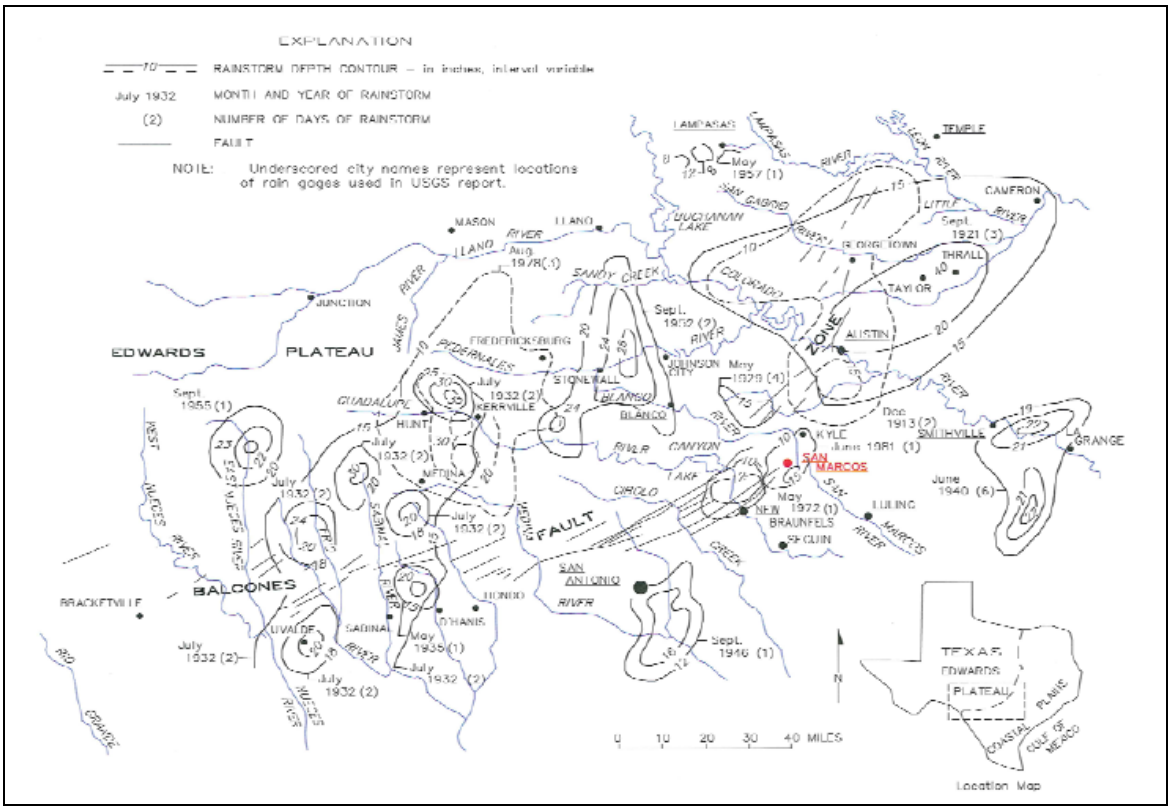
Flood severity is measured in various ways, including frequency, depth, velocity, duration and contamination. In Hays County, characterizing the severity of the flood hazard depends on what part of the county is being considered, but generally speaking the issues relate to how often floods occur. Historically, floods are (and continue to be) the most frequent, destructive, and costly natural hazard facing the State of Texas.

Generally, the major floods experienced in Hays County are produced by heavy rainfall from frontal-type storms. Major flooding can be produced by intense rainfall usually associated with localized thunderstorms, which may occur at any time during the year, but are more prevalent during the spring and summer months. The Hays County FIS indicates major historical floods in the area have occurred in 1921, 1929, 1970, 1972, 1974, 1981, and 1991. Studies conducted by the United States Geological Survey (USGS) indicate that the 1921 flood event was extremely large, well in excess of the 100-year flood event.[11] More recently, the county has been impacted by five significant flood events in the past 13 years: in 1997, 1998, 2001, 2004, and 2007.

The meteorological characteristics of central Texas, along with a geographic influence caused by the Balcones Escarpment, produce conditions conducive to large rainstorms in the area. Many of the highest rainfall intensities in the world have occurred in central Texas. A 1921 storm in Thrall, Texas, produced 32 inches of rain in 12 hours, and a 1935 storm near D'Hanis, Texas, produced 22 inches of rain in two hours and 45 minutes. In Hays County, one of the most notable events was the October 1998 event where 15 inches of rain fell in San Marcos within a 24-hour period, causing substantial damage to the downtown area.[12] Figure 11 identifies the location, dates, and depths, for historical rain events in central Texas. The City of San Marcos is highlighted in red, showing the city's location relative to the Balcones escarpment.

[11] Flood Insurance Study (FIS), Hays County, Texas. Effective September 2, 2005. Page 9.
[12] San Marcos Flood Protection Plan – Engineering Report. Volume I of II. May 10, 2007.

Figure 11
Historic Rainstorm Events in Central Texas
(Source: San Marcos Flood Protection Plan – Engineering Report)



Within the incorporated areas of Hays County, San Marcos has a long history of catastrophic floods. In San Marcos, the most disastrous flood of recent years occurred on May 15, 1970. In Hays County, the storm produced rainfall totals that ranged from six inches in the northern part of the county, with up to 13 inches recorded in San Marcos. The flood frequency was estimated between a 50- and 100-year flood event (1% to 2% annual probability). It was estimated that 1,850 acres of floodplain were inundated, and approximately half of this total was urban area.[13] To reduce the severity of flooding in Hays County, flood structures have been constructed on Sink, Cottonwood Branch, Plum Creek, Brushy Creek, and Purgatory Creeks.

Impact on Life and Property

Floods can have a tremendous impact on life and property in the planning area. Severe floods, particularly flash floods, can result in injury and possibly death. Floods are also disruptive to daily life, potentially displacing people and families for days, weeks or months in some cares. Floods can also cause significant damage to property, including both commercial and residential structures and contents.

[13] Flood Insurance Study (FIS), Hays County, Texas. Effective September 2, 2005. Page 9.

Past flood events in Hays County have caused extensive property damage, injuries and several lost lives. The NCDC database indicates that there have been 79 floods in Hays County in the period 1994 to 2010. The database provides no indication as to why there are no events recorded prior to 1994, but other sources such as the Hays County FIS identify severe flood events in the planning area as far back as 1899. Figures maintained by the NCDC indicate that Hays County has experienced four deaths and 277 injuries from floods between 1994 and 2010.[14] Table 15 lists the flood events reported by the NCDC that have resulted in at least one injury in Hays County. See Table 16, in the *Occurrence of the Flood Hazard* Subsection, for flood events in Hays County that have resulted in property damage.

Table 15
Hays County: Flood Events causing at least one Injury
(Source: NOAA/NCDC)

Query Results

5 FLOOD event(s) were reported in **Hays County, Texas** between **01/01/1950** and **12/31/2010** with **at least 1 injuries**.

*Click on **Location or County** to display Details.*

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

Texas

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 Countywide	06/08/1997	11:00 PM	Flood	N/A	2	7	2.5M	50K
2 Countywide	10/17/1998	07:30 AM	Flood	N/A	0	100	500K	50K
3 TXZ191	10/17/1998	10:00 AM	Flood	N/A	0	25	4.0M	50K
4 TXZ191 - 208 - 223	10/17/1998	10:00 AM	Flood	N/A	0	125	62.0M	650K
5 Countywide	11/15/2001	10:00 AM	Flash Flood	N/A	0	20	200K	50K
				TOTALS:	2	277	69.200M	850K

Within the NCDC table above, several of the column headings (the five farthest to the right) have been abbreviated and are defined as follows:

- Mag = Magnitude of the event for applicable hazards (Hailstorms, Tornadoes, etc.)
- Dth = Number of deaths
- Inj = Number of Injuries
- PrD = The dollar amount of reported property damage
- CrD = The dollar amount of reported crop damage

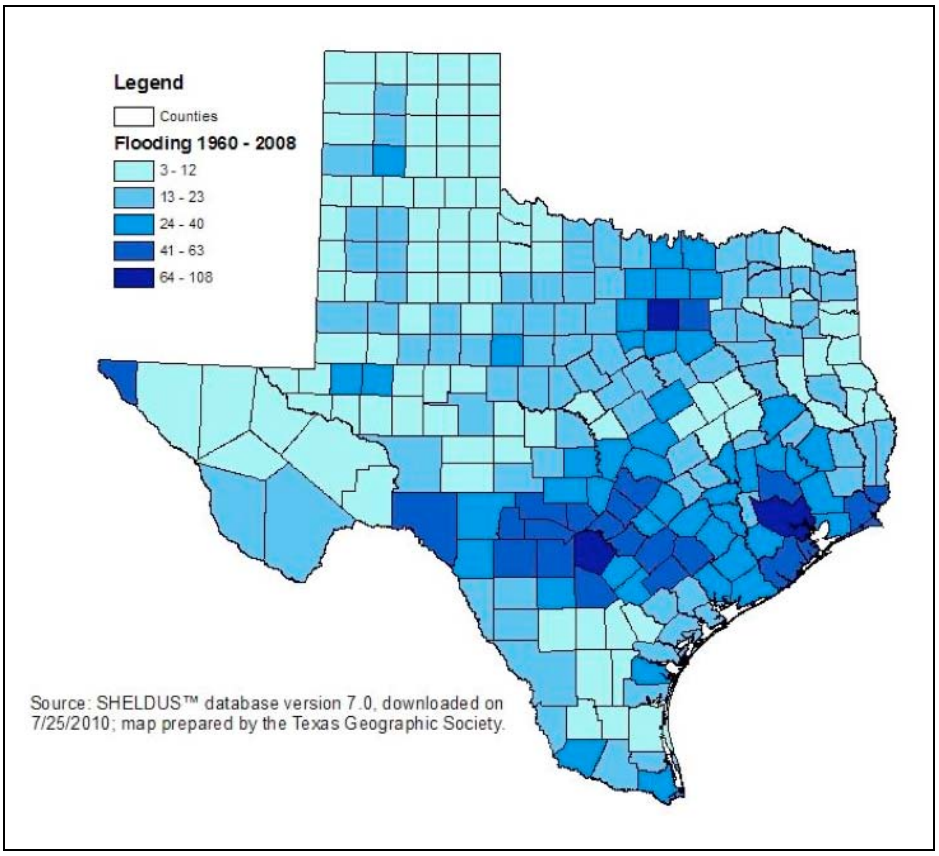
Section 6 of this plan includes a much more detailed discussion of flood impacts on Hays County and the jurisdictions within the county. In particular, the section includes a discussion about the history of National Flood Insurance Program (NFIP) claims, and the number of FEMA "repetitive loss" (RL) and "severe repetitive loss" (SRL) properties in the county.

[14] NOAA, NCDC – Hays County, Texas – Flood Events

Occurrences of the Flood Hazard

The MPC reviewed the 2010 State Hazard Mitigation Plan to identify the number of historical flood events by county.. Figure 12 is a map from the most recent version of the State HMP. It displays both previous flood occurrences and location of floods (by county) between 1961 and 2003. The map is classified into four value ranges using the natural breaks (Jenks) method. The State Plan indicates that Hays County falls within the second highest class (41-63 floods). Counties that fall within this category are considered to have a moderate to high risk for experiencing future flood events.

Figure 12
Flood Occurrences in Texas 1961-2008
(Source: 2010-2013 State of Texas Hazard Mitigation Plan)



The NCDC indicates there have been 79 flood events in Hays County between 1950 and 2010. The majority of these events were labeled as flash floods. For 52 of the events listed in Hays County, the NCDC reported no property damages or injuries. A total of nine of the 79 flood events resulted in property damage in excess of $25,000 each. These nine flood events are listed below in Table 16. The event causing the greatest amount of damage was a flood that occurred on October 17, 1998. This event caused an estimated $62 million in property damage. A detailed description of this event is included as part of the significant floods described after the table below.

Table 16
Hays County: Flood Events Resulting in Property Damage in Excess of $25,000, 1950 – 2010
(Source: NOAA/NCDC)

Query Results

9 FLOOD event(s) were reported in **Hays County, Texas** between **01/01/1950** and **12/31/2010** with **at least $25 Thousand in Property Damage**.

*Click on **Location or County** to display Details.*

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

Texas

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 Countywide	06/08/1997	11:00 PM	Flood	N/A	2	7	2.5M	50K
2 Countywide	06/22/1997	08:00 AM	Flood	N/A	0	0	50K	50K
3 Countywide	10/17/1998	07:30 AM	Flood	N/A	0	100	500K	50K
4 TXZ191	10/17/1998	10:00 AM	Flood	N/A	0	25	4.0M	50K
5 TXZ191 - 208 - 223	10/17/1998	10:00 AM	Flood	N/A	0	125	62.0M	650K
6 Countywide	08/31/2001	08:30 PM	Flash Flood	N/A	0	0	30K	20K
7 Countywide	11/15/2001	10:00 AM	Flash Flood	N/A	0	20	200K	50K
8 Countywide	06/09/2004	11:30 AM	Flash Flood	N/A	0	0	350K	0
9 Dripping Spgs	07/20/2007	13:00 PM	Flash Flood	N/A	0	0	100K	0K
				TOTALS:	2	277	69.730M	920K

In addition to the NCDC, the county MPC researched a variety of other sources to identify additional flood events. As mentioned earlier, the September 2, 2005 Hays County FIS indicates that in addition to the flood events listed in the NCDC database, significant historical flood events in the planning area also occurred in 1921, 1929, 1970, 1972, 1974, 1981, and 1991. The bullets below summarize some of the more significant recent floods in the county. The "DR" notation indicates events that received a Presidential Disaster Declaration.

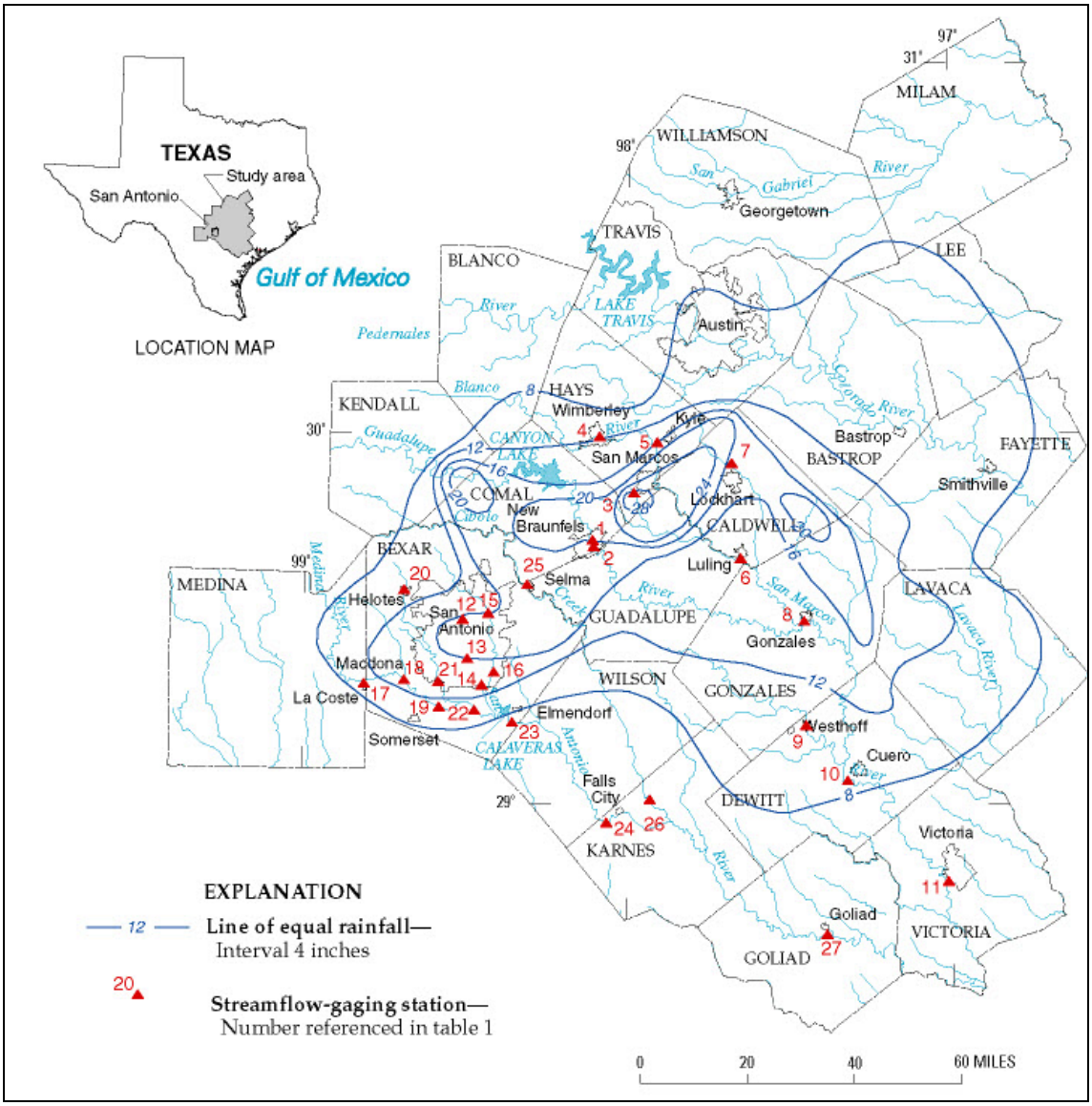
- **May 14 and 15, 1970 (DR-286).** Heavy rain began in the Sink, Purgatory, Limekiln, and Willow Springs watersheds near San Marcos near 6:00 PM May 14, 1970. By 3:00 PM May 15, rainfall would range from 6.0 in. at the Sink and Purgatory Creek headwaters to 18.0 in. at radio station KCNY in downtown San Marcos. The heaviest period was midnight to 6 AM of the 15th. Disastrous flooding began after 8 AM and crested near 11 AM of the 15th. Four-hundred five homes were severely flooded, and many more businesses and public buildings. Three elementary schools were flooded, and students from one were rescued from the roof by helicopter. Two children drowned when the small aluminum boat they were being rescued in overturned. The Aquarena Springs Administrative Building had 6 ft of water in it. The National Guard was de-activated as their facilities flooded. The armory had several feet of water in it. Many hundreds of cars were washed about and destroyed as tens of ft of turbulent flow covered many city streets. Five flood-retention dams built by the NRCS prevented additional severe flooding down these drainages. These structures prevented much of the city from being destroyed recently in the October 1998 flood when 20 in. to more than 30 in. of rain fell over the entire drainages.
- **December 26, 1991 (DR 930). Christmas Flood -** A stalled long wave Dec 18th over Arizona extended into the Sonoran Desert of northern Mexico. The upper low was reflected at the surface along the

Arizona/Mexico border. A series of cold air masses pushed from the Pacific Northwest across the Central Plains into the southeastern U.S. A cold-air-induced surface high was centered over Georgia. A stationary front in central Texas marked the southern periphery of the cold air masses moving across the Central Plains. At low levels, clockwise flow around the southeastern high brought a long fetch of very warm moist air across the Gulf, across the Texas Coastal Bend, and into central Texas as a low-level jet. The weather station at Corpus Christi measured 850 mph winds of 60 to 70 knots from about 160 to 170 degrees for the duration of the storm. The low-level jet slammed into the stationary front across central Texas as a trigger mechanism. At upper levels, the long wave in the west induced a water vapor plume from the eastern Pacific across Mexico into Texas. Tremendous rain and flooding occurred at and south of the confluence of the upper vapor plume, the low-level jet, and the surface stationary front. The heaviest rain was 16 to 18 in. on an area from Llano to Bandera to Boerne. The 6-in. isohyetal extended from the Red River north of the Dallas/Fort Worth metroplex - to near Coleman - to between Bracketville and Uvalde - to near Corpus Christi - to near Palestine - to the Red River. This was not a historic event in terms of large rainfall totals. But in terms of total rain volume that fell from the sky in one event, this certainly was one of the largest in Texas recorded history, if not the largest. Certainly it rivals Hurricane Beulah, the June 1935, Hurricane Alice in 1954, and the June 1987 floods.

- **June 8, 1997.** Heavy rains produced three to four inches of rains over a period of less than four hours. Widespread flash flooding occurred along the Blanco River across southern Hays County from Blanco to Wimberley. The NCDC reported that over 40 homes were flooded as a result of the heavy rainfall. An estimated 40 cars were washed away by the flooding. More than 25 Hays County roads were flooded, with the worst flooding occurring along Dry Cypress Creek. The flooding caused two fatalities, seven injuries, and $2.5 million in property damage.
- **October 17-22, 1998 (DR-1257).** A series of storms moved across the central and south regions of Texas, dropping up to 22 inches of rain in some areas and spawning several tornados According to a National Weather Service (NWS), the October 17-19, 1998 flood was caused by a slow moving cold front in combination with deep tropical moisture from the Gulf of Mexico and Eastern Atlantic Ocean. The resulting rainfall produced Floods-of-Record for much of the Hill Country and southeast Texas rivers, including the San Marcos River. In southern Hays County rainfall totals ranged from 15 to 22 inches. A total of sixty Texas counties (24%) reported flooding during October 17-19. Thirty-six counties (including Hays) became eligible for federal and/or state assistance as a result of damages suffered from this storm system during October 17-31. In Hays County, flooding along the San Marcos River was most devastating to the eastern part of San Marcos, with many permanent homes flooded and several mobile homes washed from their sites. Homes and apartments were flooded along the San Marcos River on Riverside and Riviera Drives, along Purgatory Creek, and along Uhland and Post Roads. Flooding also occurred along the Blanco River at Wimberley, where the river crested at 26.7 feet (flood stage is at 13 feet). Several businesses in Wimberley were flooded. The worst flooding in Wimberley was along Cypress Creek, which may have been produced as the Blanco River backed up into the Wimberley business district, and runoff coming down Cypress Creek. The event caused an estimated $1 billion in total damages and approximately $62 million in damages in Hays County.
- **November 15, 2001.** Flash flooding was widespread across the county, with the worst problems in the Wimberley area. Two cars were washed off roads, but all the occupants were rescued. Minor flooding was reported in San Marcos, and hundreds of people were evacuated away from flood prone areas. The NCDC reported that property damage in Hays County totaled $200,000.
- **July 4, 2002 (DR-1425).** Heavy rains fell over a four-day period causing damage to homes, roads, and bridges.

Figure 13 shows the total rainfall amounts from the October 17-18, 1998 flood event. The map shows the heaviest rainfall totals were located in southern Hays County where between 16 and 28 inches of rain fell over a two day period. The Natural Resources Conservation Service (NRCS) indicated that the most intense portion of the storm exceeded the 500-year flood event.

Figure 13
Total Rainfall Depths for October 17-18, 1998 Flood Event
(Source: USGS)



Future Flood Probability for Hays County

With a total of 79 flood events between 1994 and 2010, Hays County experiences on average slightly less than five floods per year. As with most areas of its size, there is a virtual 100% chance that a flood of some magnitude will occur somewhere in Hays County annually. Based on the ranges shown in Table 16, there is a high probability of future floods occurring in Hays County. This method is not intended to be an exact, scientific assessment of probability. Site-specific engineering studies such as FISs should be used to determine flood probability on a case-by-case basis when specific metrics are needed. Section 7 of this plan includes detailed probability-based estimates of potential future flood losses for various areas of the county.

Figure 14
July 4, 2002 Flood Event, Wimberley, Texas
River Road and Wayside showing Flood Gauge
(Source: Wimberley.com, Rivers and Streams)

5.4.2 Tornadoes

Description of the Tornado Hazard

A tornado is a rapidly rotating vortex or funnel of air extending ground ward from a cumulonimbus cloud. Most of the time, vortices remain suspended in the atmosphere. When the lower tip of a vortex touches the ground, the tornado becomes a force of destruction. The most violent tornadoes are capable of tremendous destruction with wind speeds of 250 mph or more. In extreme cases, winds may approach 300 mph. Damage paths can be in excess of 1 mile wide and 50 miles long. Tornado statistics from the National Weather Service (NWS) indicated that the United States averaged 1,315 tornadoes between 2007 and 2009. The highest monthly average during this time period occurred in May with an average of 305 tornadoes.[15]

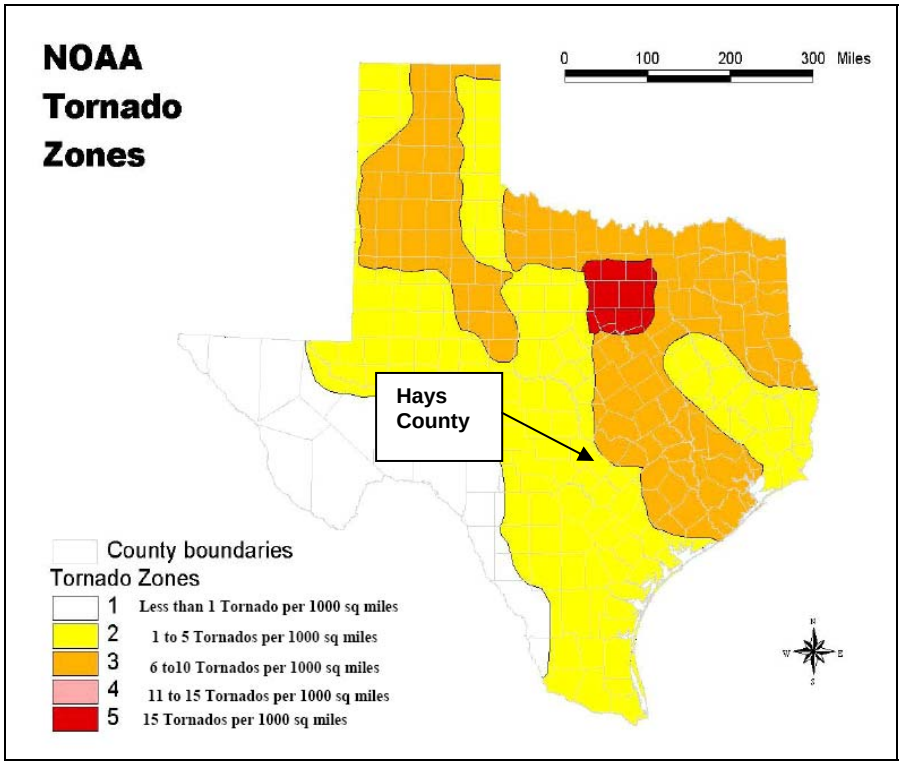
Tornadoes are most hazardous when they occur in populated areas. Tornadoes can topple mobile homes, lift cars, snap trees, and turn objects into destructive missiles. Among the most unpredictable of weather phenomena, tornadoes can occur at any time of day, almost anywhere in the country, and in any season. In Texas, tornadoes have a higher frequency in the spring months of March, April, and May. While the majority of tornadoes cause little or no damage, some are capable of tremendous destruction. Additionally, tornadoes are often generated from hurricanes, so the entire hurricane season has to be viewed as a risk period for this hazard. For additional information about tornadoes visit NOAA's *Severe Weather* page: http://www.noaawatch.gov/themes/severe.php.

Location of the Tornado Hazard

Tornadoes are a likely occurrence in Hays County. From 1953 to 2004, NOAA indicates that Texas experienced the highest average annual number of tornadoes with 139, followed by Oklahoma (57), Kansas and Florida (55 each), and Nebraska (45). Average annual tornado statistics were available only up to 2004 through NOAA's NCDC. In Texas, peak tornado occurrence is in March through May, and in November. Figure 15 illustrates the frequency of tornado strikes in the Texas per 1,000 square miles. The map indicates that in Hays County NOAA has recorded 1-5 tornadoes per 1,000 square miles.

[15] National Weather Service (NWS), Monthly and Annual U.S. Tornado Summaries

Figure 15
Tornado Activity in Texas
(Source: Source: State of Texas Hazard Mitigation Plan, 2010)

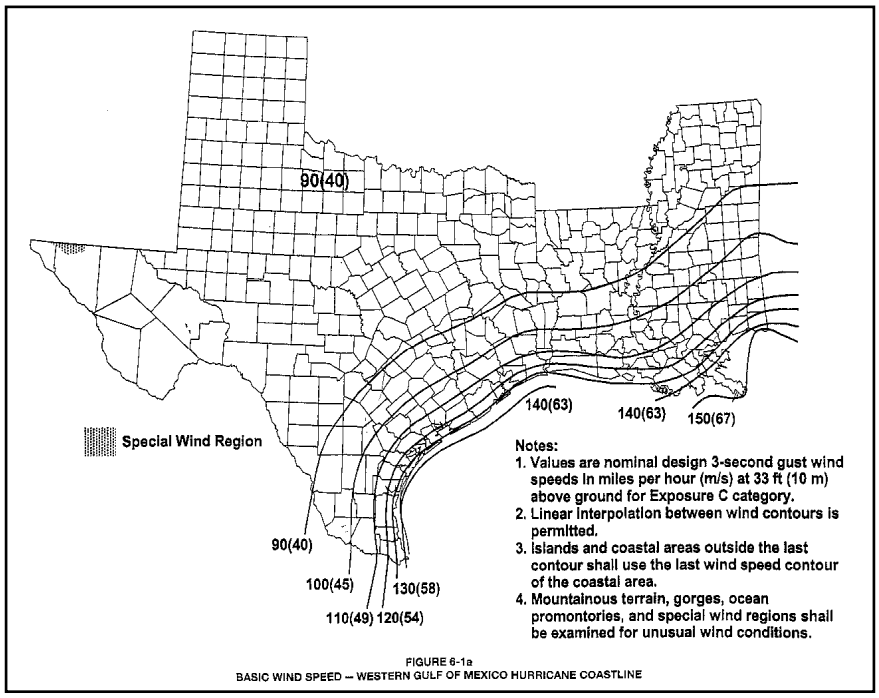


With an average of 153 tornadoes touching down each year, Texas is considered the U.S. "tornado capital", although this is obviously a function of the State's size as well as its location. While Texas tornadoes can occur in any month and at all hours of the day or night, they occur with greatest frequency during the late spring and early summer months during late afternoon and early evening hours. In Hays County, detailed damage descriptions from the NCDC indicates most wind damage has been limited to downed trees, blocked roads, and disabled power lines.

Figure 16 provides the "basic wind speed" map for Texas. The map was developed by the International Code Council (ICC) and is referenced in model building codes as the International Building Code (IBC). The map is used to assist with designing buildings to withstand reasonably anticipated winds in order to minimize property damage.[16] The map shows that the majority of Hays County falls within the area where the "design wind" speed is 90 miles per hour.

[16] American Society of Civil Engineers, 2002

Figure 16
Basic Wind Speed: Texas and Louisiana
(Source: International Building Code)



Severity (or Extent) of the Tornado Hazard

Tornado damage severity is currently measured by the Enhanced Fujita Tornado Scale (F-Scale), named after Dr. T. Theodore Fujita, who first introduced the scale in 1971. The original Fujita Scale, used until 2007, assigned numerical values based on wind speeds and categorizes tornadoes from 0 to 5. The scale was based on damage caused by a tornado related to the fastest ¼ mile wind speed at the height of a damaged structure. The letter "F" often precedes the numerical value. Table 17 provides a description of the Fujita Tornado Measurement Scale.

Table 17
Fujita Tornado Measurement Scale
(Source: NOAA)

Category	Wind Speed	Examples of Possible Damage
F0	Gale (40-72 mph)	Light damage. Some damage to chimneys; break branches of trees; push over shallow rooted trees; damage to sign boards.
F1	Moderate (73-112 mph)	Moderate damage. Peel surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off roads.
F2	Significant (113-157 mph)	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.
F3	Severe (158-206 mph)	Severe damage. Roofs and some walls torn off well constructed houses; trains overturned; most trees in forest uprooted; cars lifted off ground and thrown.
F4	Devastating (207-260 mph)	Devastating damage. Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
F5	Incredible (261-318 mph)	Incredible damage. Strong frame houses lifted off foundations and carried considerable distance to disintegrate; automobile sized missiles fly through air in excess of 100 yards; trees debarked; incredible phenomena will occur.

In February, 2007 the F-Scale was replaced with a more accurate Enhanced Fujita Scale (EF-scale). It was the Jarrell, Texas tornado of May 27, 1997 and the Oklahoma City/Moore tornado of May 3, 1999 that brought to the forefront the problem that perhaps the wind estimates were too high in the F-Scale. The changes to the original scale were proposed by a committee of meteorologist and engineers searching for a more accurate method of assessing the magnitude of tornadoes. The modifications made to the F-scale were limited to ensure that the new Enhanced F-scale could continue to support the original tornado database found within the NDCD.

The Enhanced F-scale is a set of wind estimates (not measurements) based on observed damages after a tornado. Its uses three-second gusts estimated at the point of damage based on a judgment of eight levels of damage to 28 indicators that include various commercial and residential building types, transmission towers, poles and trees. Similar to the original scale, the new Enhanced F-scale includes five classes ranging from EF0 to EF5 (Source: NOAA, National Weather Service – Storm Prediction Center). The wind speeds from the Fujita Scale were used as basis for development of the Enhanced F-scale. The following Table displays the wind speed ranges for the original Fujita Scale, the derived wind speeds (Enhanced F-scale), and the new Enhanced F-scale currently in use since February of 2007.

Table 18
Wind Speed Comparison of the Fujita Scale and Enhanced Fujita Scale
(Source: NOAA – National Weather Service)

Fujita Scale			Derived EF Scale		Operational EF Scale	
F Number	Fastest 1/4-mile (mph)	3 Second Gust (mph)	EF Number	3 Second Gust (mph)	EF Number	3 Second Gust (mph)
0	40-72	45-78	0	65-85	0	65-85
1	73-112	79-117	1	86-109	1	86-110
2	113-157	118-161	2	110-137	2	111-135
3	158-207	162-209	3	138-167	3	136-165
4	208-260	210-261	4	168-199	4	166-200
5	261-318	262-317	5	200-234	5	Over 200

Within the planning area it is possible for a tornado of any magnitude to occur, with the probability decreasing as the intensity scale increases. Although the NCDC indicates the strongest historical tornado in Hays County was rated F3 on the Fujita scale, the climate in central Texas, and the potential for extreme atmospheric instability, allow for the possibility that tornadoes in the planning area could reach EF-5 severity. For example the Jarrell, Texas tornado in 1997 mentioned above was officially categorized by NOAA as an F5. This tornado occurred in nearby Williamson County where climate conditions are similar to Hays County. With wind speeds over 200 mph, a tornado of this magnitude would potentially cause catastrophic damage to a localized area of Hays County.

Tornadoes have an impact on Hays County equally and uniformly. The severity of the tornadoes identified in the NCDC database for Hays County ranged from F0 to F3. According to NOAA, between 1950 and 1994 Texas ranked first in the United States for frequency of tornadoes. The State of Texas also ranked first in the number of fatalities, injuries and property damage.[17] As part of the 2011 Plan update, open sources were reviewed in search of more recent tornado ranking statistics, but no updated data was identified.

Table 19
Texas National Ranking for Tornadoes, Fatalities, Injuries, and Damages from 1950-1994
(Source: NOAA – Storm Prediction Center)

Tornadoes		Fatalities		Injuries		Damages	
Rank	Number	Rank	Number	Rank	Number	Rank	Dollar
1	5,490	1	475	1	7,452	1	$1,955,927,552

[17] NOAA – Tornado Numbers, Deaths, Injuries, and Adjusted Damage 1950 - 1994

Impact on Life and Property

Tornadoes pose a significant threat to life and safety in Hays County and the 11 (participating) municipalities in the planning area. Infrastructure is also at risk from tornadoes. Historically, lightly constructed residential structures (in particular, manufactured housing and mobile homes) located within the planning area are most vulnerable to the tornado hazard. Data related to the number of structures by building type and past damages for specific building types was unavailable at the time of the 2011 Plan update. However, people living in manufactured or mobile homes are most exposed to damage from tornadoes. In Hays County there are a total of 6,550 mobile homes. Even if anchored, mobile homes do not withstand tornado wind speeds as well as permanent, site-built structures.

The NCDC database reports one death and 13 injuries from tornadoes in Hays County. The tornadoes caused an estimated $27.28 million in property damage. Table 20 identifies the 11 tornadoes that have caused greater than $50,000 in property damages. Of these events, the August 10, 1980 tornado caused the most severe damage, $25 million in property damage. Also note that Section 6 of the Plan update includes a more detailed assessment of the tornado hazard.

Table 20
Hays County: Tornado Events Causing Property Damage
Greater Than $50,000, 1950 – 2010
(Source: NOAA/NCDC)

Query Results

11 TORNADO(s) were reported in **Hays County, Texas** between **01/01/1950** and **12/31/2010** with **at least $50 Thousand in Property Damage**.

*Click on **Location or County** to display Details.*

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

Texas

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 HAYS	04/28/1953	2045	Tornado	F3	1	5	250K	0
2 HAYS	04/30/1954	0537	Tornado	F1	0	0	250K	0
3 HAYS	03/30/1976	0330	Tornado	F2	0	1	250K	0
4 HAYS	08/10/1980	1610	Tornado	F2	0	0	25.0M	0
5 HAYS	04/22/1985	1916	Tornado	F2	0	0	250K	0
6 Kyle	11/15/2001	03:20 PM	Tornado	F1	0	3	500K	0
7 Kyle	11/15/2001	03:21 PM	Tornado	F1	0	3	500K	0
8 Henly	11/15/2001	09:45 AM	Tornado	F0	0	1	50K	0
9 Wimberley	11/15/2001	10:20 AM	Tornado	F0	0	0	50K	0
10 Driftwood	10/08/2002	10:20 AM	Tornado	F0	0	0	70K	0
11 San Marcos	01/13/2007	07:08 AM	Tornado	F1	0	0	50K	0K
				TOTALS:	1	13	27.220M	0

Occurrences of the Tornado Hazard

The NCDC reports that 25 tornadoes have occurred in Hays County between 1950 and 2010. The database indicates there were 11 FO, eight F1s, five F2s, and one F3s tornadoes. Table 21 summarizes the 14 tornado events categorized as F1 or greater – this list includes some of the same events noted in the table above – the query is intended to capture tornadoes over a certain F-class, instead of screening them by damage threshold. These 14 events caused property damage totaling approximately $9 million.

Table 21
Hays County: Tornado Events – F1 and Stronger 1950 – 2010
(Source: NOAA/NCDC)

Query Results

14 TORNADO(s) of magnitude **F1 and Higher** were reported in **Hays County, Texas** between **01/01/1950** and **12/31/2010**.

*Click on **Location or County** to display Details.*

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

Texas

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 HAYS	04/28/1953	2045	Tornado	F3	1	5	250K	0
2 HAYS	04/30/1954	0537	Tornado	F1	0	0	250K	0
3 HAYS	05/02/1958	1520	Tornado	F1	0	0	0K	0
4 HAYS	11/12/1961	2330	Tornado	F2	0	0	3K	0
5 HAYS	05/10/1975	0715	Tornado	F1	0	0	25K	0
6 HAYS	03/30/1976	0320	Tornado	F2	0	0	25K	0
7 HAYS	03/30/1976	0330	Tornado	F2	0	1	250K	0
8 HAYS	08/10/1980	1610	Tornado	F2	0	0	25.0M	0
9 HAYS	04/22/1985	1916	Tornado	F2	0	0	250K	0
10 HAYS	08/22/1991	1540	Tornado	F1	0	0	3K	0
11 Kyle	05/27/1997	04:38 PM	Tornado	F1	0	0	5K	0K
12 Kyle	11/15/2001	03:20 PM	Tornado	F1	0	3	500K	0
13 Kyle	11/15/2001	03:21 PM	Tornado	F1	0	3	500K	0
14 San Marcos	01/13/2007	07:08 AM	Tornado	F1	0	0	50K	0K
				TOTALS:	1	12	27.110M	0

Some of the more significant tornado events that have impacted Hays County are described below.

- **August 10, 1980 (F2 Tornado).** As Hurricane Allen made landfall in South Texas, the storm spawned tornadoes across central Texas. At least 24 tornadoes were reported across central & south Texas. In Hays County, a tornado produced damage along a path 24 miles long and 33 yards wide. The tornado caused an estimated $25 million in damages.
- **November 15, 2001 (F1 Tornado).** A tornado touched down 2.5 miles north of Kyle, Texas. The tornado moved across I-35 between mile markers 215 and 217. A second tornado formed in the same vicinity as the first one. The second tornado moved alongside the first for several minutes. The two tornadoes caused extensive tree damage with the tops of trees sheared off. Several 18-wheelers were knocked over by the tornadoes. A hotel under construction was also damaged along with a restaurant along I-35. The Hays

County Independent School District Headquarters building was also damaged. In total, over 100 homes were damaged (two of which were destroyed), by the tornadoes. As many as 20 businesses suffered damage. In Hays County, the tornadoes caused approximately $500,000 in damages.

With 25 tornado events between 1950 and 2010, Hays County experiences on average a tornado slightly less than once every two years. With slightly less than one event two years, there is roughly a 42% annual probability of future tornados occurring in the planning area. Based on the ranges shown in Table 21, there is a high probability of future tornadoes occurring in Hays County.

5.4.3 Severe Thunderstorm/High Wind

Description of the Severe Thunderstorm/High Wind Hazard

Thunderstorms are local storms produced by cumulonimbus clouds, and always accompanied by lightning and thunder. Thunderstorms are the by-products of atmospheric instability, which promotes vigorous rising of air particles. A typical thunderstorm may cover an area three miles wide. The National Weather Service (NWS) considers a thunderstorm "severe" if it produces tornadoes, hail of 0.75 inches or more in diameter, or winds of 58 miles per hour or more. Structural wind damage may imply the occurrence of a severe thunderstorm. The high wind/severe storms hazard affects the entire planning area. For additional information about severe thunderstorms and high winds visit NOAAs *Severe Weather* page located at http://www.noaawatch.gov/themes/severe.php.

Location of the Severe Thunderstorm/High Wind Hazard

The entire planning area is subject to the wind effects from the thunderstorm/high wind hazard. Figure 17 shows how the frequency and strength of extreme windstorms vary across the United States. The map is based on a combination of all past occurrences and shows that central Texas, and Hays County, falls within wind Zone III, where wind speeds can reach as high as 200 mph.[18]

Figure 17
Wind Zones in the United States
(Source: FEMA)

[18] Source: FEMA, Wind Zone map

See Section 5.4.2, Tornadoes, for the basic wind speed map from the International Building Code. This map is used as part of the basis for designing buildings to withstand reasonably anticipated winds.[19] Hays County falls within the area where the "design wind" speed is 90 mph. The county does not have minimum design wind speed requirements for the unincorporated areas. However, the municipalities within Hays County have adopted individual building code requirements. The 2006 Plan indicated that in 2003 the City of San Marcos began the process of updating from the 2000 International Building Code (IBC) to the Unified Land Development Code. In 2004 the City of San Marcos adopted the Land Development Code. The Land Development Code governs all development in the city limits and the three and a half- mile extraterritorial jurisdiction of San Marcos, including zoning, subdivision, watershed protection, site planning, and construction permitting.

Severity (or Extent) of the Severe Thunderstorms/High Wind Hazard

During the spring and summer months, Hays County is subject to strong storms that are primarily triggered by rapid surface warming, which causes air to become unstable. This combines with southward shifts in the jet stream that bring cold air masses into contact with warm fronts coming up from the Gulf of Mexico, with thunderstorms as one of the results.

The severity (magnitude or extent) of high winds is mainly measured by velocity, either *sustained* wind, or *peak gusts*. High wind effects may be exacerbated by the presence of debris, which are loose objects that become airborne missiles during high winds and can cause damage that winds would otherwise not create. Typical examples of windborne debris are gravel roof ballast and tree branches. Assets and people in areas with significant potential for missiles to be present are thus somewhat more exposed to secondary wind risks. Wind velocities from hurricanes and tornadoes are typically much higher than from thunderstorms, so building codes are usually calibrated based on potential sustained wind speed, or on 3-second peak gusts at a specific elevation about the surface.

Impact on Life and Property

All people and assets in Hays County are considered to have the same degree of exposure to the severe thunderstorm/high wind hazard. Within the county, the risk to people and property from the high wind hazard cannot be distinguished by area; the hazard is expected to have a relatively uniform probability of occurrence across the entire County.

In Hays County, most wind damage has been limited to downed trees, blocked roads, and disabled power lines. Typically, assets of lighter construction (such as mobile homes) are most vulnerable to the high winds hazard. The NCDC database indicates that between 1950 and 2010 Hays County experienced no deaths or injuries from severe thunderstorm high wind events. During this same time period, property damage totaled $13.13 million. It should be noted, however, that information in the NCDC database likely does not fully characterize the extent of damage from high winds – typically, private insurance covers such damages, and information regarding claims payments from insurers is proprietary.

[19] American Society of Civil Engineers, 2002

Occurrences of the Severe Thunderstorm/High Wind Hazard

The NCDC database indicates that between 1950 and 2010, Hays County experienced 58 severe thunderstorm/high wind events (eight of which had winds of 60 knots or greater). Table 22 summarizes the eight high wind events with greater than 60 knot winds.

Table 22
Hays County: Thunderstorm/High Wind Events Over 60 Knots, Excluding Tornado Winds, 1950 – 2010
(Source: NOAA/NCDC)

8 THUNDERSTORM WINDS event(s) were reported in **Hays County, Texas** between **01/01/1950** and **12/31/2010**.

*Click on **Location or County** to display Details.*

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

Texas

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 HAYS	05/19/1975	1900	Tstm Wind	70 kts.	0	0	0	0
2 HAYS	06/12/1992	0401	Tstm Wind	60 kts.	0	0	0	0
3 San Marcos	06/02/2003	03:45 PM	Tstm Wind	60 kts.	0	0	7.0M	0
4 San Marcos	08/11/2003	02:10 PM	Tstm Wind	60 kts.	0	0	30K	0
5 Dripping Spgs	10/13/2004	04:10 PM	Tstm Wind	60 kts.	0	0	50K	0
6 Dripping Spgs	04/18/2006	08:25 PM	Tstm Wind	70 kts.	0	0	0	0
7 San Marcos	01/13/2007	07:00 AM	Thunderstorm Wind	70 kts.	0	0	100K	0K
8 San Marcos	04/25/2007	00:10 AM	Thunderstorm Wind	70 kts.	0	0	50K	0K
				TOTALS:	0	0	7.230M	0

Some of the more significant thunderstorm and high wind events are summarized below.

- **June 2, 2003.** A line of thunderstorms formed along a cold front in central Texas and moved quickly southward. As the storms moved through Hays County, they produced a downburst that struck the town of San Marcos and spread southeastward into Caldwell County. In San Marcos Many business signs and awnings were damaged along with roof damage to several businesses. Metal or tin roofing in some businesses was peeled off on the side of the incoming high winds. Based on the damage and its pattern, it appeared that damage was the result of straight line winds estimated at 60 knots or greater. In San Marcos, damages were estimated at $7 million.
- **January 13, 2007.** A severe thunderstorm struck just south of the San Marcos Police Headquarters Building and produced winds estimated at 70 to 80 mph northward along Interstate Highway 35. The NCDC report indicated that tin metal roofs were torn off several buildings and tossed several hundred feet. Inspection teams also noted damage to roofs and eaves as well as walls of some buildings. Damages from the event were estimated at $100,000.

With 58 severe thunderstorm/high wind events between 1950 and 2010, Hays County experiences on average about one severe thunderstorm/high wind event per year. With one event per year, there is nearly a 100% annual probability of a future severe thunderstorm/high wind events occurring in the planning area. Based on the ranges shown in Table 22, there is a high probability of future severe thunderstorm and high wind events occurring in Hays County.

5.4.4 Dam Failure

Description of the Dam Failure Hazard

A dam is defined as any artificial dike, levee, or other barrier that is constructed for the purpose of impounding water on a permanent or temporary basis, that raises the water level five feet or more above the usual, mean, low water height when measured from the downstream toe-of-dam to the emergency spillway crest or, in the absence of an emergency spillway, the top-of-dam. Dams generally serve the primary purpose of retaining water, while other structures such as floodgates or levees (also known as dikes) are used to manage or prevent water flow into specific land regions.

Dam failures are not themselves natural hazards, but are often caused by natural hazards such as floods and earthquakes, and their failure can then result in floods. Dam failures can result from a variety of causes including lack of maintenance, seismic activity, improper design or construction, or the effects of large storms. For additional information about dam failure visit FEMAs *Dam Failure* page located at http://www.fema.gov/hazard/damfailure/index.shtm.

Location of the Dam Failure Hazard

As of December 2010, the U.S. Army Corp of Engineer's (USACE) National Inventory of Dams (NID) database and Texas Commission on Environmental Quality Dam Safety Program data, indicate that there were 43 dams in Hays County.[20] Dams are typically ranked by hazard classification, which is determined by the potential for infrastructure and property damages downstream if a dam failure were to occur. The three hazard classifications include high hazard, significant, and low and are defined as follows:

- **High hazard potential** dams are those who's failure or operational failure will probably cause loss of life and/or significant infrastructure losses.
- **Significant hazard potential** dams are those whose failure or operational problems are unlikely to cause loss of human life, but can cause economic loss, environmental damage, disruption of lifelines, or other concerns.
- **Low hazard potential** dams are those whose failure would probably cause no loss of human life and only low economic and/or environmental losses, which would typically be limited to the dam owner's property.

[20] US Army Corp of Engineers National Inventory of Dams database. Hays County, Texas.

Table 23 summarizes information reported by the NID for to the 43 dams located within Hays County. Of the 43 dams in the County, there are 14 high hazard dams, nine significant hazard dams, and 20 low hazard dams.[21] Although 14 dams have been classified as "high hazard", this classification reflects only the possible damage if the structure were to fail, and does not take in to account the likelihood that this will occur (i.e. the condition of the dam and the kind of hazard event that may cause it to fail are not factors in the classification).

The number of high hazard dams remains unchanged from the 2006 Hays County HMP. The original HMP recommended developing emergency action plans for the 14 high hazard dams. An emergency action plan was prepared in May, 2006 (revised March, 2007) for the five dams on the Upper San Marcos River Watershed:

Site 1 Freeman Ranch Dam (Sink Creek)
Site 2 Sink Creek
Site 3 Sink Creek
Site 4 Robinson Dam (Purgatory Creek)
Site 5 Purgatory Creek

The original Plan recommended improving the flood warning capabilities in Hays County (Mitigation Action F-6 in the original Plan). This action recommended flood warning systems be installed at selected "High Hazard" dams. As of 2011 no flood warning systems had been installed, but the action item is included as part of the Plan update.

[21] US Army Corp of Engineers National Inventory of Dams database. Hays County, Texas.

Table 23
Inventory of Hays County Dams, ordered by Hazard Classification
(Source: USACE - National Inventory of Dams)

Nearest City	Dam Name	River	Hazard Class	Inspection Date	Dam Length	Dam Height	Primary Purpose
Uhland	Plum Creek WS SCS Site 2 Dam	Tr-Plum Creek	High	6/13/2006	2,770	38	Flood Control
Uhland	Plum Creek WS SCS Site 3 Dam	Tr-Plum Creek	High	9/29/2005	1,135	26	Flood Control
Uhland	Plum Creek WS SCS Site 4 Dam	Tr-Plum Creek	High	6/13/2006	1,228	34	Flood Control
Uhland	Plum Creek WS SCS Site 5 Dam	Bunton Branch	High	3/8/2002	2,510	38	Flood Control
Uhland	Plum Creek WS SCS Site 6 Dam	Porter Creek	High	6/7/2002	3,340	36	Flood Control
Uhland	Plum Creek WS SCS Site 7 Dam	Tr-Plum Creek	High	1/21/1981	1,175	40	Flood Control
Woodcreek	Bid Dam	Tr-Cypress Creek	High	6/29/2001	475	15	Recreation
San Marcos	Upper San Marcos River WS SCS Site 1	Sink Creek	High	1/8/2001	2,905	80	Flood Control
None	Upper San Marcos River WS SCS Site 2	Sink Creek	High	1/9/2001	1,465	51	Flood Control
San Marcos	Upper San Marcos River WS SCS Site 3	Sink Creek	High	1/8/2001	1,630	60	Flood Control
None	Upper San Marcos River WS SCS Site 4	Purgatory Creek	High	1/9/2001	1,365	100	Flood Control
San Marcos	Upper San Marcos River WS SCS Site 5	Purgatory Creek	High	5/1/2007	2,950	80	Flood Control
San Marcos	San Marcos State Fish Hatchery	Off Ch-San Marcos	High	6/29/2001	0	13	Other
Woodcreek Resort	Hog Creek Dam	Hog Creek	High	6/12/1997	300	16	Recreation
None	Plum Creek WS SCS Site 1 Dam	Plum Creek	Significant	3/8/2002	2,560	33	Flood Control
Lockhart	Plum Creek WS SCS Site 16 Dam	Elm Creek	Significant	6/7/2002	2,800	41	Flood Control
San Marcos	Aquarena Dam	San Marcos River	Significant	4/1/1999	350	8	Recreation
Austin	Purola Lake Dam	Tr-Pedernales River	Significant	Unknown	699	37	Water Supply
Wimberley	Seven H Ranch Lake Dam	Tr-Wanslow River	Significant	Unknown	894	21	Water Supply
Zorn	South Ridge Estates Dam	Tr-York Creek	Significant	Unknown	978	18	Recreation
None	McAlister Ranch Dam No. 5	Onion Creek	Significant	11/16/1987	0	17	Irrigation
None	River Oaks Ranch Dam	Fitzhugh Creek	Significant	Unknown	0	26	Recreation
None	Lone Man Dam	Lone Man Creek	Significant	1/4/1983	105	13	unknown

Nearest City	Dam Name	River	Hazard Class	Inspection Date	Dam Length	Dam Height	Primary Purpose
None	Reeves Lake Dam	Millseat Branch	Low	Unknown	350	20	Recreation
None	Plum Creek WS SCS Site 10 Dam	Brushy Creek	Low	Unknown	1,788	36	Flood Control
None	Plum Creek WS SCS Site 11 Dam	Tr-Brushy Creek	Low	9/23/1975	2,700	37	Recreation
None	Plum Creek WS SCS Site 12 Dam	Brushy Creek	Low	Unknown	2,660	28	Flood Control
None	Jan Land Company Lake No. 1 Dam	Tr-Brushy Creek	Low	2/23/1999	1,470	20	Recreation
None	Barrow Lake Dam	Tr-Brushy Creek	Low	7/21/1998	1,090	25	Recreation
None	Brown Ranch Dam	Tr-Onion Creek	Low	Unknown	450	24	Fire Protection, Stock, Or Small Fish Pond
None	York Creek WS SCS Site 5 Dam	Tr-York Creek	Low	2/26/1975	1,897	41	Recreation
None	John Baugh Dam	Tr-San Marcos	Low	Unknown	635	15	Irrigation
None	Scrutchin Lake Dam	Tr-San Marcos	Low	Unknown	1,125	30	Water Supply
None	Webster Lake Dam	Tr-Long Creek	Low	Unknown	1,116	20	Water Supply
None	MD Heatly Dam	Pecan Springs	Low	Unknown	500	18	Water Supply
None	Pierce Lake Dam	Tr-Blanco River	Low	12/1/1983	390	37	Fire Protection, Stock, Or Small Fish Pond
None	Clear Lake Dam	Pinoak Creek	Low	5/6/1974	910	17	Recreation
Martindale	Boy Scout Dam	Blanco River	Low	2/2/1999	195	11	Recreation
San Marcos	Hays County Park Lake Dam	Blanco River	Low	Unknown	315	8	Recreation
None	Alexander Lake Dam	Tr-Plum Creek	Low	Unknown	1,200	20	Fire Protection, Stock, Or Small Fish Pond
None	Rio Vista Dam	San Marcos River	Low	5/16/2006	100	8	Recreation
None	Cummings Dam	San Marcos River	Low	4/26/2002	0	10	Irrigation
Buda	Centrex Recirculation Pond	Unknown	Low	6/19/2008	0	15	Tailings

Note: the designation "Tr" before some of the water courses in the "River" column means *tributary.* The designation "Off Ch" means *off channel.*

Figure 18 identifies the location for the 43 dams in Hays County. The map shows the 14 high hazards dams are located in central to southern Hays County, mainly concentrated near the City of San Marcos and the area of Kyle and Uhland. Figure 18 is followed by maps showing dam sites for San Marcos and Kyle.

Figure 18
Dams in Hays County
(Source: USACE - National Inventory of Dams)

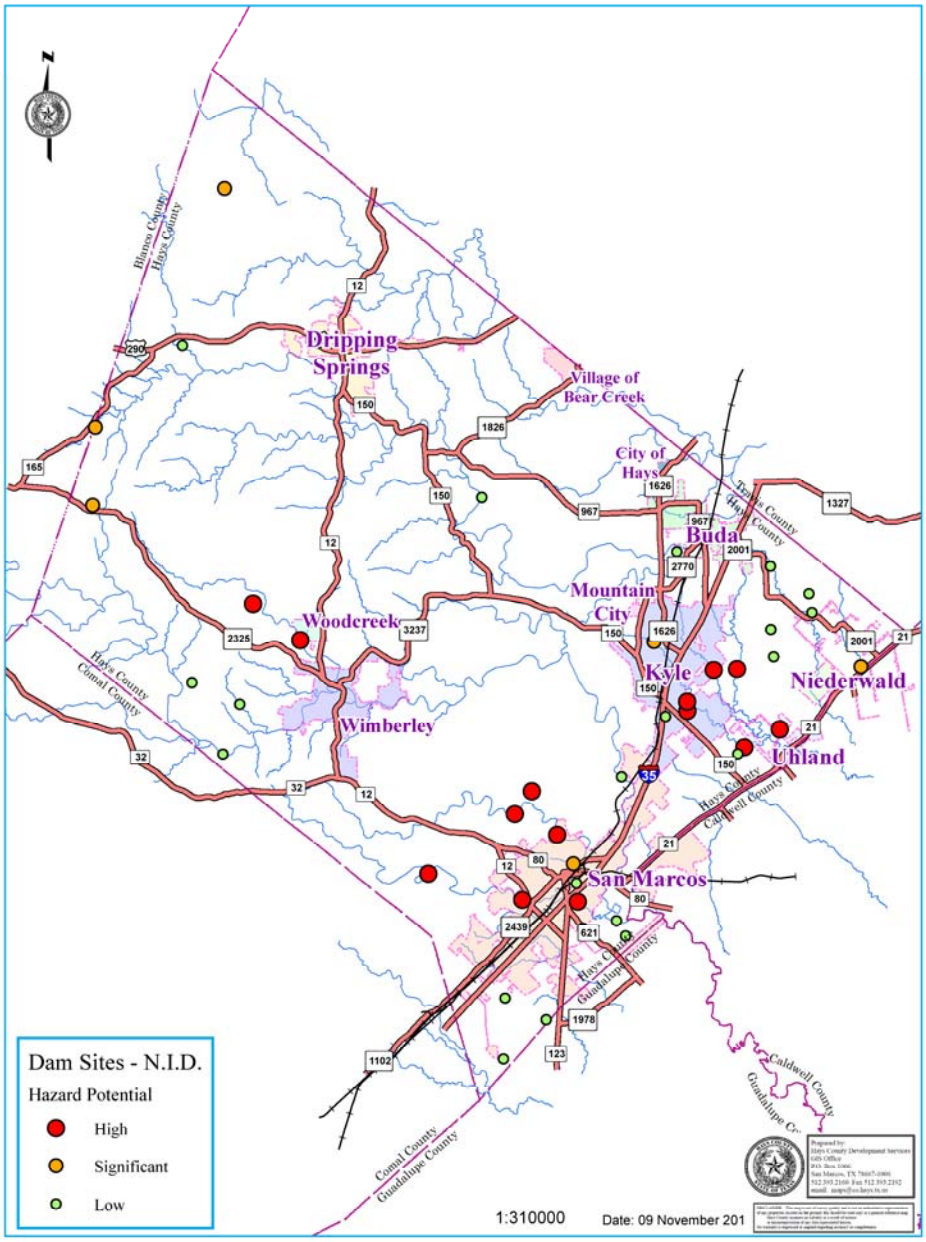


Figure 19 identifies the Hays County dams located in the City of San Marcos and surrounding area.

Figure 19
Dams in San Marcos, Texas
(Source: USACE - National Inventory of Dams)

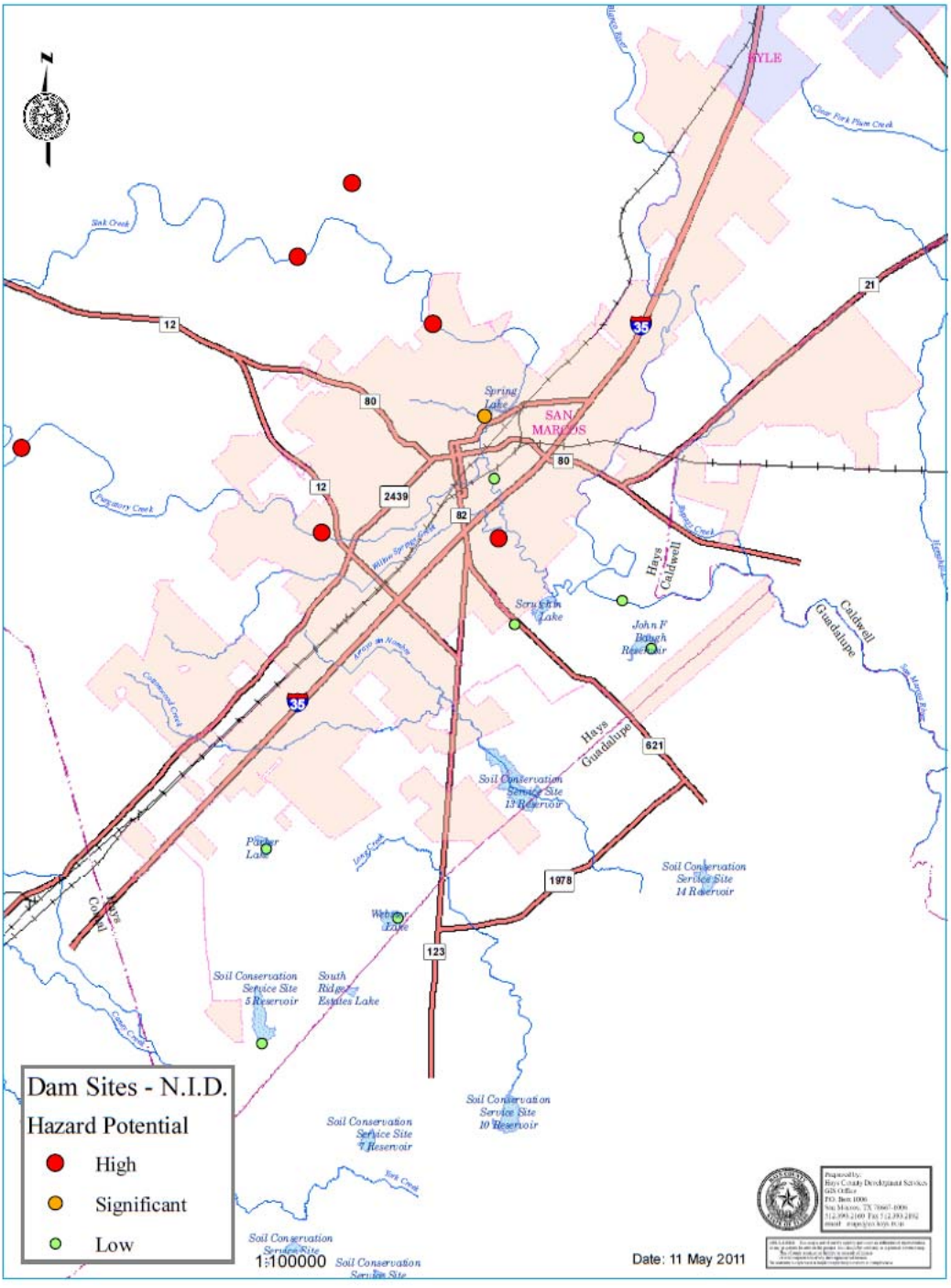
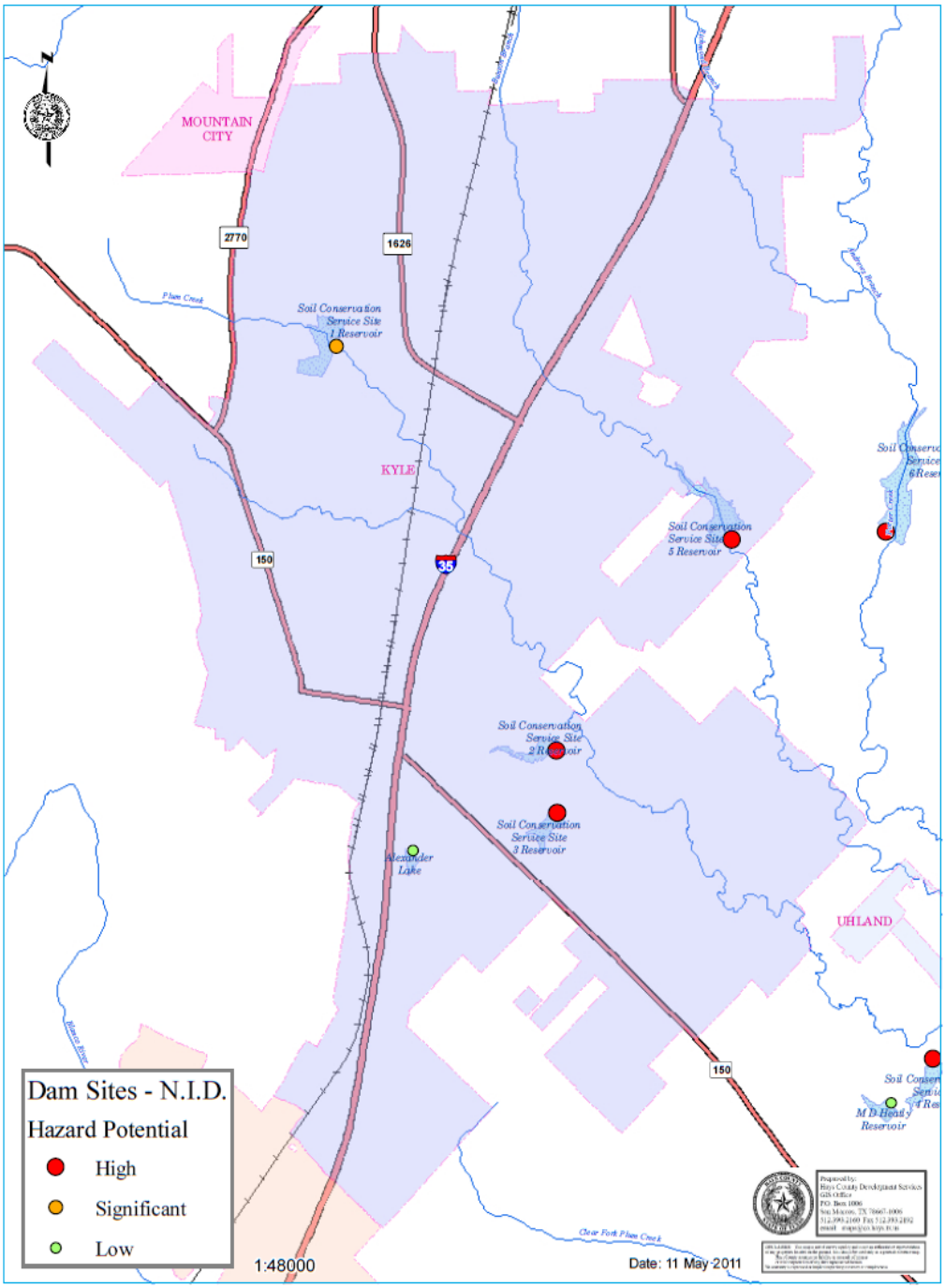


Figure 20 identifies the Hays County dams located in the City of Kyle and surrounding area.

Figure 20
Dams in Kyle, Texas
(Source: USACE - National Inventory of Dams)



Severity and extent of Dam Failure

The severity of a dam failure depends on several factors, including the size of the dam, the amount of water released, the extent of the failure (i.e., catastrophic structural failure versus a small breech), the velocity of the floodwater released, and the density of built environment and populations downstream. There is the potential for total collapse of a dam, but less significant failures are more likely as a result of overtopping (inadequate spillway design, debris blockage), foundation defects, or seepage.

Impact on Life and Property

According to the USACE's National Inventory of Dams Program, as of 2009 there were 45,000 dams in the United States. FEMA indicated that as of 2009 there were 1,800 dams classified as "high hazard" dams. Dam failure has the potential for catastrophic impact on life and property. This risk can be reduced by proper design, construction and routine maintenance and inspection.

To prevent, or reduce the probability of a failure, high and significant hazard dams are periodically inspected by professional engineers on a regular basis by the Texas Commission on Environmental Quality (TCEQ) - Dam Safety Program. The program periodically inspects dams that pose a high or significant hazard and makes recommendations and reports to dam owners to help them maintain safe facilities.[22]

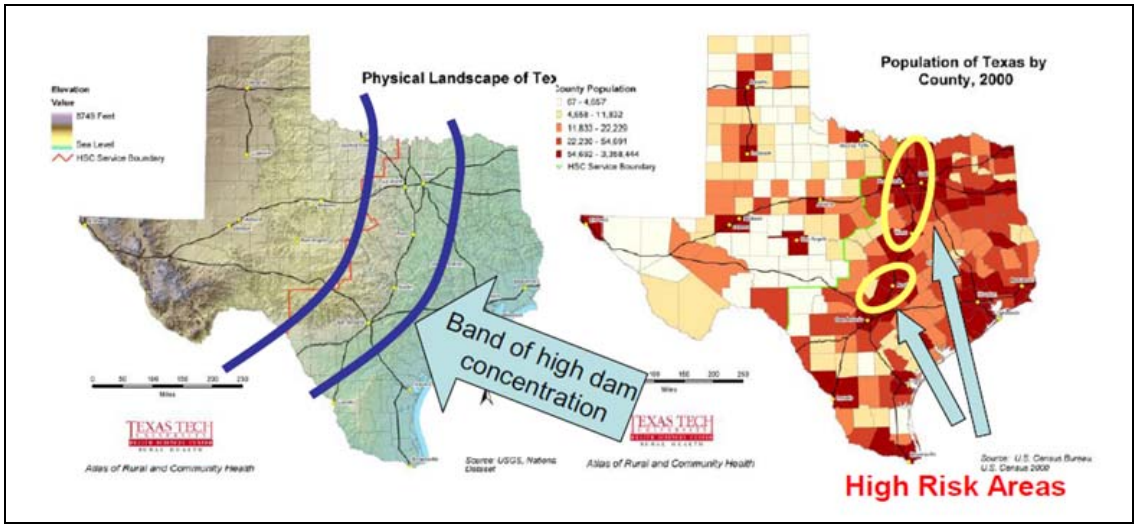
Effective January 1, 2009 the Texas Administrative Code (Title 30, Part 1 Chapter 299 - rule §299.1) directed the TCEQ to oversee the design, review, and approval of construction plans and specifications; and construction, operation and maintenance, inspection, repair, removal, emergency management, site security, and enforcement of high and significant hazard dams that:

- have a height greater than or equal to 25 feet and a maximum storage capacity greater than or equal to 15 acre-feet,
- have a height greater than six feet and a maximum storage capacity greater than or equal to 50 acre-feet;[23]

The *2010 State of Texas Hazard Mitigation Plan Update* was also reviewed to determine the dam failure risk in Hays County. Review of the State Plan indicates that in Texas the high risk dam area is concentrated along a generally north –south band across the central portion of the state. Sections of this band include densely populated areas combined with a high number of dams. Figure 21 identifies the band of dam concentration and high risk areas in Texas. The map shows that Hays County is located within the identified high risk area.

[22]Texas Commission on Environmental Quality - Dam Safety Program
[23] Texas Administrative Code. Title 30. Part 1. Chapter 299.

Figure 21
Areas of High Dam Risk In Texas
(Sources: 2010 - 2013 State of Texas Hazard Mitigation Plan, Texas Tech)



Occurrences of Dam Failure

The *State Hazard Mitigation Plan Update* indicates that Texas has experienced over 136 documented dam failures. At least two of those failures resulted in loss of life. The most recent dam failures in Texas occurred in 2009 as a result of a severe rainfall event in Northeast Texas, Montgomery, and McLennan Counties. There were seven earthen dams that failed or partially failed. Due to the rural nature of the area, there was no danger to human life.[24]

A review of current literature and open data sources revealed no known past dam failures in or near Hays County. Based on no past dam failures in the County, the probability of future failures is projected to be low. See Table 13 for the definition of high, medium and low probability of occurrence.

[24] 2010 State of Texas Hazard Mitigation Plan. Section 2 – Risk Assessment. Dam and Levee Failure, Page 83

5.4.5 Winter Storm

(Including Extreme cold and Ice Storms)

Description of the Winter Storm Hazard

Winter storms bring various forms of precipitation that occur only at cold temperatures, such as snow, sleet, or a rainstorm where ground temperatures are cold enough to allow icy conditions. These cold weather storms can also take the form of freezing rain or a wintry mix. A winter storm is defined as "the occurrence of hazardous winter weather due to a variety of elements, occurring either independently or in combination, including freezing rain, sleet, snow, ice and windy conditions that may contribute to low wind chill temperatures." Accumulations of sleet, snow and/or ice may render roads impassable and trigger utility outages.

Heavy snowfall and extreme cold can immobilize an entire region. Even areas that normally experience mild winters can be hit with a major snowstorm or extreme cold. Winter storms can result in flooding, storm surge, closed highways, blocked roads, downed power lines and hypothermia. For additional information about winter storms visit NOAAs *Hydrometeorological Prediction Center* page located at http://www.hpc.ncep.noaa.gov/wwd/winter_wx.shtml.

Location of the Winter Storm Hazard

Although winter storms in Texas occur less frequently than they do further north, they occur often enough to be considered a viable, seasonal threat. Texans are most familiar with four types of winter storms: snowstorms, blizzards, cold waves and ice storms.[25] In Hays County snowstorms, cold waves and ice storms are most common.

Generally, the winter storm season in Texas runs from late November to mid-March, although severe winter weather has occurred as early as October and as late as May in some areas. Within Hays County, the risk to people and property from winter weather cannot be distinguished by area; the hazard is reasonably predicted to have uniform probability of occurrence across the entire county. All people and assets are considered to have the same degree of exposure. Figure 22 shows the average annual snowfall totals for the United States. The map shows central Texas receives less than eight inches of snow per year.

[25] Hazards Analysis, The State of Texas, 6-1

Figure 22
United States Average Annual Snowfall Map

Severity and Extent of the Winter Storm Hazard

With the County's generally dry climate, any frozen precipitation falling in Hays County poses a potentially hazardous situation due to ice, wind, and cold temperatures. During these cold periods, the weather is often volatile, changing from warm and sunny to freezing in just a few hours. Many homes generally have inadequate cold-weather pipe protection, so are at a greater risk of freezing and bursting water pipes when the outdoor temperature drops to 20°F. In Hays County**,** where the climate is considered subtropical, winter storms of such severity that property damage results does occur, but is considered a rare event.

Based on past winter storm events, it would be possible for Hays County to experience an occasional snow or ice storm. Accumulations of up to a foot of snow are possible in the higher elevations of the planning area. An occasional ice storm is also possible with accumulations up to a ¼ inch of ice coating all surfaces such as road and trees. An extreme cold event with temperatures in the single digits and wind chills below zero are possible in Hays County. The County has an emergency plan in place to manage such weather situations, providing shelter areas if necessary. Additionally, crews are responsible for maintaining transportation routes in the event of such weather.

In Hays County's subtropical climate, winter storms that damage property are rare. During cold periods the weather is often volatile, changing from warm and sunny to freezing in just a few hours. The severity of extreme cold temperature events is measured by temperature, duration, and humidity. Most events are less than a week in duration, but can occasionally last for longer periods up to several weeks. An extreme cold event with temperatures in the single digits and wind chills below zero are possible in the planning area. Normally, the mercury falls below freezing about 10 to 15 times each winter, but rarely are readings lower than 25 degrees experienced.

Impact on Life and Property

Winter storms in Texas, although not as numerous or severe as in the northern states, do occur often enough and with sufficient severity to be a minor threat to people and property. Review of the *2010 State Hazard Mitigation Plan* indicates that snowfalls in the central part of Texas are usually light to moderate but there have been exceptions when drifting snow has snarled transportation systems and stranded hundreds of motorists.[26] Extreme cold temperatures are generally minimal in the area, with effects mainly limited to humans, although occasionally there are relatively minor effects on infrastructure such as freezing pipes or electrical grids. Winter storms may place residents of the county at risk of injury or death; during extreme weather conditions, elderly persons, small children and infants and/or the chronically ill who do not have adequate heating in their homes may become more vulnerable to injury or death. Many homes in this area of the country have inadequate cold-weather pipe protection, so are at a greater risk of freezing and bursting water pipes when the outdoor temperature drops to 20°F.

Hays County is in a climatic region that is unlikely to experience snow depths sufficient to cause significant property damage (such as collapsed roofs). The NCDC reports there has been $7.5 million in property damage from nine past winter storms in Hays County from 1996 - 2010. The NCDC database indicated there have been no injuries or deaths due to snow and ice conditions. The winter storm hazard affects all residential and commercial building types about equally within the planning area.

Hays County and the City of San Marcos have sustained damage from ice storms and extreme cold events. While infrequent, they have affected the entire area, restricting travel, interrupting electrical power and causing water mains to break. The Hays County record low temperature is -2 degrees and the mean minimum temperature in January is 36 degrees. Hill Country storms can render treacherous driving conditions and result in broken water mains and water damage associated with broken plumbing in residential and commercial structures.

[26] 2010 State of Texas Hazard Mitigation Plan. Section 2 – Risk Assessment. Severe Winter Storm, Page 111

Figure 23
Snow on February 4, 2011 Caused Semi-Truck to Lose Control and Turn on its Side Along Interstate 35 in Buda, Texas
(Source: Hays Free Press, February 4, 2011)

As with some other hazards, there are no detailed records of damages from winter storms, except in the most extreme events. This is because much of the damage is presumably addressed through private-sector insurance, and data about claims payments is nearly always proprietary. It is assumed that actual damages are greater than what is reported by the NCDC, but there is no way to accurately characterize them using open data sources.

Occurrences of the Winter Storm Hazard

In Hays County the NCDC reports there have been nine snow and ice events between 1950 and 2010. Although the query results begin in 1950 the first reported event is in 1996. It is unclear why the database does not include any events prior to 1996, although presumably occurrences prior to this date follow the same pattern as found in the NCDC list. Table 24 lists the nine winter storms in Hays County between 1996 and 2010.

Table 24
Hays County: Winter Storm Events, 1950 – 2010
(Source: NOAA/NCDC)

9 SNOW & ICE event(s) were reported in **Hays County, Texas** between **01/01/1950** and **12/31/2010**.

*Click on **Location or County** to display Details.*

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

Texas

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 TXZ171>173 - 185>194 - 204>209	02/01/1996	01:40 AM	Winter Storm	N/A	0	0	1.5M	50K
2 TXZ183>192	01/07/1997	08:00 AM	Winter Storm	N/A	0	0	5.0M	100K
3 TXZ183>192 - 202>209 - 217>225	01/11/1997	08:00 PM	Winter Storm	N/A	0	0	1.0M	20K
4 TXZ171>173 - 186 - 188>193 - 205>206	12/23/1998	02:00 AM	Winter Storm	N/A	0	0	0	0
5 TXZ171>173 - 183>194 - 202>209 - 221 - 223	12/12/2000	02:00 PM	Winter Storm	N/A	0	0	0	0
6 TXZ171>173 - 183>192 - 194 - 202>208 - 217	11/28/2001	07:00 AM	Winter Storm	N/A	0	0	0	0
7 TXZ171>173 - 184>194 - 204>209	02/24/2003	07:00 PM	Winter Storm	N/A	0	0	0	0
8 TXZ191 - 206	12/07/2005	10:00 PM	Winter Storm	N/A	0	0	0	0
9 TXZ188 - 191	01/15/2007	16:00 PM	Winter Storm	N/A	0	0	0K	0K
				TOTALS:	0	0	7.500M	170K

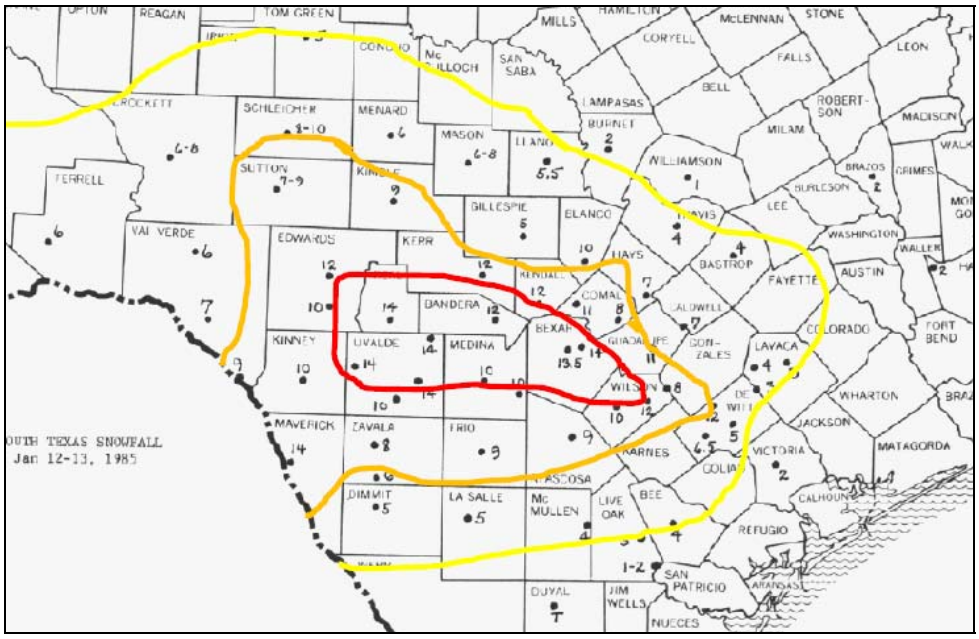
In addition to the NCDC, other sources such as the National Weather Service (NWS) – Dallas-Fort Worth Office indicates numerous past snow and ice storm events impacting Central Texas. Several of the more significant events are described below. The sources for the information below are a combination of the NCDC and the NWS – Dallas-Fort Worth Office.

- **January 12-13, 1985.** Snowfall above four inches fell over a large area of southwest and south central Texas, generally southwest of a line from Midland to Austin and north of a line from Eagle Pass to Gonzales, Texas. Between 8-14 inches fell from the Hill Country to San Antonio and as far south as Eagle Pass.
- **January 7, 1997.** An ice storm caused an estimated $5 million in damages in Central Texas. Over 60,000 residents suffered power outages across the area due to tree limbs falling onto power lines. Many of the outages continued for as long as five days. Hundreds to thousands of limbs were lost across central Texas due to the weight of ice, sleet and snow. Many residents referred to this storm as the "worst winter storm in the past 25 years or more."
- **February 24-27, 2003.** A widespread freezing rain, sleet, and snow event occurred, with ice to the south and snow to the north. Accumulations were generally 3-5 inches over the northern third of the area, and 1-3 inches over the middle third. In Central Texas and adjacent portions of Southeast Texas, ice accumulated to between ¼-½ inch.

- **February 23, 2010.** A strong upper level low pressure system tracked across Central Texas and brought a significant snow event to the region. The highest accumulations of 3 to 5 inches occurred south of I-20 near where the center of the upper low tracked. Snow began in the Hill Country during the early morning hours. Heavy snow spread across Central Texas and moved into East Texas during the afternoon hours before ending.

Figure 24 is a map of south-central Texas identifying the snowfall totals from the January 12-13, 1985 snow event. The map shows that western Hays County received approximately 7-8 inches of snow from the event.

Figure 24
Snowfall Totals From the January 12-13, 1985 Snow Event



With a total of 11 snow or ice storms between 1985 and 2010, Hays County experiences a winter storm event on average slightly less than once every two years. With one event every two years, there is a 44% annual probability of a winter storm event, a medium probability based on the scale in Table 13.

The NCDC database combines the extreme cold and extreme heat into a single category called temperature extremes. The database indicates there have been no extreme cold events in Hays County between 1950 and 2010. However, other sources indicate that an extreme cold event occurred in late December, 1983. On December 22, 1983, Hays County remained locked in below freezing temperatures. The thermometer fell around 15 degrees that morning and did not climb higher than the upper 20's that day. Cold temperatures continued into the weekend. This near-record cold caused only limited problems for county citizens. However, had temperatures remained below freezing for more than 48 hours then the County could have experienced more significant damages. Most likely other extreme cold events have occurred in Hays County but not available from open source documents.
Based on the one event between 1983 and 2010, an extreme cold temperature event occurs on average approximately once every 27 years. With one event every 27 years, there is a 3% annual probability of a winter storm event (snow or ice storm) occurring in Hays County. Based on the high, medium, and low ranges identified in Table 13, there is a low probability of future winter storms occurring in Hays County.

5.4.6 Wildfire/Brush Fire

Description of the Wildfire Hazard

Wildfires are uncontrolled fires often occurring in wildland areas, and can consume houses or agricultural resources if not contained. Wildfires/urban interface is defined as the area where structures and other human development blend with undeveloped wildland. For additional information about wildfires visit the *Fire and Emergency Response* page of the Texas Forest Service located at http://txforestservice.tamu.edu/main/default.aspx?dept=frp.

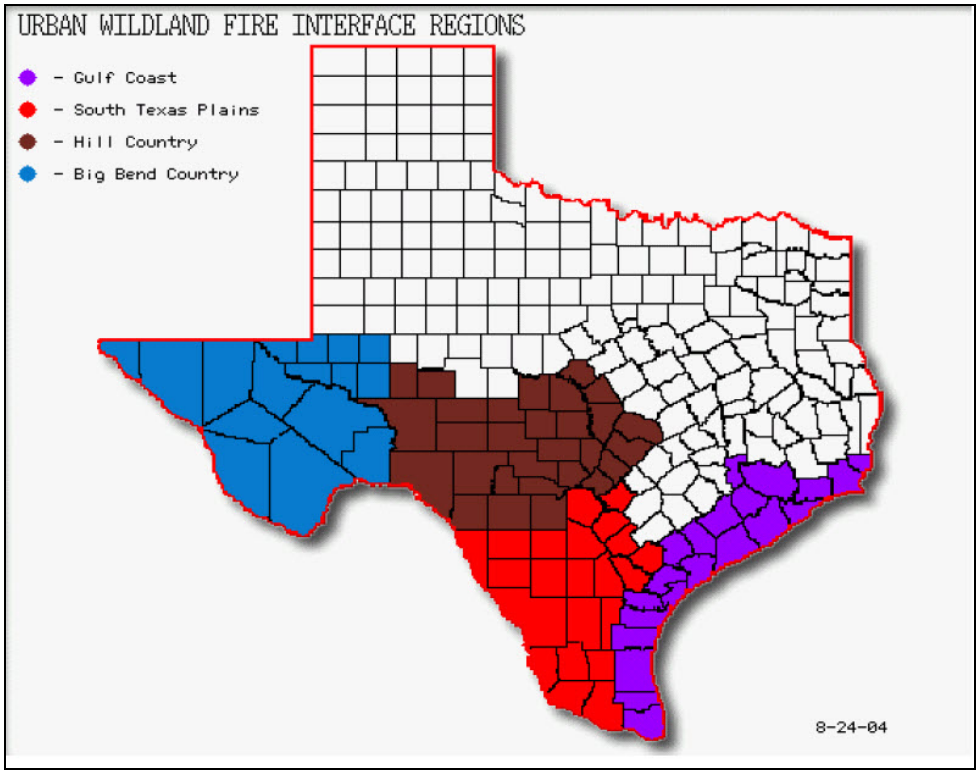
Location of the Wildfire Hazard

The State of Texas faces major wildfire problems each year. The risk for wildfire is increased and compounded by increasing development within the zone commonly referred to as the "urban-wildland interface." Within this zone of natural landscape, buildings become additional fuel for fires when fires do occur. Most wildland fires are man-caused and occur in the interface of developed lands and forest and range lands. In particular, the dry conditions, high temperatures, and low humidity that characterize drought periods set the stage for wildfires.

The *2010 State of Texas Hazard Mitigation Plan Update* has identified seven different regions in Texas that have some type of urban/wildland interface issues. Figure 25 identifies four of these regions across the south-central Texas area. The map shows that south-central Texas and Hays County are located in the Hill Country urban/wildland interface region. [27]

[27] 2007 State of Texas Hazard Mitigation Plan. Section 2 – Risk Assessment. Wildfire Hazard

Figure 25
Wildfire-Interface Regions across Southern Texas
(Source: 2007 State of Texas Hazard Mitigation Plan)



Severity of the Wildfire Hazard

The frequency and severity of wildfires depends on both weather and human activity. In the planning area, severity has historically been very low, and duration a matter of hours to a few days. Hays County is at risk for wildfire year-round. There is always the possibility that a wildfire will take place in or around the county. Wildfires can spread quickly and may affect parts of the planning area in a very short period of time. Continued growth and development throughout the county have increased the threat to the built environment from wildfire, especially in the eastern sections.

In Hays County, the peak time for wildfires is during the summer months extending into fall. That is the time of year when all of the factors contributing to fires are present. These factors include extreme heat, drought, and continuous gusty winds. A second peak time for wildfires is several weeks to a month following a very hard freeze. The freezing temperatures kill field vegetation. If little or no rainfall has occurred, the potential for rapid combustion is very high. When the limited rainfall is combined with gusty winds following the passage of a cold front (typically with very low humidity) there is the potential for a major wildfire.

Impact on Life and Property

There are no records of deaths or injuries and no recorded loss of property from wildfires in the planning area.

Occurrences of the Wildfire Hazard

The NCDC indicated there have been no wildfire incidents between 1950 and 2010 in Hays County, although this is likely a function of reporting to the NCDC more so than a lack of any events. Other sources indicate that recent wildfire events in Hays County have occurred in 2006 and 2011. The events are summarized below.

- **August 24, 2006.** A fire destroyed two structures and threatened more on Mail Route Road, between Wimberley and Canyon Lake. A total of 25 firefighters responded from Canyon Lake, Spring Branch, Wimberley and South Hays Fire Departments. This fire was part of the Presidential disaster declaration (DR 1624). In addition to the above structure damages, as part of this declaration, FEMA authorized the use of federal funds to help fight the Rim Rock Fire in Hays County. Fire conditions in Hays County during this time were extreme with the Rim Rock Fire covering over 200 acres. The fire threatened 150 homes and required evacuation of several subdivisions.
- **Summer 2011.** An extreme drought affected most of the State of Texas, including Hays County. At the time of this plan development, the current wildfire danger was high, if not extreme. Hays County has been fortunate that no large fires had broken out nor have extensive damages been encountered.

In terms of probability, although incidents may occur more frequently due to the increase in human activity in forested areas, there is no acceptable mechanism to assign a probability to site-specific fire occurrences. As noted, wildfire incidents are directly related to weather patterns and antecedent conditions, and thus probabilities are dynamic. Given the size of the county and the fact that the entire state is currently in an extended, severe drought, the probability of a wildfire somewhere in the planning area is considered high.

5.4.7 Tropical Storms and Tropical Cyclones

Description of the Tropical Storms and Tropical Cyclones Hazard

Hurricanes, tropical storms, and typhoons, collectively known as tropical cyclones, are among the most devastating naturally occurring hazards in the United States. Hurricanes generate several hazards that can cause extensive damage. High winds, heavy rainfall, tornadoes, and storm surge are all associated hazards. This subsection focuses on the effects from high winds associated with tropical storms and tropical cyclones. The effects of a strong hurricane can be catastrophic along coastal locations such as the Gulf Coast. However, Hays County, located well inland from the coast and not at risk from experiencing hurricane strength winds, but is still considered vulnerable to tropical storms and tropical depressions (tropical depressions and extra-tropical cyclones)

NOAA defines a tropical cyclone as a warm-core non-frontal synoptic-scale cyclone, originating over tropical or subtropical waters, with organized deep convection and a closed surface wind circulation about a well-defined center. Once formed, a tropical cyclone is maintained by the extraction of heat energy from the ocean at high temperature and heat export at the low temperatures of the upper troposphere. A tropical cyclone is a storm system characterized by a large low pressure center and numerous thunderstorms that produce strong winds and flooding rain. As a tropical cyclone strengthens, it can be become a tropical depression with wind speeds less than 38 mph.

A tropical storm (and hurricane) begins as a tropical depression with wind speeds below 39 mph. As the storm intensifies it becomes a tropical storm. A tropical storm is considered a tropical cyclone in which the maximum sustained surface wind speeds range from 39 to 73 mph. In most of the world, a storm is given a name when it reaches tropical storm intensity. Further development can produce a hurricane (wind speeds above 74 mph), which is not described in this subsection as the focus is on tropical storms and other cyclones that have the potential to impact Hays County. For additional information about tropical storms visit NOAAs *National Hurricane Center* page located at http://www.nhc.noaa.gov.

Location of the Tropical Storms and Tropical Cyclones Hazard

Hurricane risk in the United States extends along the entire east coast from Maine to Florida, the Gulf Coast (including Florida, Alabama, Louisiana, and Texas), and Hawaii. The southeastern United States and Gulf Coast are at greatest risk based on historical storm tracks and the warmer waters of the Gulf of Mexico and Atlantic Ocean. Farther inland from the coast, areas of Central Texas, including Hays County, are occasionally threatened by tropical storms and the remnants of hurricanes that develop in the Atlantic Ocean and the Gulf of Mexico. The greatest threat to the county comes during the Atlantic Ocean/Gulf Hurricane season, which runs from June 1 to November 30. The tropical storm and tropical cyclone hazard affects the entire planning area.

Severity and Extent of the Tropical Storms and Tropical Cyclones Hazard

The severity of tropical storms is measured primarily by wind velocity, flooding, central pressure, and storm surge. Hays County is located 130 miles from the Texas Gulf Coast and is subject to torrential rains from tropical storms that potentially cause both flash flooding and sustained flooding. As hurricanes or tropical storms move inland, areas can experience moderate to severe flooding due to intense and prolonged rainfall. As mentioned earlier, this subsection focuses on the high wind hazard associated with tropical storms. The severity of a tropical cyclone can be measured by wind speed. Located well inland from the Gulf Coast, Hays County can experience tropical storm force winds associated with either a tropical storm or a downgraded hurricane as the system moves inland from the Gulf of Mexico.

Table 25
Tropical Cyclone - Wind Speeds Categories
(Source: NOAA)

Category	Wind Speed	Definition
Tropical Depression	> 38 mph	A tropical cyclone in which the maximum sustained surface wind speed is 38 mph or less.
Tropical Storm	39 -73 mph	A tropical cyclone in which the maximum sustained surface wind speeds range from 39 to 73 mph.
Hurricane	74+ mph	A tropical cyclone in which the maximum sustained surface wind is74 mph or more. The term hurricane is used for Northern Hemisphere tropical cyclones east of the International Dateline to the Greenwich Meridian.

Impact on Life and Property

Past tropical storms have had little to no impact on life and property in Hays County. In Hays County tropical storm force winds can cause downed power lines, trees, and minor to moderate property damage.

Occurrences of the Tropical Storms and Tropical Cyclones Hazard

The NCDC's database indicates there has been no tropical storm that has impacted Hays County between 1950 and 2010. With no tropical storm between 1950 and 2010, the future probability of tropical storms in Hays County is considered low. See Table 13 for the definition of high, medium and low probability of occurrence.

5.4.8 Drought

Description of the Drought Hazard

A drought is an extended dry climate condition when there is not enough water to support urban, agricultural, human, or environmental water needs. It usually refers to a period of below-normal rainfall, but can also be caused by drying lakes, or anything that reduces the amount of liquid water available. Drought is a recurring feature of nearly all the world's climatic regions. For additional information about droughts visit the National Integrated Drought Information System (NIDIS) page located at www.drought.gov.

Location of the Drought Hazard

Droughts may occur anywhere in the United States. Effects seen in different regions vary depending on normal meteorological conditions such as precipitation and temperature, as well as geological conditions such as soil type and subsurface water levels.

Drought is possible throughout the planning area and the southeast Texas region in general. Because there is no defined geographic boundary for this hazard, all property in Hays County exposed to the risk of drought. The probability of a drought occurring in any specific region depends on certain atmospheric and climatic conditions. Duration and frequency can be used as indicators of potential severity. Effects seen in different regions vary depending on normal meteorological conditions such as precipitation and temperature, as well as geological conditions such as soil type and subsurface moisture. Variations in drought risks to people and property cannot be distinguished by area; the hazard is reasonably predicted to have uniform probability of occurrence across the entire county.

Hays County is located in the South Central Climatic Region also known as the Texas Hill Country, and is subject to frequent periods of drought. Based on the Texas Almanac, in the last 110 years, this area has experienced fifteen periods of drought over 17 drought years (thirteen one-year and two two-year droughts). Hays County and the Texas Hill Country depend on surface water sources to reduce ground water withdrawal, thus reducing the impact on the Edwards Aquifer and the San Marcos River. This dependency on surface water supplies can result in water shortages during dry or drought conditions.

Hays County is located in two regions as defined in the *Texas Water Plan - Water for Texas 2007*. Areas in Hays County north of Onion Creek are located in Lower Colorado Region K and areas south of Onion Creek are located in South Central Texas Region L.

Severity and Extent of the Drought Hazard

A drought's severity depends on numerous factors, including duration, intensity, and geographic extent as well as regional water supply demands by humans and vegetation. The severity of drought can be aggravated by other climatic factors, such as prolonged high winds and low relative humidity.[28] Due to its multi-dimensional nature, drought is difficult to define in exact terms and also poses difficulties in terms of comprehensive risk assessments.

[28] FEMA, 1997

Texas is divided into ten climatic areas that range from substantially heavy precipitation through semi-arid to arid climates. Most of Texas is prone to periodic droughts of differing degrees of severity. One reason is the State's proximity to the High Plains (the Great American Desert region) of the southwestern United States. In every decade of this century, Texas has fallen victim to one or more serious droughts. The severe-to-extreme drought that affected every region of the State in the early to mid-1950s was the most serious in recorded U.S. history.

One method used by scientists to calculate the severity and duration of a drought is the Palmer Drought Severity Index (PDSI). The PDSI indicates the prolonged and abnormal moisture deficiency or excess and indicate general conditions, not local variations caused by isolated rain. The PDSI is an important climatological tool for evaluating the scope, severity, and frequency of prolonged periods of abnormally dry or wet weather.[29]

The equation for the PDSI was empirically derived from the monthly temperature and precipitation scenarios of 13 instances of extreme drought in western Kansas and central Iowa and by assigning an index value of -4 for these cases. Conversely, a +4 represents extremely wet conditions. From these values, 7 categories of wet and dry conditions can be defined. Table 26 identifies the values used to define the PDSI.[30]

Table 26
Palmer Drought Severity Index
(Source: NOAA, National Weather Service - Climate Prediction Center)

Palmer Drought Severity Index
-4.0 or less (Extreme Drought)
-3.0 or -3.9 (Severe Drought)
-2.0 or -2.9 (Moderate Drought)
-1.9 to +1.9 (Near Normal)
+2.0 or +2.9 (Unusual Moist Spell)
+3.0 or +3.9 (Very Moist Spell)
+4.0 or above (Extremely Moist)

Impact on Life and Property

Droughts have the ability impact many sectors of the economy, and reaches well beyond the area experiencing physical drought. Drought impacts are commonly referred to as direct or indirect. Reduced crop productivity, increased fire hazard, reduced water levels, and damage to wildlife and fish habitat are a few examples of direct impacts. Drought can cause extensive damage to commercial and residential structure foundations, framing and walls, levees, roads, bridges, pipelines and other integral infrastructure. Indirect impacts of drought include increased prices for food, unemployment, and reduced tax revenues because of reduced supplies of agriculture products dependent upon on rainfall.

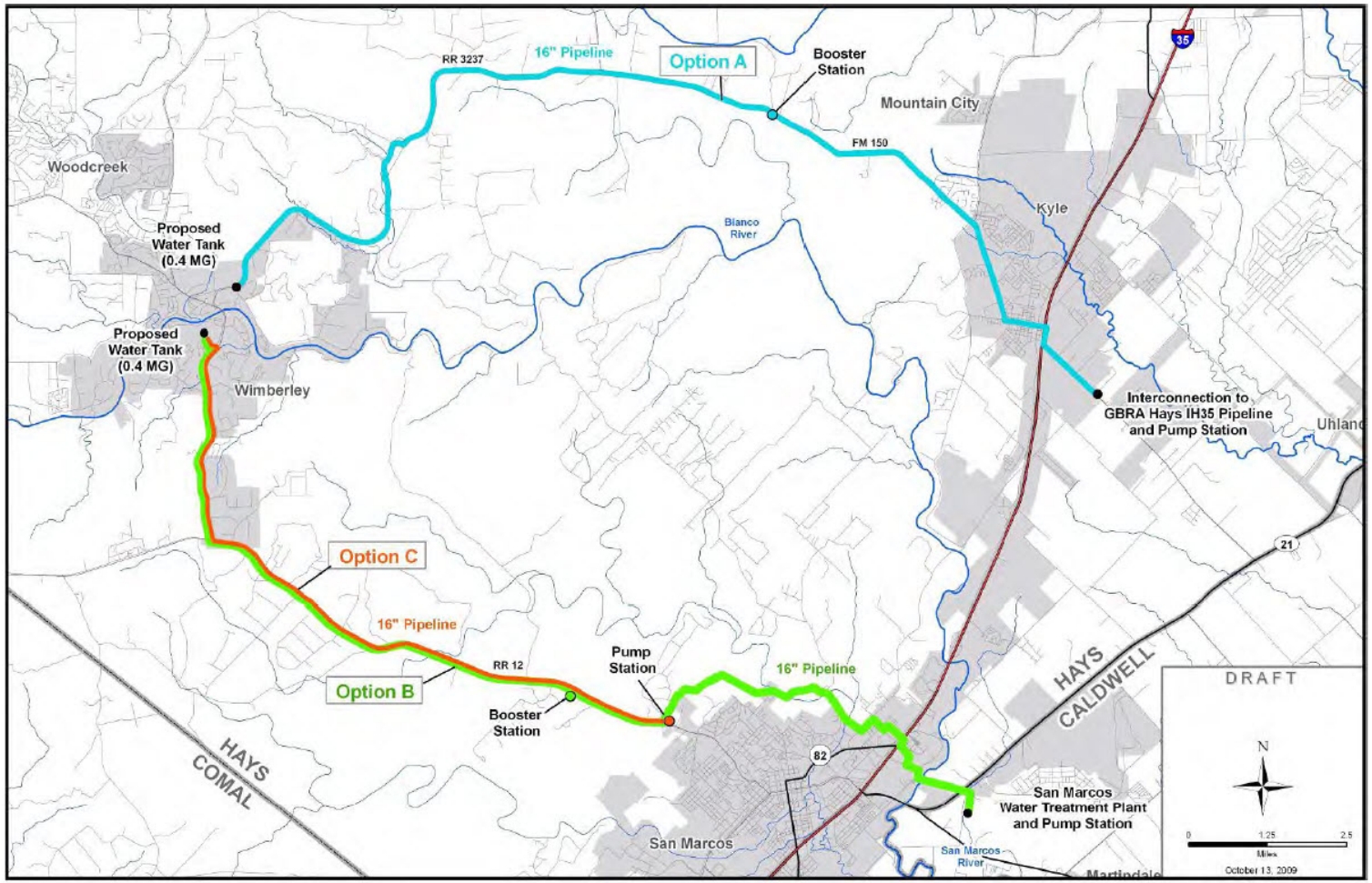
Historically the cities of New Braunfels, San Antonio and San Marcos have relied on groundwater from the Edwards-Balcones Aquifer, which affects the base flow of the Guadalupe River. The City of New Braunfels has converted from groundwater to surface water from Canyon Lake. The City of San Marcos and the Guadalupe-Blanco River Authority

[29] NOAA. NWS. Climate Prediction Center. Drought Indices – Explanation.
[30] NOAA. NWS. Climate Prediction Center. Drought Indices – Explanation.

(GBRA) recently constructed a pipeline and water treatment plant to also convert the City's primary water source to Canyon Lake water. As stated in the *2007 Texas Water Plan*, the long range water goals for the region include: protection of the San Marcos Springs from over-pumpage of groundwater; improved aquifer recharge; and construction of additional water supply projects to meet water needs until 2050. The 2011 *South Central Texas Regional Water Plan (Region L)* and the "Region K" plan recommend strategies to import new water into Hays County. The Region L plan recommends one strategy with two alternatives for meeting projected water demands in the Wimberley area. This strategy in general includes the delivery of treated water supply from GBRA source water through a 16 inch diameter pipeline sized for delivery of four million gallons per day (mgd). Depending on the option selected the estimated project costs for long-term water supply ranges from $20 – 35 million. Region K recommends two imported water strategies to meet projected needs in northern Hays County, including development of brackish water supply from the Edwards-BFZ Aquifer and the purchase of supply from City of Austin.[31] Figure 26 shows the three proposed options for long-term water supply in the Wimberley Area.

[31] Hays County Commissioners Court. *Water and Waste-Water Facilities Plan for the Portion of Hays County, Texas West of the IH-35 Corridor.* February, 2011.

Figure 26
Wimberley / Woodcreek Water Supply Options
(Source: 2011 Water and Waste-Water Facilities Plan for the Portion of Hays County, Texas West of the IH-35 Corridor)



While all residents of Hays County could be adversely affected by drought conditions, which could limit water supplies and present health threats, during summer drought, or hot and dry, conditions elderly persons, small children, infants and the chronically ill who do not have adequate cooling units in their homes may become more vulnerable to injury and/or death. However, the NCDC reported no known deaths or injuries from droughts in the planning area.

Occurrences of the Drought Hazard

According to the NCDC database, Hays County has experienced nine drought events in the period from 1996 to 2010. All nine events occurred between 1996 and 2000. The database provides no indication as to why there are no events prior to 1996, although presumably occurrences follow the same pattern and frequency as shown in the NCDC list. Also note that the events are listed by months. For example, if a drought lasts several continuous months, it is listed in the database as separate events. If the continuous months are combined into single events, the number of events is reduced from nine to three events. Table 27 summarizes the three events identified in the NCDC database for Hays County.

Table 27
Hays County: Drought Events 1996 - 2005
(Source: NOAA/NCDC)

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 TXZ171>173 - 183>194 - 202>209 - 217>225 - 228>230 - 233>234 - 239 - 247	04/01/1996	12:01 AM	Drought	N/A	0	0	0	0
2 TXZ171>173 - 183>194 - 202>209 - 217>225 - 228	05/01/1996	12:01 AM	Drought	N/A	0	0	20.0M	40.0M
3 TXZ171>173 - 183>194 - 202>209 - 217>225 - 228	06/01/1996	12:01 AM	Drought	N/A	0	0	20.0M	40.0M
4 TXZ171>173 - 183>194 - 202>209 - 217>225 - 228	07/01/1996	12:01 AM	Drought	N/A	0	0	20.0M	40.0M
5 TXZ171>173 - 183 - 185>194 - 202>209 - 217>225 - 228	08/01/1996	12:01 AM	Drought	N/A	0	0	20.0M	40.0M
6 TXZ171>173 - 183>194 - 202>208 - 217>221 - 228	07/01/2000	12:01 AM	Drought	N/A	0	0	0	0
7 TXZ171>173 - 183>194 - 202>209 - 217>225 - 228	08/01/2000	12:01 AM	Drought	N/A	0	0	0	0
8 TXZ171>173 - 183>194 - 202>209 - 217>225 - 228	09/01/2000	12:01 AM	Drought	N/A	0	0	0	0
9 TXZ171>173 - 183>194 - 202>209 - 217>225 - 228	10/01/2000	12:01 AM	Drought	N/A	0	0	0	0

Review of various other sources indicates that severe droughts in central Texas, including Hays County have also occurred between 1950-1957, 1998, 2006, 2007 – 2009, and 2011. The head of the Department for Soil and Crop Sciences at Texas A & M indicated that the 2007 – 2009 drought was considered one of the worst dry spells to impact the State since the 1950's. For nearly two years, Texas suffered through one of the worst droughts in State history. According to the Lower Colorado River Authority (LCRA) meteorologist when taking the entire period since the summer of 2007 into consideration, "this drought was more intense than the 1950s. The only other drought in recorded history that was worse was between 1917 and 1918. So, when talking about the intensity of the drought, this was worse than the 1950s. It has a much stronger correlation to the drought of a century ago."[32] The drought from 2007 - 2009 cost farmers an estimated $1 billion in failed crops and dead or undernourished livestock; fueled wildfires that in 2009 destroyed homes and scorched 424,000 acres across the State, including 1,500 acres in a Bastrop blaze in February 2009. The drought conditions have also threatened coastal wildlife, including crabs and whooping cranes.[33]. The most recent severe drought was ongoing at the time of this plan update and continues to cause damages to crops and livestock.

Another severe drought in Texas history stretched from 1950 to 1957. That drought caused agricultural damage equaling more than $3 billion, according to a 1959 report by the Texas Board of Water Engineers, or roughly $24 billion in 2008 dollars.[34]

With a total of eight significant drought events between 1950 and 2011, Hays County experiences a severe drought event on average about every nine years. The eight events have occurred over a period of 60 years, which calculates to an 13.3% annual probability of future drought occurrences. In the last year, Texas has experienced one of the most severe droughts in the state's history. Although the problem is more significant in other areas of the state, central Texas has also experienced a significant period of very low rainfall. Potential magnitude of future events is difficult or impossible to predict because they are related to weather and ocean conditions (La Nina), but the possibility of extended droughts in the state should be considered high. Although buildings and infrastructure are not at particular risk from drought, the overall population is somewhat vulnerable to this hazard, due to the potential for less water being available for drinking and other uses. Other areas of the state are highly vulnerable to drought impacts on agriculture, but Hays County is not susceptible to this risk on a significant scale.

Figure 27 shows the national Palmer Drought Severity Index (long-term). The graphic clearly depicts most of Texas being in a very severe drought (PDSI -4.0). The PDSI is based on a supply/demand model, and uses a calculation algorithm to generate a dryness rating.

[32] Lake Travis View. Current Drought is the Worst Since 1917-1918. Charles McClure. May 14, 2010.
[33] The Statesman. Despite Recent Rains, Drought Persists. Andrea Ball. April 25, 2009.
[34] The Statesman. Despite Recent Rains, Drought Persists. Andrea Ball. April 25, 2009.

Figure 27
(Source: National Climatic Data Center/NOAA)

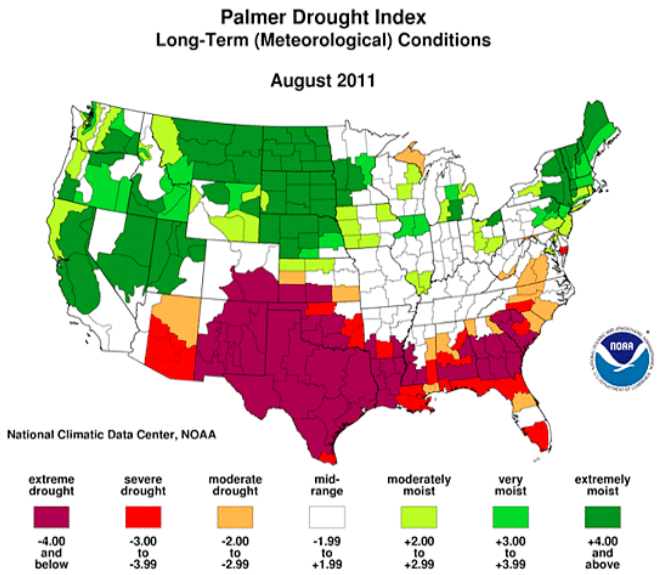
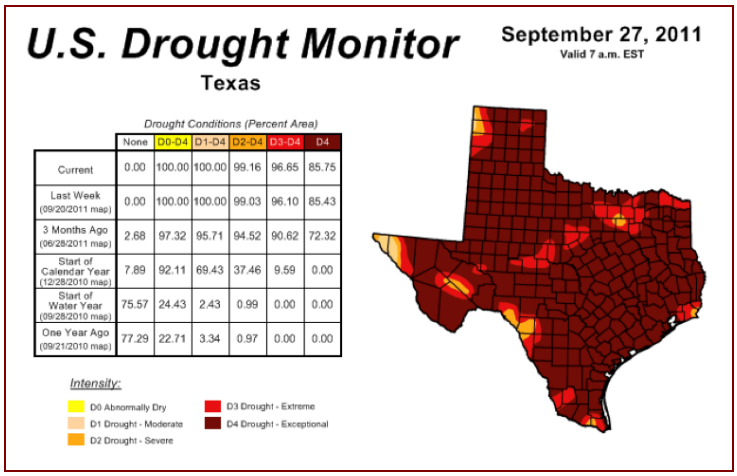


Figure 28 shows the PDSI for the State of Texas only.

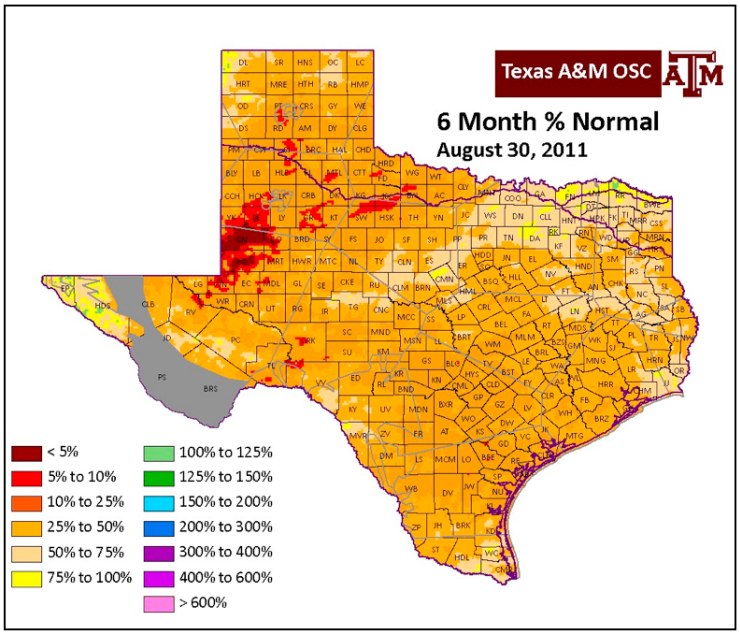
Figure 28
State of Texas Palmer Drought Severity Index, current September 27, 2011
(Source: National Climatic Data Center/NOAA)



	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	100.00	99.16	96.65	85.75
Last Week (09/20/2011 map)	0.00	100.00	100.00	99.03	96.10	85.43
3 Months Ago (06/28/2011 map)	2.68	97.32	95.71	94.52	90.62	72.32
Start of Calendar Year (12/28/2010 map)	7.89	92.11	69.43	37.46	9.59	0.00
Start of Water Year (09/28/2010 map)	75.57	24.43	2.43	0.99	0.00	0.00
One Year Ago (09/21/2010 map)	77.29	22.71	3.34	0.97	0.00	0.00

Figure 29 shows rainfall in Texas for the six month period prior to July 2011.

Figure 29
State of Texas Palmer Drought Severity Index, current September 27, 2011
(Source: National Climatic Data Center/NOAA)



Based on historical drought data, the probability of future events occurring in Hays County is considered medium to high. See Table 13 for the definition of high, medium and low probability of occurrence.

5.4.9 Seismic/Earthquake

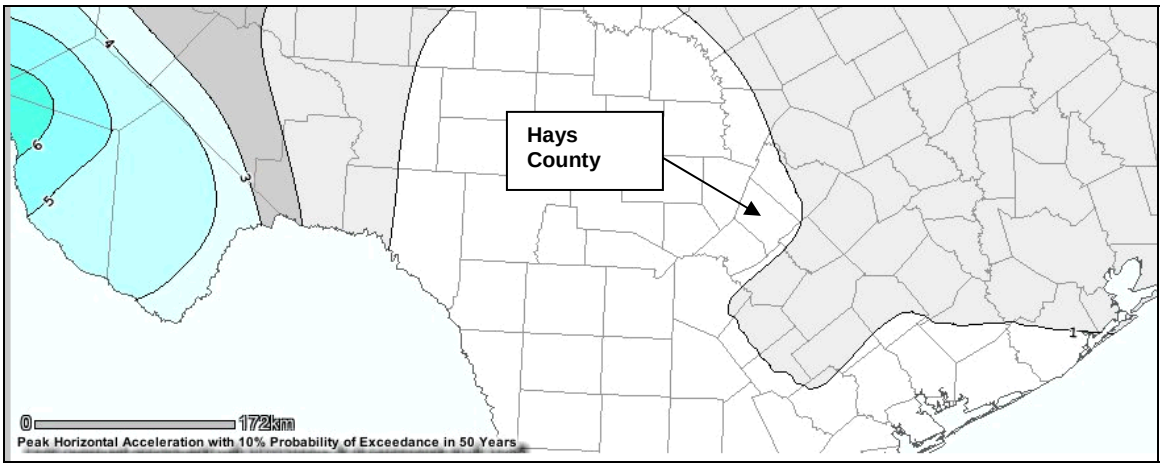
Description of the Earthquake Hazard

An earthquake is a sudden release of energy from the earth's crust that creates seismic waves. Tectonic plates become stuck, putting a strain on the ground. When the strain becomes so great that rocks give way, fault lines occur. At the Earth's surface, earthquakes may manifest themselves by a shaking or displacement of the ground, which may lead to loss of life and destruction of property. Size of an earthquake is expressed quantitatively as magnitude and local strength of shaking as intensity. The inherent size of an earthquake is commonly expressed using a magnitude. For additional information about earthquakes visit the United States Geological Survey (USGS) at http://earthquake.usgs.gov/learn/.

Location of the Earthquake Hazard

The entire planning area is susceptible to the effects of earthquakes. Figure 30 displays the central Texas portion of a USGS earthquake hazard map produced in 2008. The map shows peak ground acceleration (pga) with a 10% chance of being exceeded over 50 years is in the 1%g range across central-southern Texas, including Hays County. The *FEMA How-To guidance, Understanding Your Risks*, FEMA 386-2, p. 1-7, suggests the earthquake hazard should be profiled if the pga is greater than 3%g.

Figure 30
Seismic Hazard Map, showing Peak Ground Acceleration in Percent of *g*, with 10% exceedence in 50 years
(Source: USGS, 2008)



Severity of the Earthquake Hazard

Earthquakes with epicenters in central-southern Texas have typically been small. Most past earthquakes in Texas have been of low magnitude and have mainly occurred in west Texas, or the Panhandle area. It is possible, however, for earthquakes to occur in this region of the State. Small earthquakes are possible almost anywhere in the State, and all regions face possible impacts from very large, distant earthquakes.

As shown in Figure 30 above, the probability of any severe earthquake in the area is low. However, Hays County could be affected by "very large and distant quakes which might occur in Missouri-Tennessee or Oklahoma; the earthquakes that pose such a hazard are rare, probably occurring only once every 500 years or less," states the Hazard Analysis for the State of Texas.

Although there have been no known earthquakes that have impacted the planning area, an earthquake in the Richter magnitude 5 - 6 range (based on past events in Texas) could be possible in Hays County. The severity of earthquakes is influenced by several factors, including the depth of the quake, the geology in the area, and the soils. The severity of soil liquefaction is dependent on the soils grain size, thickness, compaction, and degree of saturation. Another method for describing the intensity level of the motion triggered by an earthquake is the Modified Mercalli Intensity Scale (MMI). The MMI scale uses Roman numerals to describe intensity so that measurements are not confused with Richter magnitude numbers.

Impact on Life and Property

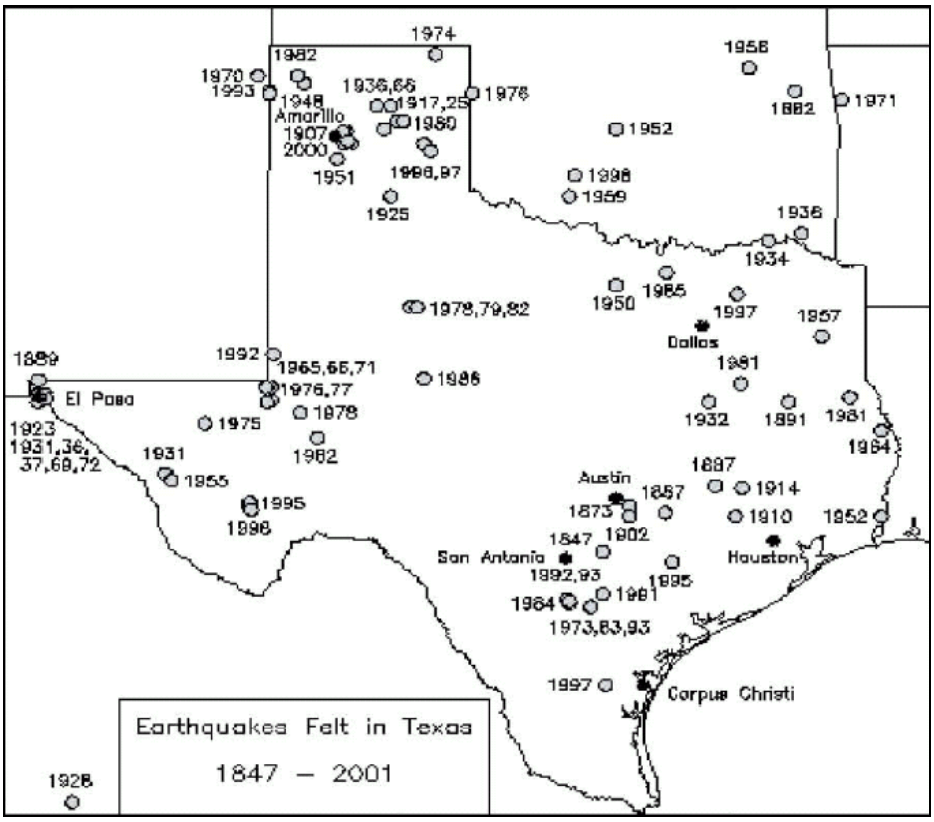
There are no known deaths or injuries from earthquakes in Hays County. Some of the past earthquake events were severe enough in Texas to cause minor property damage such as broken windows or contents falling from shelves. The effects on life and property in the planning area could be significant if a large earthquake were to occur, because of the nature of the built environment. However, the very low probability of an event suggests that potential for these impacts is minimal.

According to the Hazards Analysis for the State of Texas, architects and planners in central Texas should be informed that large and distant earthquakes can affect structures in Central Texas. Sensitive structures such as bridges, dams, towers, tall buildings, highway overpasses and water and/or sewer infrastructure should be constructed with the possibility of earthquakes, both small and large, in mind. The potential effects of earthquakes should be considered in the design and site selection of infrastructure and/or structures that are essential for providing medical or emergency management services or which will house sensitive machinery or store hazardous materials.

Occurrences of the Earthquake Hazard

Historically Hays County has experienced minor shaking from earthquakes located outside of the region. Figure 31 shows past earthquakes in Texas from 1847 - 2001. The map shows several small earthquakes occurred near Austin in the late 1800s and early 1900s.

Figure 31
Earthquakes in Texas, 1847 - 2001
(Source: State of Texas Hazard Mitigation Plan, 2010)



The USGS earthquake history was reviewed for the State of Texas to identify past earthquake occurrences that have impacted Hays County. The USGS earthquake history for Texas indicates there have been 12 earthquakes statewide between 1882 and 2009. Of the 12 events in Texas, the earthquake descriptions provided by the USGS indicates none of the events affected Hays County.[35]

With no significant earthquakes affecting Hays County in the past, there will most likely be minimal future impacts to the planning area. Based on previous data, the probability of earthquakes occurring in the future is considered low. See Table 13 for the definition of high, medium and low probability of occurrence. Due to the extremely low probability of an earthquake within Hays County and the fact that there is no record of any historical building damage as a result of seismic activity in the County a more detailed risk assessment was not performed for this hazard.

[35] USGS. Earthquake Hazards Program – Texas Earthquake History

5.4.10 Hail Storms

Description of the Hail Storms Hazard

Hail is a form of precipitation comprised of spherical lumps of ice. Known as hailstones, these ice balls typically range from 5 mm–50 mm in diameter on average, with much larger hailstones forming in severe thunderstorms.The size of hailstones is a direct function of the severity and size of the storm. For additional information about hail storms visit NOAAs *Severe Weather* page located at http://www.noaawatch.gov/themes/severe.php.

Hailstorms occur more frequently during the late spring and early summer, when the jet stream migrates northward across the Great Plains. This period has extreme temperature changes from the ground surface upward into the jet stream, which produces the strong updraft winds needed for hail formation.

Location of the Hail Storm Hazard

Hailstorms affect the County equally and uniformly, and every location in the County has been affected by hailstorms at some time in the past. The land area affected by individual hail events is approximately the same as that of a parent thunderstorm, an average of 15 miles in diameter around the center of a storm.

Severity of the Hail Storm Hazard

The severity of hailstorms is measured by duration, size of the hail itself, and geographic extent. All of these factors are directly related to the weather phenomena that create the hail, thunderstorms. There is wide potential variation in these severity components. Data on the probability and frequency of occurrence of hailstorms is limited, with little recent research. What data that is available shows that only a localized area along the border of northern Colorado and southern Wyoming experiences hailstorms eight or more days each year. Outside of the coastal regions, most of the United States experiences hailstorms at least two or more days each year.

Impact on Life and Property

There are no known instances of injuries or death from hail storms in Hays County. Although typically not life threatening, severe hailstorms have the potential to cause significant property damages particularly to automobiles and some building types. In the United States the development of hailstorms from thunderstorm events causes nearly $1 billion in property and crop damage each year. The NCDC database reports that a total of $101.7 million in property damage has occurred in Hays County between 1950 and August, 2010. Table 28 summarizes the five hail storms in Hays County that have resulted in property damage of at least $50,000. The hail storm causing the most damage occurred in San Marcos on April 20, 2006. This event caused an estimated $100 million in property damages. See the *Occurrence of the Hail Hazard subsection*, for additional details about this event.

Table 28
Hays County: Hail Storm Events Causing Property Damage of At Least $50,000, 1950 – 2010
(Source: NOAA/NCDC)

Query Results

5 HAIL event(s) were reported in **Hays County, Texas** between **01/01/1950** and **12/31/2010** with **at least $50 Thousand in Property Damage**.

*Click on **Location or County** to display Details.*

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

Texas

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 Wimbereley	04/05/1994	1645	Hail	1.75 in.	0	0	500K	500K
2 San Marcos	04/05/1994	1655	Hail	2.00 in.	0	0	500K	500K
3 San Marcos	03/16/2000	05:32 PM	Hail	4.50 in.	0	0	600K	0
4 Dripping Spgs	04/07/2000	08:10 PM	Hail	1.00 in.	0	0	100K	0
5 San Marcos	04/20/2006	03:55 PM	Hail	4.25 in.	0	1	100.0M	0
				TOTALS:	0	1	101.700M	1.000M

Occurrences of the Hail Hazard

The NCDC's database indicates that there have been 83 hail storms in Hays County between 1950 and 2010. Table 29 below summarizes the 10 hail storms in Hays County that have included hailstones of at least two inch diameter.

Table 29
Hays County: Hail Storm Events With Hailstones at Least two Inch Diameter, 1950 – 2010
(Source: NOAA/NCDC)

Query Results

10 HAIL event(s) were reported in **Hays County, Texas** between **01/01/1950** and **12/31/2010 with hail size of at least 2 inch(es)**.

*Click on **Location or County** to display Details.*

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

Texas

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 HAYS	05/20/1967	1915	Hail	3.00 in.	0	0	0	0
2 HAYS	02/25/1971	1820	Hail	2.25 in.	0	0	0	0
3 HAYS	03/12/1971	1825	Hail	3.00 in.	0	0	0	0
4 HAYS	04/14/1977	1710	Hail	2.00 in.	0	0	0	0
5 HAYS	04/14/1977	1900	Hail	2.00 in.	0	0	0	0
6 HAYS	05/20/1987	2000	Hail	2.00 in.	0	0	0	0
7 San Marcos	04/05/1994	1655	Hail	2.00 in.	0	0	500K	500K
8 San Marcos	03/16/2000	05:32 PM	Hail	4.50 in.	0	0	600K	0
9 San Marcos	04/20/2006	03:55 PM	Hail	4.25 in.	0	1	100.0M	0
10 San Marcos	04/20/2006	04:15 PM	Hail	2.00 in.	0	0	0	0
				TOTALS:	0	1	101.100M	500K

The hailstone size for the 83 hail events that have occurred in Hays County between 1950 and 2010 is summarized below in Table 30. The most common size hail storm the County has experienced ranges between 0.75 inches and 1.75 inches.

Table 30
Hail Size Summary for Hays County
Between 1950 and 2010
(Source: NOAA/NCDC)

Size of Hail	Number of Events
.75	23
.88	2
1.0	21
1.25	2
1.50	5
1.75	21
2.00	5
2.25	1
3.0	2
4.25	1

The most significant hail storm in Hays County occurred on April 20, 2006 in the City of San Marcos. Severe thunderstorms produced extremely large hailstones that caused extensive damage to the San Marcos Tanger Outlet Mall and Prime Outlet Mall. Inspectors from the National Weather Service (NWS) surveying the damage after the event indicated the damages were caused by a combination of large hail and winds gusting 40 to 50 mph. The type of damage was clearly indicative of straight-line winds, also referred to as "downburst winds." The inspection team found hundreds of roof tiles had been broken and cracked, and many of these had fallen into the parking lot during the storm. One of the NWS staff members was at the Malls during the storm. Dents in his vehicle were 4.25 inches in diameter, indicating that at some of the hail stones were as large as grapefruits.[36]

The NWS inspection team indicated the severe wind and hail had caused the worst damage in an area enclosed by Wonder World Drive, Posey Road, Hunter Road, and CR 266 which is also known as Old Bastrop Highway. Damages from this storm were estimated at $100 million by the NCDC with up to 10,000 vehicles damaged and another 7,000 vehicles in homes in the area.[37] This event was considered one of the costliest hailstorms in U.S. history.

[36] National Climatic Data Center (NCDC). Texas – Hays County, Texas. Hail Events – April 20, 2006
[37] National Climatic Data Center (NCDC). Texas – Hays County, Texas. Hail Events – April 20, 2006

Figure 32
Hail Damaged Car in San Marcos, Texas From April 20, 2006
(Source: NWS - Austin/San Antonio)

With a total of 83 hailstorms, Hays County experiences a significant hail storm event on average slightly more than one hail storm per year. The 83 events have occurred over a period of 60 years which equates to an annual probability of 100%, although this figure applies to the entire County, so site-specific probability is much lower. Based on historical records from the NCDC database the future probability of hail storms in Hays County is considered high. See Table 13 for the definition of high, medium and low probability of occurrence. Although the probability is high, the impact on life in the County and property damage is considered minimal compared to the potential damage from other hazards.

5.4.11 Extreme Heat

Description of the Extreme Heat Hazard

Temperatures that hover ten degrees or more above the average high temperature for the region, and last for several weeks are defined as extreme heat. The National Weather Service (NWS) will initiate alert procedures such as special weather statements when the heat index is expected to exceed 105°F-110°F (depending on local climate), for at least two consecutive days.[38] Heat stress can be indexed by combining the effects of temperature and humidity. Additional information about extreme heat can be found on FEMAs website at http://www.fema.gov/hazards/extremeheat/heat.shtm

Location of the Extreme Heat Hazard

The entire planning area is subject to the hazards associated extreme heat.

Severity of the Extreme Heat Hazard

The severity of extreme heat events is measured by temperature, duration and humidity. Most events are less than a week in duration. As mentioned in Section 3.3.3, Climate, Hays County is in a sub-tropical climatic area. Summer daytime temperatures average in the low to mid 90s, with nighttime lows in the low to mid 70s. Extreme heat waves may occur about once every one to two years when maximum daily temperatures exceed 100°F for an extended period of time. It may seem like a small difference, but when daytime high temperatures exceed 100 degrees and the overnight low does not fall below 80, heat stress increases dramatically. The passing of a cold front usually moderates temperatures after a few days to a week.

Impact on Life and Property

The extreme heat hazard can impact all citizens of Hays County, but has the greatest impact on the elderly, ill, and very young. The inability of individuals to purchase, maintain and pay high energy costs for air conditioning systems and fans can place individuals at health risk. County residents without air conditioned homes could be left trying to survive in their super-heated homes. These residents must seek assistance to prevent heat related illness or possible death. Household pets and farm animals can also suffer and even succumb during extended periods of extreme heat.

The NCDC database was queried to identify past injuries and deaths related to extreme heat events in Hays County. The structure of the NCDC database combines the extreme cold and extreme heat into temperature extremes. The results from the database query indicate there have been no deaths or injuries in Hays County from excessive heat-related events.

Although there have been no deaths reported in Hays County, the extreme heat hazard can be moderately disruptive to life in the planning area. Damages from the extreme high temperature hazard are generally confined to effects on humans, although occasionally there may be relatively minor effects on infrastructure such as electrical grids.

[38] NOAA– Heat Wave Description

Occurrences of the Extreme Heat Hazard

The NCDC database indicates there have been no extreme heat events in Hays County during the period 1950 and 2010. Although not reported to the database, there have most likely been extreme heat events in the past that have affected Hays County. With no reported events during this period, the future probability of extreme heat events occurring in Hays County is considered low. See Table 13 for the definition of high, medium and low probability of occurrence.

5.5 Methodology for Identifying Hazards of Concern

In accordance with the requirements of the Interim Final Rule all hazards with potential to affect Hays County are profiled in this section of the Plan update. However, because this is a county-level hazard mitigation plan it is useful to identify the hazards that are of the most concern countywide, so these can be the focus of more detailed assessment. It is important to note, however, that many hazards and risks are very site-specific, so as local municipalities perform more detailed risk assessments and identify mitigation actions they should recognize that this process and the resulting table should be used only as a guide.

Various national, regional and local sources were used to identify and classify different hazards for Hays County. The criteria used were:

1. **History** – incorporating historical accounts and records that the hazard has affected the county often in the past, and that the hazard has occurred often and/or with widespread or severe consequences.
2. **Potential for mitigation** – acknowledging that there are ways to address the hazard, and that the methods are technically feasible and have the potential to be cost-effective [i.e. mitigation measures are available at a reasonable cost, and damages to property, lives and/or community functions would be reduced or eliminated.]
3. **Presence of susceptible areas or vulnerability** – indicating that Hays County has numerous facilities, operations or populations that may be subjected to damage from the hazard.
4. **Data availability** – demonstrating that sufficient quality data is available to permit an accurate and comprehensive risk assessment.
5. **Federal disaster declarations and local emergency declarations** – noting that Hays County has received numerous disaster declarations for the particular hazard.

The table on the following pages lists the hazards, describes the rationale for identifying (or not identifying) hazards as significant, shows sources of information that were consulted for the determination, and the disposition of the hazard with regard to hazard identification/profiling and vulnerability assessment/loss estimation in this plan. The initial hazards in the shaded portion of the table are those that were identified by Hays County's MPC as significant enough to warrant a full risk assessment.

Table 31
Hays County: Hazard Ranking

Hazard	Rationale	Sources	Disposition
Flood	Widespread impacts, history of occurrences in the County, significant annual damages	FEMA Flood Insurance Studies, FEMA Flood Insurance Rate Maps, FEMA Public Assistance records, FEMA National Flood Insurance Program claims data, US Army Corps of Engineers (USACE), and National Oceanographic and Atmospheric Administration (NOAA), studies and records. NOAAs National Climatic Data Center (NCDC).	Profile and risk assessment
Tornado	High annual probability, widespread impacts, losses generally limited except in most extreme events.	NOAA, NCDC, National Weather Service (NWS) – Houston/Galveston, Texas Office	Profile and risk assessment
Hail Storm	High annual probability of site-specific events, with moderate impacts	NOAA, NCDC, National Weather Service (NWS) – Houston/Galveston, Texas Office	Profile and risk assessment
Winter Storms	Low annual probability with the potential for widespread impacts	NOAA, NCDC, National Weather Service (NWS) – Houston/Galveston, Texas Office	Profile and risk assessment
Severe Thunderstorms/ High Winds	High annual probability, widespread impacts, losses considered moderate except in most extreme events.	NOAA, NCDC, National Weather Service (NWS) – Houston/Galveston, Texas Office	Profiled, but not part of detailed risk assessment
Wildfire/Brush Fire	High annual probability of site-specific events, with moderate impacts	NOAA and National Climatic Data Center (NCDC) records,	Profiled, but not part of detailed risk assessment
Drought	High annual probability, but impacts generally limited.	NOAA – NCDC	Profiled, but not part of detailed risk assessment
Dam Failure	Low annual probability, but potential for locally significant consequences.	Texas Commission on Environmental Quality (TCEQ) - Dam Safety Program, and USACE NID	Profiled, but not part of detailed risk assessment
Extreme Heat	Low to medium annual probability, with impacts generally limited	NOAA – NCDC	Profiled, but not part of detailed risk assessment
Seismic/Earthquake	Very low annual probability, some potential for significant consequences.	United States Geologic Survey (USGS)	Profiled, but not part of detailed risk assessment
Tropical Storms and Cyclones	Relatively high annual probability with moderate to severe impacts, potential for widespread losses, history of occurrences in the County	NOAA, NCDC, National Hurricane Center	Profiled, but not part of detailed risk assessment

Based on qualitative ranking above, the Hays County MPC recommended including four hazards in the more detailed risk assessments in Section 6:

- **Flood**
- **Tornado**
- **Hail storms**
- **Winter storms**

Section 6
Vulnerability Assessment and Loss Estimation

Contents of this Section

6.1 IFR Requirement for Risk Assessments
6.2 Overview and Analysis of Hays County's Vulnerability to Hazards
6.3 Estimate of Potential Losses

6.3.1 Flood Risk in Hays County
6.3.2 Tornado Wind Risk in Hays County
6.3.3 Hail Storm Risk in Hays County
6.3.4 Winter Storm Risk in Hays County

6.4 Future Development Trends in Hays County
6.5 Summary of Risk Assessment

6.1 Interim Final Rule Requirement for Risk Assessments

IFR §201.6(c)(2): *The plan shall include a risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.*

IFR §201.6(c)(2)(ii): *[The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.*

IFR §201.6(c)(2)(ii): *[The risk assessment]* ***must*** *also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged floods.*

IFR §201.6(c)(2)(ii)(B): *[The plan* ***should*** *describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate.*

Requirement §201.6(c)(2)(ii)(C): *[The plan* ***should*** *describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.*

6.2 Overview and Analysis of Hays County's Vulnerability to Hazards

As discussed in Section 6 of this Plan (Hazard Identification), Hays County has at least some exposure to as many as 11 natural hazards, but most of them have such low probability or limited potential impacts that there is little or no significant risk to the county. Section 5 described the process by which the County reduced the list of 11 possible hazards to the four that create the most risk to the people, assets and operations. As shown in the ranking table at the end of the previous section, these are ***floods, tornadoes, hail, and winter storms.***

In accordance with FEMA requirements, this section addresses county vulnerabilities to the four most significant risks, and estimates future expected losses from them. The most significant natural hazard to which Hays County is exposed to is flooding. Flooding in the planning area can be the result of the following weather events: hurricanes, thunderstorms (convectional and frontal), or winter storms. Hays County is most susceptible to riverine flooding, particularly flash floods. As discussed in Section 5 of this Plan, there have been 84 floods in Hays County between 1950 and 2010.

Tornadoes also pose a threat; the entire county is equally exposed to the potential damages from tornadoes, though clearly some structures are at far more risk than others due to their physical characteristics. The NCDC database indicates there have been 25 tornadoes in Hays County between 1950 and 2010, ranging in severity from F0 to F3. Although the threat is less significant than floods, the hazards hail and winter storm also pose a significant enough threat to Hays County that a risk assessment is performed for these hazards. One of the most damaging events in Hays County resulted from a hailstorm on April 20, 2006 which caused an estimated $100 million in damages to parts of San Marcos, Texas.

6.3 Estimate of Potential Losses (Risk Assessment)

This section describes the risks to Hays County. The term *vulnerability assessment* describes the extent to which physical assets, people or operations are damaged when they are exposed to natural hazards. The term *loss estimation* is analogous to *risk assessment,* and refers to expected future damage resulting from the impacts of natural hazards. Risk can be calculated or estimated in several different ways, depending mainly on the kind of information that is available for the analysis.

6.3.1 Flood Risk in Hays County

This subsection of the Plan provides estimates of future flood losses. Each of the loss calculations is based on best available data, but they must be considered estimates because highly detailed engineering studies were not performed as part of this planning process.

National Flood Insurance Polices (NFIP) Policies In-Force.

To provide a sense of the flood risk in a community it is beneficial to summarize the policies in force and claims statistics from the National Flood Insurance Program (NFIP). The U.S. Congress established the NFIP with the passage of the National Flood Insurance Act of 1968. The NFIP is a Federal program enabling 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. Participation in the NFIP is based on an agreement between communities and the Federal Government. If a community adopts and enforces a floodplain management ordinance to reduce future flood risk to new construction in floodplains, the federal government will make flood insurance available within the community as a financial protection against flood losses.[39] Hays County has been a member of the NFIP since March, 1978. All 11 municipalities in Hays County participate in the NFIP.

Data provided by FEMA indicates that as of February 2011, federal flood insurance policies were in force on 521 buildings in the unincorporated areas of Hays County. This represents a dollar value of property and contents coverage totaling $130,665,500. Since 1978, there have been a total of 236 NFIP insurance claims in unincorporated Hays County with a total claims value of slightly more than $3,514,972. [40]

Flood Risk Assessment
Analysis of NFIP Repetitive Loss and Severe Repetitive Loss Data

The first risk assessment method is based on an analysis of National Flood Insurance Program (NFIP) data on Repetitive Loss (RL) and Severe Repetitive Loss (SRL) properties. The NFIP defines Repetitive Loss properties as those that have received least two NFIP insurance payments of more than $1,000 each in any rolling ten-year period. Severe Repetitive Loss is defined as a property that has four or more claims of more than $5,000 each, or which has had two claims the combined total of which exceeds the market value of the property. As of May, 2010, Hays County had 32 RL properties, based on a query of the FEMA BureauNet NFIP interface. Of this total 30 were residential properties and two were non-residential. There is one SRL property in the county.

Residential Repetitive Loss Properties

As mentioned, there are a total of 30 residential RL properties in Hays County. The 30 properties are located within the unincorporated areas of Hays County, and the Cities of Woodcreek and San Marcos. The query results indicated that no other incorporated areas in Hays County included RL properties. Table 32 provides a summary of residential RL claims for Hays County, and the Cities of Woodcreek and San Marcos. The table includes the number of RL properties in each municipality, building and contents damages, the total number of claims, and the average claim

[39] National Flood Insurance Program, August 1, 2002. Program Description
[40] FEMA – Policy and Claim Statistics for Flood Insurance – Hays County

amounts. The figures are from an NFIP query performed in April 2011. The table shows that for the 30 RL properties in Hays County (including San Marcos and Woodcreek) there have been 63 claims totaling $1,304,912.

Table 32
Summary of Residential NFIP RL Statistics, Hays County
(Source: FEMA NFIP Query May, 2010)

Municipality Name	Properties	Total Building	Total Contents	Total Claims ($)	# of Claims	Average Claim
Unincorporated Hays County	15	$549,865	$138,234	$688,099	32	$21,503
San Marcos, City of	13	$314,126	$119,342	$433,468	27	$16,054
Woodcreek, City of	2	$114,945	$68,400	$183,345	4	$45,836
Grand Total	**30**	**$978,936**	**$325,976**	**$1,304,912**	**63**	**$20,713**

The unincorporated areas of Hays County have not only the highest number of properties, but also have the highest building, contents, and total claims value. This is not surprising because the land area of the unincorporated County is much greater than the City of San Marcos and Woodcreek.

The RL claims can be further broken down by focusing on individual street level data. Table 33 provides a summary of residential RL claims for the 26 individual streets within Hays County that include RL properties. The building, contents, and total claims data has been combined for streets that include RL properties. Address data about individual sites is omitted for reasons of confidentiality. The data shows that Hackberry Street and River Road have the most RL properties in Hays County. These two streets both have three RL properties and six prior NFIP claims. Although these two streets have the same number of properties and prior claims, Hackberry Street has almost twice the building claims value and average claim amount.

Table 33
Summary of Residential NFIP Repetitive Loss Statistics, Hays County, ordered by number of Properties on each Street
(Source: FEMA NFIP query May, 2010)

Municipality	Street Name	Properties	Building	Contents	Total	Claims	Average
San Marcos, City of	Hackberry Street	3	$114,109	$0	$114,109	6	$19,018
San Marcos, City of	River Road	3	$61,741	$0	$61,741	6	$10,290
Unincorporated Hays County	Hub Drive	2	$78,860	$30,641	$109,501	4	$27,375
Unincorporated Hays County	Brookhollow Drive	1	$25,508	$484	$25,992	2	$12,996
Unincorporated Hays County	Candlelight Lane	1	$29,808	$3,045	$32,853	2	$16,427
Unincorporated Hays County	Deer Crossing Lane	1	$48,447	$11,600	$60,047	3	$20,016
San Marcos, City of	Farris Street	1	$10,207	$0	$10,207	2	$5,103
Unincorporated Hays County	Flite Acres Road	1	$39,622	$16,627	$56,249	2	$28,125
Unincorporated Hays County	Mariposa Lane	1	$59,353	$12,163	$71,516	2	$35,758
Unincorporated Hays County	Mccoy Drive	1	$7,214	$0	$7,214	2	$3,607
Unincorporated Hays County	Mill Race Lane	1	$15,711	$0	$15,711	2	$7,855
San Marcos, City of	North Fredericksburg Street	1	$0	$8,070	$8,070	2	$4,035
San Marcos, City of	North Riviera Street	1	$26,113	$0	$26,113	2	$13,056
Unincorporated Hays County	Palo Pinto Path	1	$6,976	$7,824	$14,800	2	$7,400
San Marcos, City of	Pecan Street	1	$51,257	$0	$51,257	2	$25,628
Unincorporated Hays County	Quiet Meadow Circle	1	$60,542	$24,771	$85,313	2	$42,656
Unincorporated Hays County	Ranch Road 12	1	$33,579	$1,436	$35,015	3	$11,672
San Marcos, City of	Riviera Street	1	$46,751	$43,900	$90,651	3	$30,217
San Marcos, City of	SR 123 North	1	$0	$67,372	$67,372	2	$33,686
Unincorporated Hays County	Stone Canyon	1	$39,835	$29,642	$69,477	2	$34,739
San Marcos, City of	Sycamore Street	1	$3,950	$0	$3,950	2	$1,975
Unincorporated Hays County	Winn Wood Road	1	$88,961	$0	$88,961	2	$44,480
Unincorporated Hays County	Woodacre Drive	1	$15,450	$0	$15,450	2	$7,725

Municipality	Street Name	Properties	Building	Contents	Total	Claims	Average
Woodcreek, City of	Woodcreek Circle	1	$77,212	$68,400	$145,612	2	$72,806
Woodcreek, City of	Woodcreek Drive	1	$37,732	$0	$37,732	2	$18,866
Grand Total		**30**	**$978,936**	**$325,976**	**$1,304,912**	**63**	**$20,713**

The RL claims data for Hays County also includes the cumulative paid claims and the building replacement value (BRV). These figures can be compared to provide a perspective about the dollar amount that has been paid from past claims, in comparison to the BRV. Table 34 compares the total RL claims values (and present value of claims) with the BRV for the 30 residential RL properties. The table shows that for one of the RL properties, the present claims value exceeds 100% of the BRV. This property has a present value claims total of $92,711 and a BRV of $51,300, a ratio of 117%.

Table 34
Comparison of Hays County Residential NFIP Repetitive Loss Claims vs. Building Replacement Value (BRV), ordered by Percent of BRV
(Source: FEMA NFIP query May, 2010)

Municipality	Street Name	Total Area	Losses	Total Building Payment	Total Contents Payment	Total Paid	Total Present Value of Payments	BRV	Claims as % of BRV
Unincorporated Hays County	Deer Crossing Lane	2,265	3	$48,447	$11,600	$60,047	$92,771	$51,300	117.05%
Unincorporated Hays County	Hub Drive	unknown	2	$73,505	$20,000	$93,505	$133,372	$128,449	72.80%
Woodcreek, City of	Woodcreek Circle	1,334	2	$77,212	$68,400	$145,612	$217,747	$211,499	68.85%
San Marcos, City of	State Route 123	2,760	2	$0	$67,372	$67,372	$176,240	$102,560	65.69%
Unincorporated Hays County	Quiet Meadow Circle	1,488	2	$60,542	$24,771	$85,313	$127,748	$153,064	55.74%
San Marcos, City of	Riviera Street	unknown	3	$46,751	$43,900	$90,651	$186,606	$221,357	40.95%
Unincorporated Hays County	Stone Canyon	2,890	2	$39,835	$29,642	$69,477	$97,891	$173,641	40.01%
San Marcos, City of	River Road	1,968	2	$38,551	$0	$38,551	$72,840	$98,070	39.31%
Unincorporated Hays County	Winn Wood Road	2,024	2	$88,961	$0	$88,961	$153,229	$235,021	37.85%
Unincorporated Hays County	Mariposa Lane	unknown	2	$59,353	$12,163	$71,516	$83,174	$196,500	36.39%
San Marcos, City of	Pecan Street	1,300	2	$51,257	$0	$51,257	$97,508	$165,477	30.98%
Unincorporated Hays County	Palo Pinto Path	1,300	2	$6,976	$7,824	$14,800	$30,653	$50,000	29.60%
San Marcos, City of	Hackberry Street	1,526	2	$36,505	$0	$36,505	$68,847	$125,172	29.16%
San Marcos, City of	Hackberry Street	1,300	2	$41,997	$0	$41,997	$79,326	$144,743	29.02%
Woodcreek, City of	Woodcreek Drive	1,161	2	$37,732	$0	$37,732	$73,622	$153,139	24.64%
San Marcos, City of	Hackberry Street	1,444	2	$35,607	$0	$35,607	$67,253	$144,743	24.60%
Unincorporated Hays County	Candlelight Lane	unknown	2	$29,808	$3,045	$32,853	$37,548	$154,412	21.28%
Unincorporated Hays County	Brookhollow Drive	unknown	2	$25,508	$484	$25,992	$39,375	$145,796	17.83%
San Marcos, City of	Farris Street	4,514	2	$10,207	$0	$10,207	$31,661	$58,000	17.60%
Unincorporated Hays County	Mill Race Lane	2,416	2	$15,711	$0	$15,711	$30,678	$104,570	15.02%

Municipality	Street Name	Total Area	Losses	Total Building Payment	Total Contents Payment	Total Paid	Total Present Value of Payments	BRV	Claims as % of BRV
Unincorporated Hays County	Flite Acres Road	unknown	2	$39,622	$16,627	$56,249	$82,713	$441,279	12.75%
San Marcos, City of	North Riviera Street	1,852	2	$26,113	$0	$26,113	$83,917	$207,697	12.57%
San Marcos, City of	River Road	1,860	2	$18,761	$0	$18,761	$34,677	$181,863	10.32%
Unincorporated Hays County	Ranch Road	1,977	3	$33,579	$1,436	$35,015	$63,703	$388,604	9.01%

Flood Risk to Residential Repetitive Loss Properties

Residential flood risk is calculated by a simple methodology that uses the FEMA default present-value coefficients from the benefit-cost analysis software modules. To perform this calculation, the repetitive loss data were reviewed to determine an approximate period over which the claims occurred. This method should not be used for risk assessments for individual properties because of the generalizations that are used, i.e. that an unknown number of properties in the County have been flooded, but did not have flood insurance, and therefore do not appear in the data. Flood claims in the most recent query occurred between 1979 and the present, a period of 31 years.

As shown in Table 35, there have been 63 claims in the 31-year period, for an average number of claims per year of slightly more than two, though it is typical for losses to be clustered around significant flood events. Based on a 100-year horizon and a present value coefficient of 14.27 (the coefficient for 100 years using the mandatory OMB discount rate of 7.0 percent), the projected flood risk to these properties is shown at the bottom of the table. It must be understood that individuals can obtain and cancel flood insurance policies, and the flood hazard depends on many variables, including the weather, so this projection is simply an estimate of potential damages. Nevertheless, it offers a useful metric that can be used in assessing the potential cost effectiveness of mitigation actions.

Table 35
Projected 100-year Flood Risk in Hays County for Repetitive Loss Properties
(Source: FEMA NFIP query May, 2010)

Data	Value
Period in years	31
Number of claims	63
Average claims per year	2.03
Total value of claims	$1,304,912
Average value of claims per year	$42,093
Projected risk, 100-year horizon	**$600,667**

Table 36 shows projections for Hackberry Street and River Road in the City of San Marcos, which appear to have the most risk, based on NFIP repetitive loss records. With a total of six claims each, these two streets have the highest number of repetitive loss claims in the NFIP database within Hays County. The projections are done in the same manner as the overall projection described above. These risk figures are a good basis for calibrating the amount that can be spent (either overall, or per typical property) on mitigation actions, although the ultimate cost effectiveness is also a function of the effectiveness and useful life of the project itself.

Table 36
Projected 100-year Flood Risk for Hackberry Street and River Road
(Source: FEMA NFIP query May, 2010)

Hackberry	Risk Projection
Total claims	6
Average claims per year	0.19
Total value of claims	$114,109
Average value of claims per year	$3,681
Projected risk, 100-year horizon	$52,573
Number of claimants	3
Projected risk per policy, 100-year horizon	$17,524
River Road	
Total claims	6
Average claims per year	0.19
Total value of claims	$61,741
Average value of claims per year	$1,992
Projected risk, 100-year horizon	$28,426
Number of claimants	3
Projected risk per policy, 100-year horizon	$9,475

Severe Repetitive Loss Properties

In 2004 FEMA began to develop the Severe Repetitive Loss (SRL) Grant Program in an effort to reduce or eliminate flood damages to residential properties that met certain minimum requirements. The Agency initiated the program early in 2008. An SRL property is defined as a residential property that is covered under an NFIP flood insurance policy and:

- has at least four NFIP claim payments (including building and contents) over $5,000 each, and the cumulative amount of such claims payments exceeds $20,000; or
- For which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building

As of May 2010, Hays County had one property on the SRL list. The SRL property is located in Wimberley. Table 37 provides loss estimates for the one SRL property, as calculated by FEMA and the NFIP. The columns labeled "30-year Risk" and "100-year Risk" show the expected future losses over those respective planning horizons, for the property on Woodcreek Drive. It should be noted that the methodology does not express a complete range of potential risk (and benefits if the data is used in a Benefit-Cost Analysis (BCA) for a mitigation project), so individual properties should not be dropped from consideration for mitigation based solely on this calculation. More extensive risk assessment and benefit-cost analysis would include additional loss calculations that would likely increase the apparent risk along with the concomitant benefits of reducing or eliminating it.

Table 37
Annual and 100-year Risk for SRL Properties in Hays County
(Source: FEMA/NFIP, Query May 2010)

Municipality Name	Street Name	Building Rep. Value	Total Paid Claims ($)	Losses	Annual Risk	100-year Risk
Wimberley	Woodcreek Circle	$211,499	$145,612	2	$4,697	$67,028
Grand Total	**-----**	**$211,499**	**$145,612**	**2**	**$4,697**	**$67,028**

The following map (Figure 33) identifies the NFIP RL and SRL properties in Hays County. The map includes major County thoroughfares, but detailed street names have been omitted for confidentiality purposes to prevent the identification of exact address locations of RL and SRL properties. Note that the appendices for individual jurisdictions include maps of any repetitive loss or severe repetitive loss properties located within their boundaries.

Figure 33
Map of Repetitive Loss and Severe Repetitive Loss Properties in Hays County
(Sources: FEMA/NFIP, Hays County GIS Department)

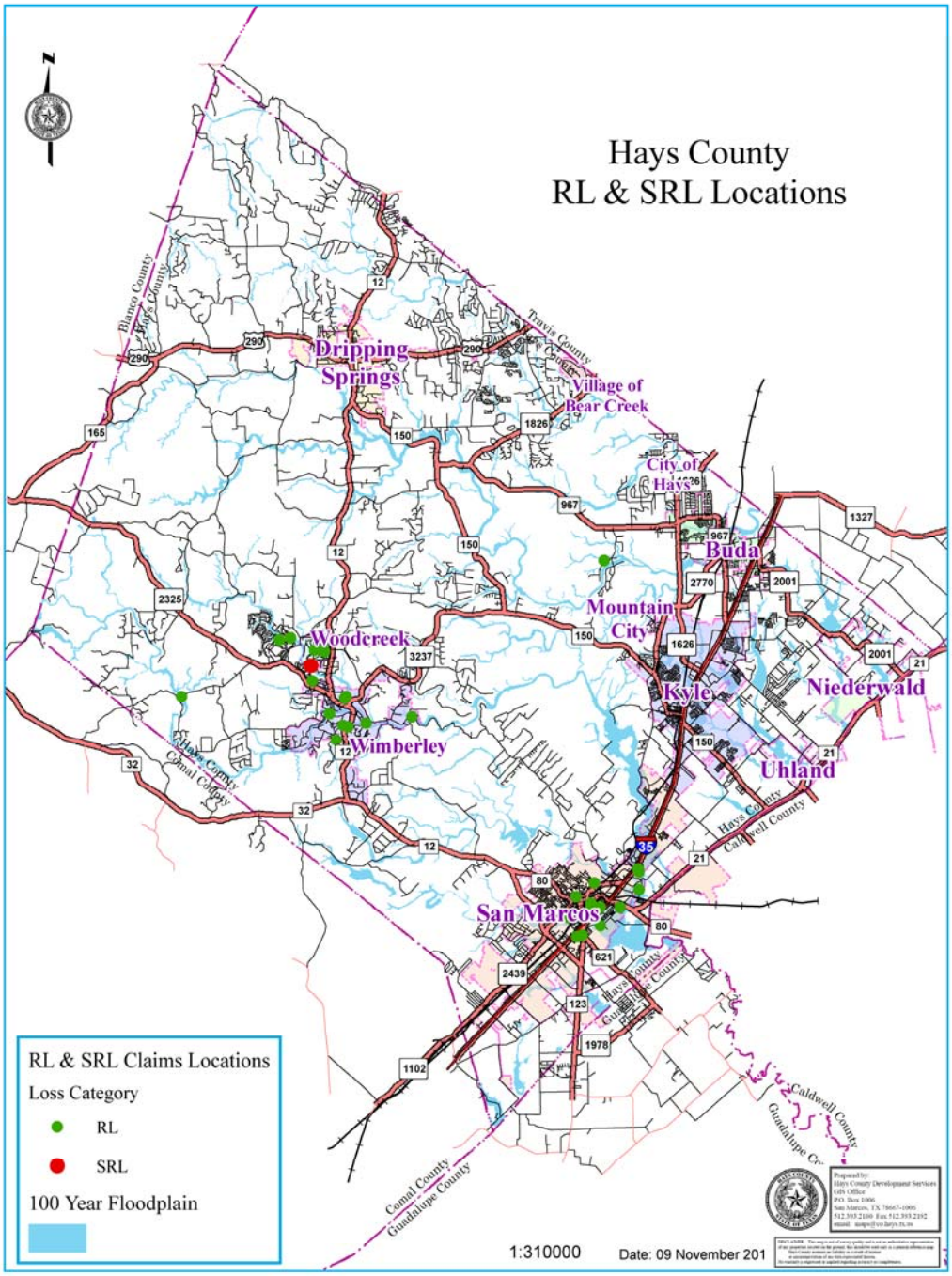
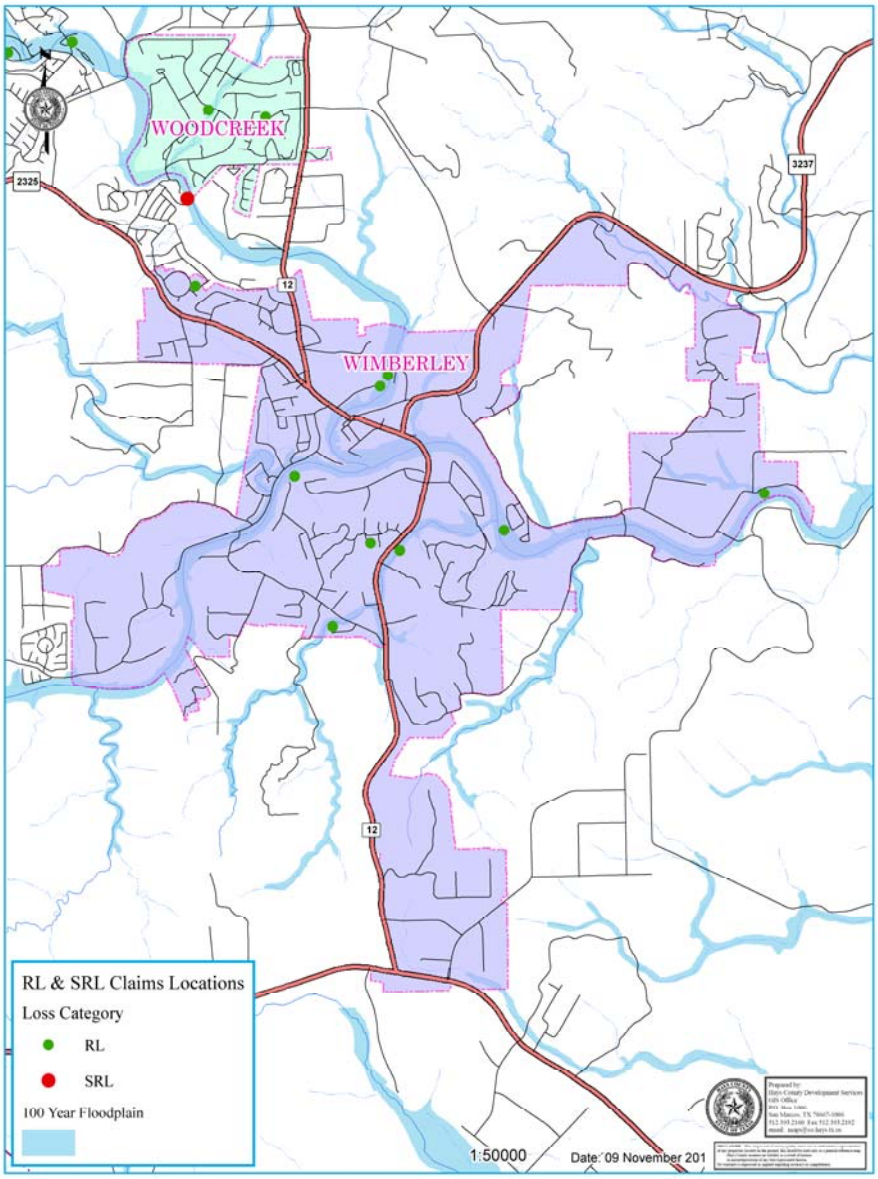


Figure 34 identifies the RL properties located near Wimberley and the City of Woodcreek. The map indicates there are seven RL properties located west and southwest of Wimberley and one southeast of the City. See Appendix H for an RL map of San Marcos.

Figure 34
Map of Repetitive Loss Properties near Wimberley and Woodcreek
(Sources: FEMA/NFIP, Hays County GIS Department)



Flood Risk to Hays County Public Assets

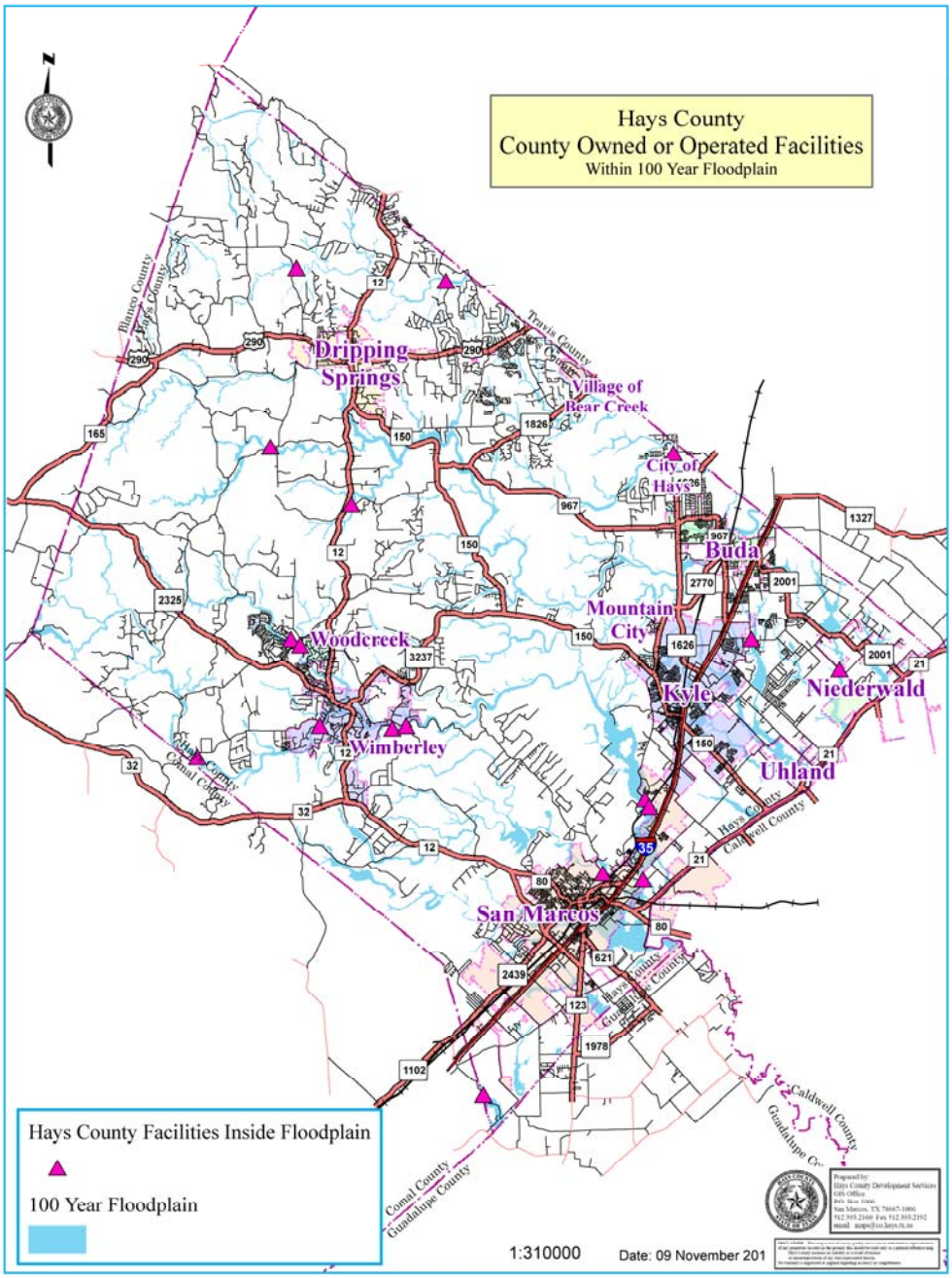
Review of the 47 public facilities for Hays indicates that three buildings are located within the 100-year floodplain. Table 38 lists the three buildings in the floodplain. The Table shows that two of the facilities are located in the City of San Marcos. Note: the first building listed below was elevated during construction and, although within the footprint of the 100-year floodplain, is currently above base flood elevation.

Table 38
Hays County Public Facilities Within the 100-year Floodplain
(Source: Hays County Development Services – GIS Department)

Facility Name	City	Year Built	Square Footage	Stories	Replacement Value
Five Mile Park Soccer Complex	San Marcos	2010	2,520	1	$450,000
Five Mile Park Soccer Complex	San Marcos	2010	1,200	1	$29,900
Jacobs Well Stewardship Center	Wimberley	1975	8,614	2	$1,000,000

Figure 35 is a map identifying the public facilities in Hays County located in the 100-year floodplain. The map shows that 3 of the 47 total facilities are located within the floodplain. The majority of the facilities are located in the more densely populated southern half of the County.

Figure 35
Public Facilities in the 100-year Floodplain
(Source: FEMA, Hays County GIS Department)



6.3.2 Tornado Wind Risk in Hays County

Relative to other parts of the nation, the overall tornado risk is moderate in Hays County. There is significant enough exposure to the hazard to perform a simple risk assessment to characterize potential future losses. The calculation is done using FEMA's Benefit-Cost Analysis (BCA) software (version 4.5.5.0). It should be noted that this software was designed to assess risk at a single site or building, so the methodology must be adapted to reflect an assessment of an entire community. Furthermore, the software bases the risk calculation (and by extension, benefits, when risk is reduced) on avoided injuries and casualties, not damage to structures or loss of operations. These limitations mean that the results of the analysis should be regarded as a preliminary indication of potential life safety risk, based on very basic inputs. Evaluation of specific mitigation alternatives requires technical information that was not available for this version of the plan.

The FEMA BCA analysis methodology and tornado element of the software are based entirely on avoided injuries and fatalities. As a result, it is not necessary to separate public assets from private ones in order to estimate potential future losses (risk) – the calculation is based on the population at risk, rather than the square footage or value of buildings or functions. The software uses default values for various levels of injury related to tornadoes. These values are $5.8 million for death and $1.088 million for injuries requiring hospitalization.

Tornado Risk – Residential Assets

The FEMA BCA software requires some basic information and assumptions to complete the risk assessment. Table 39 summarizes this information. The general radius of the County was determined using the 678 total square miles and the area formula ($a = pi * r^2$). The software uses this information and the location of the County (by ZIP code) to calculate the probability of tornadoes of varying intensities occurring here, based on historical records.

Table 39
Tornado Risk Assessment – Summary of Data Parameters
(Source: FEMA BCA Software, Version 4.5.5.0)

Data	Value
Loss estimation horizon (in years)	50
Population (2010 U.S. Census)	157,107
Zip Code used as center of analysis	78676
Maximum design wind speed of the safe room (mph)	200 mph
Predominant structure type	One- or two- story residential
Average radius in miles	14.69
Occupancy Percentage	
Day	50%
Evening	80%
Night	100%

Based on the number of total occupants, the software calculates the population on site based on statistics related to the probabilities of tornadoes impacting the community, by time of day. Table 40 shows that average exposed population would be 88,661 residents.

Table 40
Population Based on Occupancy Percentage and Warning Response
(Source: FEMA BCA Software, Version 4.5.5.0)

Occupancy Results

Calculated Number Of Occupants Per Structure Type Based On Occupancy Percentage And Warning Response: *

	Time	Residences
Night	Midnight - 6:00 AM	94264.20
Evening	6:00 PM - Midnight	106832.76
Day	6:00 AM - 6:00 PM	78553.50
	Average Occupancy:	89,550.99

The software then uses these inputs to calculate the expected loss of life and number of injuries for tornado classes EF0 to EF5. Figure 36 shows the summary of benefits from the tornado risk assessment. The figures in the *Expected Avoided Damages After Mitigation* box are the calculated benefits, which in this case is the total expected losses from the tornado hazard over the 50-year planning horizon. The *annual* benefits are calculated at **$9,605,509** and the net present value of the benefits (over the 50-year project lifetime) is **$132,576,995**.

Although this is a very large figure compared to some other risks in the County, it is very important to recognize that (1) the figure is based on life safety, and FEMA has relatively high values assigned to injuries and deaths, and (2) it is very difficult to develop meaningful tornado mitigation measures for large populations such as Hays County. Although warning systems can address risk to a degree, such measures will not mitigate risk to significant percentages of the population. There are several reasons for this, including the expected effectiveness of warning systems, availability of shelters, and access to shelters.

Note that the purpose of using the Tornado element of the BC software for the risk assessment was to determine the *Annual Benefits* and the *Expected Avoided Damages After Mitigation*. Therefore, the project cost, net benefits (benefits minus cost cell), and BC ratio which are all important figures when performing a BC analysis are not relevant as part of the present risk assessment. These figures have been entered or calculated in the module but have no significance in this analysis.

Figure 36
Tornado Risk in Hays County
(Source: FEMA BCA Software, Version 4.5.5.0)

SUMMARY OF BENEFITS

Expected Annual Damages Before Mitigation		Expected Annual Damages After Mitigation	
Annual	$ 9,606,509	Annual	$ 357,218
Present Value	$ 132,576,995	Present Value	$ 4,929,877

Expected Avoided Damages After Mitigation (BENEFITS)	
Annual	$ 9,249,291
Present Value	$ 127,647,118

MITIGATION BENEFITS	$ 127,647,118
MITIGATION COSTS	$ 0
BENEFITS MINUS COSTS	$ 127,647,118
BENEFIT-COST RATIO	0.00

The results of the tornado risk assessment for Hays County can be further broken down to the municipality level. Table 41 summarizes the tornado risk for the 11 municipalities (participating in the Plan update) in Hays County. The last column, *50-year Tornado Risk,* indicates the estimated cumulative tornado risk (injuries and deaths) over a 50-year planning horizon, using the required 7% discount rate for net present value. The table shows that San Marcos is the municipality with the highest 50-year tornado risk in Hays County.

Table 41
Estimate of Risk to the 11 Participating Hays County Municipalities from Tornadoes, ordered by 50-year risk
(Source: FEMA BCA Software, Version 4.5.5.0)

Municipality Name	Total Area (Square Miles)	Population (2010)	% of Co. Population	Annual Damages	50-year Risk
San Marcos	18.3	44,894	28.58%	$2,745,101	$37,884,446
Kyle	6.0	28016	17.83%	$1,713,074	$23,641,703
Buda	2.4	7,295	4.64%	$446,062	$6,155,990
Wimberley	33.5	2627	1.67%	$160,754	$2,218,519
Dripping Springs	3.3	1,788	1.14%	$109,330	$1,508,829
Woodcreek	1.1	1457	0.93%	$89,090	$1,229,510
Mountain City	0.5	648	0.41%	$39,387	$543,566
Niederwald	3.0	565	0.36%	$34,548	$476,783
Uhland	1.8	1014	0.65%	$62,002	$855,679
Bear Creek	1.1	392	0.25%	$23,358	$322,356
Hays, City of	0.2	217	0.14%	$13,269	$183,119
Grand Total	**----**	**88,913**	**56.59%**	**$5,435,975**	**$75,020,500**

Tornado Risk – Public Assets

In addition to the residential tornado risk assessment an analysis was also completed for the County's public facilities. The tornado risk assessment for Hays County public buildings was completed for the 25 occupied buildings owned by the County. The analysis was completed based on data provided by Hays County and entered into the tornado module of the FEMA BCAR software. Within the tornado module, with the exception of the number of occupants and design wind speed, all other data points remained constant. Table 42 below summarizes the non-residential data inputs.

Table 42
Non-Residential Tornado Risk Assessment - Project Information
(Source: FEMA BCA Software, Version 4.5.5.0)

Data	Value
Loss estimation horizon	50
Assumed structure design wind speeds (mph) of safe room	200
Zip code as center of analysis (Wimberley)	78676
Assumed structure type	Small Professional Building
Occupancy Percentage	
Day	100%
Evening	25%
Night	5%

The FEMA software used for assessing tornado risk is based exclusively on life safety, so there is a strong correlation between the occupancy of a facility and the risk. The software uses inputs related to building occupancy by time of day to calculate the expected loss of life and number of injuries for tornado classes F0 to F5. The results displayed in Table 43 below were calculated using the same methodology as described in the section immediately above (the residential tornado assessment).

Table 43
Estimated Tornado Risk to Hays County Public Facilities, 50 year Planning Horizon, ordered by 50-year Risk
(Source: FEMA BCA Software [BCAR], Version 4.5.5.0)

Facility Description	City	Square Footage	Structure Replacement Value	Occupancy	Annual Risk	50-year Risk
Public Safety Building	San Marcos	10,450	$1,319,500	150	$24,290	$335,225
Jail	San Marcos	88,273	$15,933,300	129	$20,890	$288,294
County Courts Building	San Marcos	39,546	$4,147,200	117	$18,946	$261,474
Juvenile Detention Center	San Marcos	40,533	$6,550,100	101	$16,355	$225,717
Courthouse	San Marcos	22,284	$6,603,600	45	$7,287	$100,567
Road & Bridge Supervisor Bldg	Kyle	1,200	$49,000	34	$5,506	$75,983
Road & Bridge Shop	Kyle	17,208	$1,203,600	32	$5,182	$71,514
County Health Department	San Marcos	9,120	$1,066,800	31	$5,020	$69,282
Annex Offices	San Marcos	15,062	$2,923,300	30	$4,858	$67,046
Juvenile Probation Dept.	San Marcos	3,300	$247,200	17	$2,753	$37,993
Maintenance Department	San Marcos	6,200	$0	17	$2,753	$37,993
PCT #5 Office Building	Buda	5,905	$529,500	11	$1,781	$24,584
IT Shop	San Marcos	1,750	$0	9	$1,458	$20,115
Road Crew Office	Driftwood	1,488	$55,000	7	$1,134	$15,646
Health Department	Kyle	3,572	$337,100	7	$1,134	$15,646
County Clerk & Records Dept.	San Marcos	8,280	$783,500	6	$972	$13,410
Road And Bridge Pct #3	Wimberley	3,200	$69,000	6	$972	$13,410
Constable Pct #2	Kyle	874	$55,200	5	$810	$11,174
Extension Office	San Marcos	5,000	$266,200	4	$648	$8,941
Sheriff'S Office Auto Shop	San Marcos	10,000	$670,800	4	$648	$8,941
Election Office (2)	San Marcos	2,000	$144,400	3	$486	$6,705
Civic Center	San Marcos	96,304	$5,159,300	2	$324	$4,469
Election Office	San Marcos	1,800	$151,000	2	$324	$4,469

Facility Description	City	Square Footage	Structure Replacement Value	Occupancy	Annual Risk	50-year Risk
Jail – Classroom	San Marcos	1,357	$55,600	2	$324	$4,469
Office Building (Transfer Station)	Driftwood	192	$6,200	2	$324	$4,469
Grand Total	**-----**	**394,898**	**$48,326,400**	**773**	**$125,179**	**$1,727,536**

Figure 37 is a photograph of the Public Safety Building. This facility has the highest 50-year tornado risk of the 25 occupied facilities in Hays County. The Public Safety Building has a 50-year tornado risk of $335,225.

Figure 37
Hays County Public Safety Building
(Source: Property Appraisal Report Hays County, 2010)

Figure 38 is a photograph of the Hays County Jail. This facility has the second highest 50-year tornado risk of public facilities in Hays County. The Jail has a 50-year tornado risk of $288,294.

Figure 38
Hays County Jail
(Source: Property Appraisal Report Hays County, 2010)

6.3.3 Hail Storm Risk in Hays County

A basic risk assessment can be performed for the hail storm hazard using data from the National Oceanic Atmospheric Administration's (NOAA) National Climatic Data Center (NCDC) database. The NCDC lists 83 hail storm events from 1967 to 2010 for Hays County. The data covers the past 43 years and is sufficient to complete a risk assessment for Hays County. Table 44 shows the basic data required for the assessment; all information is from open sources. Note that the NCDC only reported one injury and no deaths for Hays County. With only one injury (considered a rare occurrence) or deaths, the risk assessment focused on damages associated hail storms.

Table 44
Data Parameters for Hays County Hail Storm Risk Assessment;
Data from the NOAA/NCDC Database (1967 - 2010)
(Source: NOAA/NCDC)

Data	Value
Hail storm events	83
Reporting Years	43
Average annual number of hail events	1.93
Total reported damages	$101,703,000
Annual damages	$2,365,186

After determining the annual figures for damages in Hays County, the risk assessment comprises a simple projection of future expected damages based on a standard present value coefficient of 14.27. This represents a 100-year time horizon and a 7% discount rate (the latter required by the Office of Management and Budget (OMB)).

Table 45
Estimate of Risk to Hays County from Hail Storms
(Source: NOAA/NCDC)

Data	Value
Annual damages to Hays County	$2,365,186
Projected 100-year risk from direct winter storm damages	$33,751,205

The hail storm risk for Hays County can be analyzed in greater detail by focusing on individual municipalities. Specific municipality-level hail storm data was not available for Hays County from the NCDC database or other sources. In the absence of this data, the hail damages for each municipality were calculated as a proportion of the Hays County population. In the 2010, the U.S. Census Bureau reported the total population in Hays County was 157,107. For each municipality, the percentage of the county population was calculated, then total hail storm damages were proportioned by population among the unincorporated county and municipalities.

Table 46 provides a summary of the hail storm risk for unincorporated Hays County and the 11 municipalities that are located (or partially located) within the county. For each municipality, the annual damages were calculated by dividing the total damages by 43, the number of years reported in the NCDC database. The last column (*100-Year Hail Storm Risk)* indicates the estimated cumulative damages over a 100-year planning horizon, using the mandated 7% discount rate for net present value. The table shows that the unincorporated area of Hays County has the highest 100-year hail storm risk. The unincorporated area of the county has the highest risk due to the population (and land

area) being much greater than any of the municipalities. The municipality with the highest 100-year risk is the City of San Marcos. The 100-year risk in San Marcos is $9,644,552.

Table 46
Estimated Hail Storm Risk for Unincorporated Hays County and the 11 Municipalities, Ordered By 100-Year Risk
(Sources: NOAA/NCDC, US Census Bureau)

Municipality Name	Population (2010)	% of County Population	Total Damages	Annual Damages	100-Year Risk
Unincorporated Hays County	68,194	43.41%	$44,145,292	$1,026,635	$14,650,077
San Marcos	44,894	28.58%	$29,062,069	$675,862	$9,644,552
Kyle	28,016	17.83%	$18,136,119	$421,770	$6,018,661
Buda	7,295	4.64%	$4,722,408	$109,823	$1,567,181
Wimberley	2,627	1.67%	$1,700,585	$39,548	$564,357
Dripping Springs	1,788	1.14%	$1,157,459	$26,918	$384,115
Woodcreek	1,457	0.93%	$943,187	$21,935	$313,006
Uhland	1,014	0.65%	$656,412	$15,265	$217,837
Mountain City	648	0.41%	$419,482	$9,755	$139,209
Niederwald	565	0.36%	$365,752	$8,506	$121,379
Bear Creek	392	0.25%	$253,761	$5,901	$84,213
Hays, City of	217	0.14%	$140,475	$3,267	$46,618
Grand Total	**157,107**	**100.00%**	**$101,703,000**	**$2,365,186**	**$33,751,205**

6.3.4 Winter Storm Risk in Hays County

Similar to the hail storm hazard above, data from NOAA's NCDC can be used to perform a basic risk assessment for the winter storm hazard. The NCDC database lists seven winter storm/snow/ice events from 1996 to 2010 for Hays County. The web site does not indicate why the data does not include events prior to 1996. However, the amount of data that is presently on the site is sufficient for a basic risk assessment for Hays County. Table 47 shows the basic data required for the assessment; all information is from open sources. Note that no injuries or deaths were reported by the NCDC for Hays County. With no injuries or deaths, the risk assessment focused on physical damages associated with winter storms.

Table 47
Data Parameters for Hays County Winter Storm Risk Assessment;
Data from the NOAA/NCDC Database (1996-2010)
(Source: NOAA/NCDC)

Data	Value
Winter storm events	9
Reporting Years	14
Average annual number of winter storm events	0.64
Total reported damages	$7,500,000
Annual damages	$535,714

After determining the annual figures for damages in Hays County, the risk assessment comprises a simple projection of future expected damages based on a standard present value coefficient of 14.27. This represents a 100-year time horizon and a 7% discount rate (the latter required by the Office of Management and Budget (OMB)).

Table 48
Estimate of Risk to Hays County from Winter Storms
(Source: NOAA/NCDC)

Data	Value
Annual damages to Hays County	$535,714
Projected 100-year risk from direct winter storm damages	$7,644,643

The winter storm risk for Hays County can be analyzed in greater detail by focusing on individual municipalities. Specific municipality-level winter storm data was not available for Hays County from the NCDC database or other sources. In the absence of this data, the winter storm damages for each municipality were calculated as a proportion of the Hays County population. In the 2010, the U.S. Census Bureau reported the total population in Hays County was 157,107. For each municipality, the percentage of the county population was calculated. The total winter storm damages for each municipality were then calculated by multiplying the percent of the county population by $7,500,000, the total winter storm damages for the county.

Table 49 provides a summary of the winter storm risk for unincorporated Hays County and the 11 municipalities that are located (or partially located) within Hays County. For each municipality, the annual damages were calculated by dividing the total damages by 14, the number of years reported in the NCDC database. The last column (*100-Year Winter Storm Risk)* indicates the estimated cumulative wind damages over a 100-year planning horizon, using the mandated 7% discount rate for net present value. The table shows that the unincorporated area of Hays County has

the highest 100-year winter storm risk. The unincorporated area of the county has the highest risk due to the population (and land area) being much greater than any of the municipalities. The municipality with the highest 100-year risk is the City of San Marcos. The 100-year risk in San Marcos is $2,184,490.

Table 49
Estimated Winter Storm Risk for Unincorporated Hays County and the 11 Municipalities, Ordered By 100-Year Risk
(Sources: NOAA/NCDC, US Census Bureau)

Municipality Name	Population	% of County Population	Total Damages	Annual Damages	100-Year Risk
Unincorporated Hays County	68,194	43.41%	$3,255,456	$232,533	$3,318,240
San Marcos	44,894	28.58%	$2,143,157	$153,083	$2,184,490
Kyle	28016	17.83%	$1,337,432	$95,531	$1,363,226
Buda	7,295	4.64%	$348,250	$24,875	$354,966
Wimberley	2627	1.67%	$125,408	$8,958	$127,827
Dripping Springs	1,788	1.14%	$85,356	$6,097	$87,002
Woodcreek	1457	0.93%	$69,555	$4,968	$70,896
Uhland	1014	0.65%	$48,407	$3,458	$49,340
Mountain City	648	0.41%	$30,934	$2,210	$31,531
Niederwald	565	0.36%	$26,972	$1,927	$27,492
Bear Creek	392	0.25%	$18,713	$1,337	$19,074
Hays, City of	217	0.14%	$10,359	$740	$10,559
Grand Total	**157,107**	**100.00%**	**$7,500,000**	**$535,714**	**$7,644,643**

6.4 Future Development Trends in Hays County

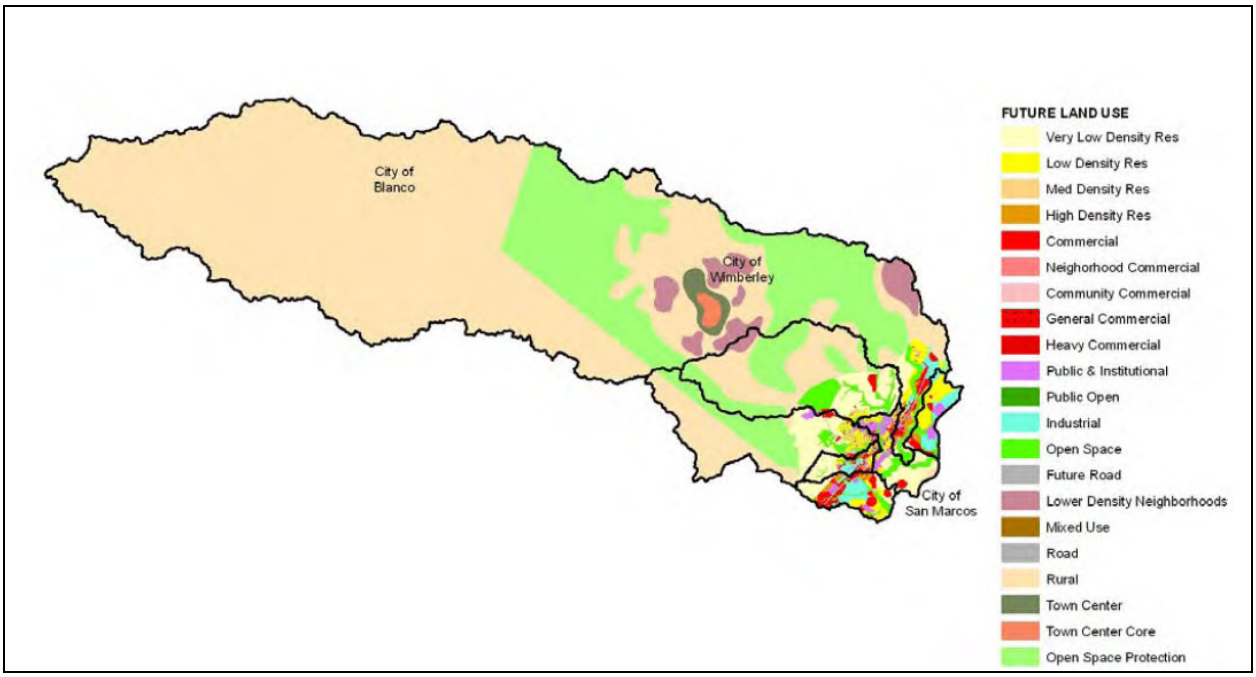
To identify future development trends in Hays County Texas, the planning team reviewed the *Regional Economic Development: An Economic Base Study and Shift-Share Analysis for Hays County, Texas* and the 2007 *San Marcos Flood Protection Plan.* The team also completed an extensive search of open sources for plans and studies related to development trends in the county.

Based on data from CAPCOG (www.capcog.org/information-clearinghouse/publications) over the past 20 years Hays was among the fastest-growing counties in the region. Between 1960 and 2000, Hays County grew by 229%. Its total population has increased since then by another 60 percent, to over 157,000 residents.

As of 2011, the most densely populated area of Hays County is located in the southern portion of the county near the areas of San Marcos and Kyle. These municipalities have the by far the highest population estimates and number of housing units of the 11 municipalities located within Hays County. The future development trends in Hays County can be narrowed to focus on this area of the county which is anticipated to experience the most growth over the next 10 to 20 years.

As part of the *San Marcos Flood Protection Plan,* a flood frequency analysis was completed based on ultimate development conditions within the seven watersheds that are located within the City of San Marcos. For the analysis, full development was equivalent to a 25-year time horizon (i.e., the development status in the year 2031). Figure 39 is the composite future land use map for the San Marcos Flood Protection Plan watersheds. The map was created using a combination of best available data sets including the City of San Marcos Future Land Use Map and the Envision Central Texas Future Land Use Map. Although not indicated on the map, large sections of the Blanco River, Sink Creek, and Purgatory Creek watershed extend into rural areas that are not projected to be developed within the next 25 years.[41] This map was compared with the current San Marcos Land Use Map and most of the proposed development will be occurring in the southeastern part of the watersheds near the City of San Marcos.

Figure 39
San Marcos, Texas Watersheds - Future Land Use Map
(Source: 2007 San Marcos Flood Protection Plan)



[41] 2007 San Marcos Flood Protection Plan - Engineering Report Volume I of II. May, 2007. Page 27.

6.5 Summary of Risk Assessment

Mitigation planning is intended to provide a rational method for communities to decide what actions to take to reduce their risks from natural hazards. Aside from actually determining and implementing specific actions, perhaps the most important part of a mitigation plan is the risk assessment, which establishes an objective basis for prioritizing mitigation efforts. The risk assessment in this plan was used to develop a sense of where the most significant risks are in Hays County, to identify the hazards that present the most potential damage to the county, municipalities and their assets, to ascertain where additional study may be warranted, and to begin the process of identifying and prioritizing mitigation actions.

Table 50 summarizes the results of the risk assessments (future loss estimates) for the hazards floods, tornado winds, hail, and winter storms. The figures are based on calculations of direct damages, losses of functions and casualties. When considered across the entire county, the data shows lower total risk from floods than from the other hazards and over a long planning horizon. The reason for this is that the flood hazard is geographically concentrated, while the entire county is uniformly exposed to the effects of tornadoes, hail, and winter storms. It is worth noting that the tornado analysis is based entirely on life safety, i.e. avoided death and injury, which tends to inflate the expected losses somewhat. Also, following the comment above about the geographic concentration of floods, it should be noted that although hazards other than floods appear to produce more risk, they are also typically more difficult and expensive to mitigate, particularly on a large scale. For example, there is no structural solution to residential tornado risk, so although the hazard may present the largest potential loss, any large-scale structural mitigation is not feasible. The same is true for hail storms.

Table 50
Summary of Hays County Risk Assessment
by Asset and Hazard Type (50 and 100-year horizons)

Asset	# of Properties	Hazard	Planning Horizon	Risk
Residential repetitive loss properties	30	Floods	100-year	$600,667
Residential severe repetitive loss properties	1	Floods	100-year	$67,028
County Population	157,107	Tornado wind	50-year	$132,576,995
County facilities	25	Tornado wind	50-year	$1,727,536
All Public and Private Assets	n/a	Hail Storm	100-year	$33,751,205
All Public and Private Assets	n/a	Winter Storm	100-year	$7,644,643

As noted earlier, the purpose of risk assessment is to identify and quantify future losses from natural hazards, with the goal of using this information to determine what actions should be taken to reduce damages. The risk assessment in this Plan update was used to develop a sense of where the most significant risks are in Hays County, to identify the hazards that present the most potential damage to the county, municipalities and their assets, to ascertain where additional study may be warranted, and to identify and prioritize mitigation actions. Section 7 of the Plan update identifies specific mitigation actions that have been identified by the MPC to reduce the risk in Hays County from the hazards profiled in Section 5.

Section 7
Mitigation Strategy

Contents of this Section

7.1 IFR Requirements for Mitigation Strategy
7.2 Mitigation Goals and Accomplishments
7.3 Ongoing and Previous Mitigation Initiatives
7.4 Mitigation Objectives and Strategies
7.5 Prioritized Mitigation Actions Items

As mentioned elsewhere, during the 2011 Plan Update portions of the original HMP were preserved, including some of the terms and language. This Section includes some elements from the original 2004 version of the Plan.

7.1 IFR Requirements for Mitigation Strategy

IFR §201.6(c)(3): *The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.*

IFR §201.6(c)(3)(i): *[The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.*

IFR §201.6(c)(3)(ii): *[The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.*

IFR §201.6(c)(3) (iii): *[The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.*

7.2 Mitigation Goals and Accomplishments

Goals are general descriptions of desired long-term outcomes. State and federal guidance and regulations pertaining to mitigation planning require the development of mitigation goals to reduce or avoid long-term vulnerabilities to identified hazards. Mitigation goals have been established by FEMA, the Texas Division of Emergency Management (TDEM), and Hays County.

FEMA's Mitigation Goal

FEMA's mitigation strategy is set forth in a document originally prepared in the late 1990s. This strategy is the basis on which FEMA implements mitigation programs authorized and funded by the U.S. Congress. The national mitigation goal Statement is as follows:

FEMA's Two-Part Mitigation Goal

To engender fundamental changes in perception so that the public demands safer environments in which to live and work; and

To reduce, by at least half, the loss of life, injuries, economic costs, and destruction of natural and cultural resources that result from natural disasters.

State of Texas Mitigation Goals

The DEM is designated by the Governor as the State's coordinating agency for disaster preparedness, emergency response, and disaster recovery assistance. DEM also is tasked to coordinate the State's natural disaster mitigation initiatives and administer grant funding provided by FEMA. A key element in that task is the preparation of the 2010 *State of Texas Hazard Mitigation Plan*. The State's plan includes a series of mitigation goals, as follows:

Texas State Mitigation Goals

- *Reduce or eliminate hazardous conditions that cause loss of life;*
- *Reduce or eliminate hazardous conditions which inflict injuries;*
- *Reduce or eliminate hazardous conditions which cause property damage; and*
- *Reduce or eliminate hazardous conditions which degrade important natural resources.*

Texas Hazard Mitigation Plan (2010)

Hays County Mitigation Goals

As required by the planning process, the Hays County MPC identified mitigation goals for various hazards. During the original Plan development, the Committee reviewed the State of Texas Emergency Management Plan and the State mitigation goals and strategies. The MPC also reviewed the goals and strategies from the National Flood Insurance Program (NFIP), TDEM, the Hazard Mitigation Grant Program (HMGP), and the Flood Mitigation Assistance (FMA) program. The Committee followed FEMA's Community Rating System (CRS) Program 10-step planning process that ultimately led to establishing mitigation plan goals, identifying and analyzing mitigation strategies, and prioritizing mitigation actions for Hays County and each of the participating communities. The 2005 Hays County MPC identified goals for the eight hazards that were classified as "Substantial" or "Major" in severity and "Highly Likely" or "Likely" in frequency (See Section 2.2 Known Hazards from the original Plan).

The seven goals from the original Plan were as follows:

1. Make Hays County more flood resistant
2. Improve emergency preparedness in Hays County
3. Reduce HAZMAT incidents and corresponding transportation accidents
4. Reduce exposure and damages from wildfire and urban fires
5. Minimize risk of loss of life and damages from tornadoes (and high winds)
6. Reduce the impact of drought in Hays County
7. Mitigate the impacts of extreme heat

The seven goals from the 2006 Plan were discussed and reviewed at the initial MPC meeting held on February 2, 2011. The goals from the 2006 version were circulated to the MPC for comment. After careful analysis, the Committee determined that the original goals from the 2006 Plan were appropriate to include in the 2011 update.

7.3 Ongoing and Previous Mitigation Initiatives

Dealing with flood hazards, the most significant natural hazard in the jurisdiction is not a new proposition for the county, which has experienced numerous flooding events in its history. The county has undertaken a number of cooperative efforts, studies, and projects to address flood hazards. Foremost among these efforts is the county's participation in the National Flood Insurance Program (NFIP) since 1978. The following subsections highlight some of the previous mitigation initiatives as well as efforts undertaken since approval of the 2006 HMP.

Hays County Flood Warning System

In November, 2006 Hays County received a grant for $600,000 from the Hazard Mitigation Grant Program (HMGP) through the Texas Division of Emergency Management (TDEM), to install warning systems at bridges and low water crossing on several roadways throughout the county. The project began in 2007, and as of 2011 the county had spent approximately $800,000 for the installation of 17 sensors with additional sites planned as funding becomes available. At that bridge or low-water crossing, motorists see a flashing light(s) warning them that water is across the road.[42] The sensors are located at the following site locations:

- Hilliard Road (CR 222) at Sink Creek Tributary (near Valley View West)
- Jacobs Well Road (CR 182) at Cypress Creek
- Wayside Drive (CR 179) at Blanco River near Bendigo Lane
- Windy Hill Road (CR 131) at Porter Creek
- Bell Springs Road (CR 169) at Barton Creek
- Post Road (CR 140) at Blanco River
- Rohde Road (CR 126) at Brushy Creek Tributary near Graef Road
- Elder Hill Road (CR 170) at Gatlin Creek Tributary near RR 12
- Trautwein Road (CR 185) at Barton Creek
- York Creek Road (CR 262) east of the Comal County line
- Mt Gainor Road (CR 220) west of East Mt. Gainor Road
- Little Arkansas Road (CR 174) east of Flite Acres Road at the Blanco River
- Hidden Valley Road (CR 217) east of Spoke Hollow Road
- Chaparral Road west of Bliss Spillar Road
- Uhland Road (CR 161 at the Blanco River (San Marcos city limit)
- CR 1492 at the Blanco River (east side of River Road in Wimberley)
- Lime Kiln Road on Sink Creek (near Travis Elementary School)

[42] Official website of Hays County, Texas. Emergency Management - Hays County Flood Warning System

Figure 40 is a map identifying the sensor locations. A real-time interactive map is also available through the county web site. The site locations are monitored remotely and typically shown as green circles on the map, but will turn red when activated by floodwaters on or near the roadway. The interactive map can be viewed through the following link.

http://www.co.hays.tx.us/index.php/government/emergency-management/hays-county-flood-warning-system/

This project is listed as Action Item #5, Minimize the Risk of Life at Low Water Crossings in Hays County, in Table 53. This action was labeled F-3 in the 2006 Plan.

Figure 40
Hays County Flood Warning Sensor Sites
(Source: Hays County Government, Hays County Flood Warning System)

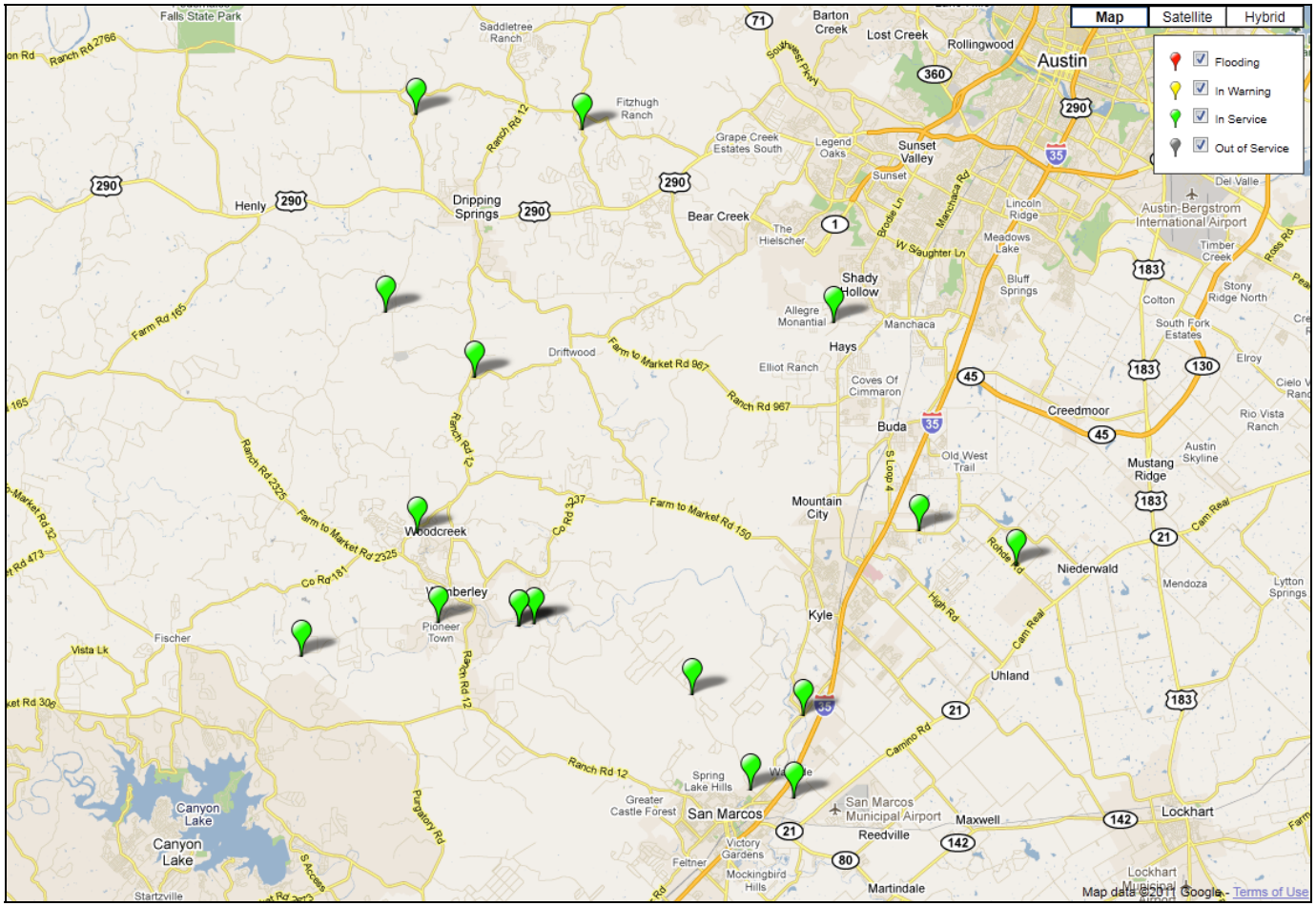


Table 51 highlights mitigation grants received by Hays County between 1998 and 2010. The table indicates the county has received five grants since 1998. The largest grant was in 1998 for just over $1.1 million for the purchase of 28 homes on Dry Cypress Creek in the Wimberley and Woodcreek areas.

Table 51
Summary of Hays County Grants

Disaster	Grant	Amount	Date	Purpose
FEMA DR-1257 - Texas Severe Storms, Flooding and Tornadoes	DR-1257.002	$1,110,100	10/21/1998	Floodplain buyouts on Dry Cypress Creek in Wimberley/Woodcreek area; 28 homes purchased
FEMA DR-1425 - Texas Severe Storms and Flooding	DR-1425 CES21	$11,262	9/18/2002	Repairs at Dudley Johnson Park due to flooding of Blanco River
FEMA DR-1624 - Texas Extreme Wildfire Threat	DR-1624 KNW-024	$6,647	6/9/2006	Assistance to volunteer fire departments from throughout County
FEMA DR-1606 - Texas Hurricane Rita	DR-1606-062	$600,000	10/28/2006	Installation of 15 low water crossing warning systems on County roads
FEMA DR-1780 - Texas Hurricane Dolly	DR-1780-044	$56,250	9/8/2010	HMGP assistance for updated County Hazard Mitigation Plan

Prior Actions Related to NFIP Compliance

Community Assistance Visit (CAV). Based on FEMA Region 6 Community Information System (CIS) records, there have been three CAVs conducted in Hays County since 2002. In February, 2002 CAVs were conducted in Bear Creek and the City of Kyle. No NFIP program violations were noted and both communities were certified by the Texas Commission on Environmental Quality (TCEQ), formerly the Texas Natural Resource Conservation Commission (TNRCC) as having accredited floodplain management programs. In April, 2003 a CAV was conducted by the Texas Commission on Environmental Quality (TCEQ) in San Marcos.

The Community Rating System. The NFIP includes an optional voluntary incentive program that communities can join called the Community Rating System (CRS). The CRS was developed by FEMA as an option for those communities participating in the NFIP that are enforcing a more restrictive floodplain management program than the minimum NFIP standards. For CRS participating communities, flood insurance premium rates are discounted in increments of 5% based on 18 creditable activities.[43] CRS communities are ranked between 1 and 10, with Class 1 communities receiving a 45% premium discount. As of 2011, the City of San Marcos was the only community in Hays County that participates in FEMA's CRS Program. San Marcos joined the CRS in October, 1992 and currently has a CRS classification of 7. As a Class 7 San Marcos receives a 15% discount on flood insurance premiums for structures located within the Special Flood Hazard Area.

Building Codes. In 2009 Hays County adopted a higher standard *Flood Damage Prevention Order,* requiring new construction and substantial improvements to be elevated one foot above the Base Flood Elevation (BFE). Although Hays County does not have the authority to adopt building codes, several municipalities within Hays County have adopted individual building code requirements. As mentioned in Section 5, in 2003 the City of San Marcos began the process of updating from the 2000 International Building Code (IBC) to the Unified Land Development Code. In 2004 the City of San Marcos adopted the Land Development Code. The Land Development Code governs all development

[43] FEMA – Community Rating System (CRS).

in the city limits and the three and a half- mile extraterritorial jurisdiction of San Marcos, including zoning, subdivision, watershed protection, site planning, and construction permitting.

Continued Compliance with the NFIP

Participation in the National Flood Insurance Program (NFIP) is important to Hays County. Hays County satisfied requirements for initial participation in the NFIP and joined the Emergency Program in 1978. Upon issuance and final approval of the Flood Insurance Rate Map in July 1993, the County joined the Regular Program. The effective Flood Insurance Rate Map for Pearland has been revised a number of times to reflect more detailed information and changes to the floodplain, and is now used as the minimum flood hazard area within which development must conform to floodplain management regulations. The County is firmly committed to continued compliance with the NFIP.

The 2011 MPC identified, reviewed and prioritized actions related to continued NFIP compliance. The prioritized NFIP actions are listed below

1. Continue efforts to improve the City of San Marcos's CRS rating through floodplain mapping improvements, reducing flood damages, and distributing public information.
2. Review and analyze existing floodplain regulations for opportunities to reduce flood damages through adoption and enforcement of new regulations.
3. Develop Digital Flood Insurance Rate Maps (DFIRM) for Hays County.
4. The county will continue to coordinate with FEMA and TDEM to improve the accuracy of floodplain maps, including Letter of Map Amendments (LOMA) and Letter of Map Revisions (LOMR). The original 2006 Plan indicates that many streams in Hays County have never been studied and mapped and flood hazards such as base flood elevations, floodway location and limits of the 100-year and 500-year floodplains are unknown.
5. Adopt a higher standard flood damage prevention ordinance.

Develop Digital Flood Insurance Rate Maps (DFIRM) for Hays County

The effective FIRM for Hays County is dated September 2, 2005. FEMA is currently in the process of updating flood maps for the jurisdiction. Hays County is currently contracted with Halff Associates to restudy the floodplain in the northern half of the county (Colorado River Drainage). This study is underway and is expected to be finished by the end of 2012. This study is coordinated with the United States Army Corp of Engineers (USACE), the Lower Colorado River Authority (LCRA), several cities within Hays County, FEMA, and the Texas Water Development Board (TWDB). FEMA is on schedule to incorporate the study in the northern half of the county into a republishing of the maps for the entire county in 2012. This re-publication will include improvements made by FEMA in adjusting the floodplain in existing studied floodplains along better topographic lines using LIDAR. FEMA will also incorporate some limited studies that they have completed in previously unstudied floodplains. In the southern half of Hays County, the county is coordinating with the TWDB, cities within the county, USACE, Guadalupe-Blanco River Authority, and Halff Associates to do a complete restudy of the floodplains in the Guadalupe River Drainage. This study will be completed after FEMA re-publishes the maps in 2012.

Adopt a Higher Standard Flood Damage Prevention Ordinance

In 2009 a higher standard Flood Damage Prevention Order was adopted requiring new construction and substantial improvements to be elevated one foot above the Base Flood Elevation (BFE). In 2011 the county proposed to adopt additional requirements more restrictive than the FEMA model order. In August of 2011, Hays County adopted a new Flood Damage Prevention Order 8-1-2011 which includes higher standards such as one foot freeboard on new or substantially damaged structures and standards on fencing through the floodway. The adoption of this higher standard is listed as Action Item #12 in Table 53.

7.4 Mitigation Objectives and Strategies

Objectives

Objectives are well-defined intermediate points in the process of achieving goals. Hays County mitigation planning objectives include:

1. Make County facilities, operations and populations more resistant to natural hazards
2. Maintain timely and effective government services during natural hazard events

Strategies

Strategies are specific course of action to achieve the objectives. Hays County mitigation planning strategies include:

1. Develop and maintain a comprehensive understanding of risks in the county.
2. Develop and pursue hazard mitigation funding opportunities.
3. Implement cost-effective hazard mitigation projects.
4. Ensure that citizens are informed about the potential effects of natural hazards.
5. Maintain good standing with the NFIP.
6. Seek additional ways to integrate hazard mitigation into county plans and projects.

7.5 Prioritized Mitigation Actions Items

As part of the 2011 Plan update, the mitigation actions items from the original Plan were updated to reflect Hays County's current priorities for specific activities to achieve the goals discussed in Section 7.2. Each action item: identifies a lead person (or department/agency); discusses cost effectiveness; notes a general schedule for completion; and describes potential funding sources. For the 2011 Plan update, the MPC chose the "STAPLEE" methodology to prioritize mitigation actions. STAPLEE assesses actions based on six general criteria: **S**ocial, **T**echnical, **A**dministrative, **P**olitical, **L**egal, **E**conomic, and **E**nvironmental. Table 52 summarizes the criteria used in the STAPLEE methodology.

Table 52
STAPLEE Methodology

STAPLEE	Criteria Explanation
S – Social	Mitigation actions are acceptable to the community if they do not adversely affect a particular segment of the population, do not cause relocation of lower income people, and if they are compatible with the community's social and cultural values.
T – Technical	Mitigation actions are technically most effective if they provide long- term reduction of losses and have minimal secondary adverse impacts.
A – Administrative	Mitigation actions are easier to implement if the jurisdiction has the necessary staffing and funding.
P – Political	Mitigation actions can truly be successful if all stakeholders have been offered an opportunity to participate in the planning process and if there is public support for the action.
L – Legal	It is critical that the jurisdiction or implementing agency have the legal authority to implement and enforce a mitigation action.
E – Economic	Budget constraints can significantly deter the implementation of mitigation actions. Hence, it is important to evaluate whether an action is cost-effective, as determined by a cost benefit review, and possible to fund.
E - Environmental	Sustainable mitigation actions that do not have an adverse effect on the environment, that comply with Federal, State, and local environmental regulations, and that are consistent with the community's environmental goals, have mitigation benefits while being environmentally sound.

As part of the original Plan, the MPC developed 22 action items to implement as part of the mitigation plan. The 2011 Planning Committee members developed and prioritized the actions using these STAPLEE criteria. As part of the Plan update, the action items from the 2006 version were distributed to the MPC, and members were requested to update and provide comments. The updates and comments received were integrated into the Action Table below. The highest priority actions are generally those that are most effective in reducing risks to multiple assets simultaneously.

The Planning Committee defined High, Medium, and Low priorities in the Action Plan as follows:

- High: Meets five of the seven STAPLEE criteria
- Medium: Meets four of the seven STAPLEE criteria
- Low: Meets three of the seven STAPLEE criteria

These priorities were applied to update the action items. The items were sorted by high, medium, and low priority. A key criterion in Hays County's prioritization of actions was the cost-effectiveness of actions and projects. Cost effectiveness will continue to be central to the county's decision-making processes in identifying and funding mitigation actions.

Table 53 identifies each mitigation action (ordered by high, medium, and low priority) and identifies the proposed lead office and support assignments, cost, and schedule for completion. The proposed timeframes are consistent with the five-year review cycle required for this Plan update. For each high priority action (meets five of the seven STAPLEE criteria), the MPC characterized anticipated support by the Hays County Commissioners Court, the County OEM, and the community at-large. The MPC also discussed funding limitations and developed a qualitative statement regarding cost effectiveness. In this context, the cost of accomplishing the action was compared to the perceived benefits, including community-wide safety. In some cases, several of the high-priority actions and projects were subjected to preliminary feasibility assessments and benefit-cost analyses to determine if they were good candidates for mitigation actions.

As part of the 2011 Plan update, the MPC reviewed and updated the mitigation actions table (Table 53). The MPC discussed each action item with the lead office, and the tables modified to include the status and schedule for completion for each item. The status identifies work that has been completed to satisfy the action, or progress made as of May, 2011. An updated version of this table will be included in periodic progress reports submitted to the TDEM and FEMA.

Table 53
Hays County Prioritized Mitigation Actions

No.	Action Item Description / Benefits	Lead Manager	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
1	**Increase the number of Hays County communities that participate in the NFIP.** Accomplishing this action makes flood insurance available throughout Hays County and requires that all communities enforce the minimum requirements of the NFIP. Future buildings cannot be constructed within designated floodways and cannot be constructed below the base flood elevation. This action establishes sound floodplain management programs throughout Hays County. This action was labeled F-1 from the original Plan.	Hays County Emergency Management Coordinator (EMC) and Floodplain Manager (FPM)	Cost and Funding: Existing staff resources, no cost	2011	Flood	Not independently cost-effective, but critical for reducing flood related property damages	As of 2011, with the exception of the City of Hays all municipalities in Hays County have joined the NFIP. The City of Hays is currently applying to participate in the NFIP.
2	**Reduce Flood Losses and Increase Flood Insurance Coverage in Hays County.** Increasing the flood insurance policy base in Hays County will provide financial relief to property owners and renters that are flooded in future disaster events. By relying on flood insurance property owners and renters have economic security and do not have to rely on a disaster event being declared as a Presidential Declared Disaster. This Action Item includes hosting a Flood Insurance Workshop by the NFIP Regional Coordinator. Local community floodplain managers, insurance agents, developers, homeowners and the general public are to be invited. The purpose of the workshop is to inform attendees that flood insurance is available for all structures located in communities that participate in the NFIP and that flood insurance policies protect against losses both for structures and contents. This action was labeled F-2 from the original Plan.	FPM	Cost and Funding: Existing staff resources, no cost	2012, occurring annually after that	Flood	Not independently cost-effective	As of 2011, no workshops have been held yet. Hays County is currently coordinating with FEMA and anticipates setting up a workshop in the near future. FEMA will be invited to present a flood insurance workshop. Insurance agents, the public, and developers will be invited to attend. Ongoing

No.	Action Item Description / Benefits	Lead Manager	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
3	**Improve Emergency Warning Capabilities.** By improving emergency warning Hays County and participating communities can respond faster to save lives and reduce property damage during disaster events. This action was labeled E-1 from the original Plan. a. Research the possibility of implementing a Reverse 911, or similar system. Estimated cost is $60,000 plus monthly maintenance. The system must be able to query the State 911 System. b. Purchase radios for the Hays County and City of San Marcos Emergency Operations Center personnel. c. Purchase and install a backup mobile communications system for the City of San Marcos and Hays County. d. Improve emergency communication between Hays County communities, GBRA, LCRA, and adjacent counties and communities. e. Install emergency phone bank (independent of the 911 system) that can be activated to assist the Public during emergency response.	EMC	$60,000 – $95,000 Funding: Existing staff resources	Additional Phasing over 5 years (2011-2015)	Multi-hazard	Not independently cost-effective, but critical for saving lives	Hays County is a member of Capital Area Council of Governments, (CAPCOG). Item A: CAPCOG provides a Reverse 9-1-1 System for all 10 counties included in their collaboration. Any land line in Hays is automatically a member of the system, but personal cell phones can be registered through the CAPCOG website. Item D is in progress. Items B, C, and E have yet to be started.

No.	Action Item Description / Benefits	Lead Manager	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
4	**Improve Emergency Communication Capabilities.** This Action Item is to conduct a survey of emergency communication systems in Hays County, the City of San Marcos and other communities, purchase needed equipment and train personnel to create an effective system to improve emergency communications throughout Hays County. The ultimate goal is to develop a county-owned or leased emergency communications system. The City of San Marcos currently contracts with the LCRA for use of an emergency transmitter tower and pays a participation fee to the Capital Area Planning Council of Governments (CAPCOG) for use of emergency communication systems. The City of San Marcos Office of Emergency Management (OEM) and Hays County OEM have conducted a survey and experimented with NEXTEL emergency communication systems with the goal of upgrading equipment. By improving emergency communications Hays County and participating communities can respond faster and coordinate better to save lives and reduce property damage during disaster events. This action was labeled E-2 from the original Plan.	EMC	$620,000 Funding: Capital Area Planning Council (CAPCOG), Texas DEM	Additional Phasing over 5 years (2011-2015)	Multi-hazard	Not independently cost-effective, but critical for saving lives	In progress.

No.	Action Item Description / Benefits	Lead Manager	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
5	**Minimize the risk of loss of life at low water crossings in Hays County.** Install warning signs or barricades at all high velocity low water crossings identified in the Hays County Flood Insurance Study (FIS). Phase 1 of this Action Item is to identify low water crossings located in high velocity areas and install signage or barricades to warn and restrict vehicular or pedestrian crossings during flood events. Phase 2 of this Action Item is for Hays County and the City of San Marcos and possibly other communities to adopt a "Rescue Fee" Court Order/Ordinance that imposes a rescue fee per person during flood events for anyone that drives around or crosses a barricade and enters high water (similar to the City of San Antonio Ordinance). This action was labeled F-3 from the original Plan.	EMC and FPM	$12,000 annually and $2,000 per year maintenance cost	Continued installation over the next 3 years (2012 to 2014)	Flood	Not independently cost-effective, but critical for reducing loss of life and injuries at low water crossings	Phase 1 Complete. A total of 16 warning systems were installed, beginning in May of 2007 and ending in February of 2008, at a total cost of $800,000. See additional description in Section 7.3.
6	**Install Emergency Generators at Fire Stations.** Install emergency generators for backup power at all fire stations in Hays County. There are numerous rural and volunteer fire stations in Hays County that do not have backup power available. A survey should be conducted to evaluate which stations, if not all, should have emergency backup power installed. This action was labeled Fire-1 from the original Plan.	ESD Chiefs	$3,000 for Study Funding: Texas DEM, FEMA, Hays County	Study initiation in 2006 Phased const. ongoing	Multi-hazard	Not independently cost-effective, but critical for determining which fire stations need emergency generators	Several Fire Stations have generators installed. This action will continue into plan update

No.	Action Item Description / Benefits	Lead Manager	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
7	**Encourage Construction of Tornado "Safe Rooms."** Sponsor "Safe Room" workshops for communities, interested homeowners, design professionals and contractors. Invite recognized experts such as Texas Tech Wind Engineering, FEMA, TDEM, and others to provide technical and funding information throughout Hays County. In the event of a disaster event, provide assistance to local communities and interested citizens regarding the "Safe Room" Program and other life saving systems. This action was labeled T-1 from the original Plan.	EMC	Funding: Texas DEM, FEMA	Ongoing	Tornado	Not independently cost-effective	Ongoing
8	**Increase Hays County Office of Emergency Management (OEM) Staff**. By increasing emergency staff Hays County and participating communities can adequately staff systems like 911, fire departments, and sheriff and police departments to save lives and reduce property damage during disaster events. This action was labeled E-3 from the original Plan.	EMC	$50,000 per year salary and equipment – Hays County Funding: FEMA, Texas DEM, Hays County	Phased over 5 years (201-2015)	Multi-hazard	Not independently cost-effective	As of 2011, there have been no staffing changes for the County OEM.
9	**Develop HMP.** Development of and maintenance of countywide and individual community HMPs. Creation of a Mitigation Plan is only the start. The Mitigation Plan needs to be implemented, monitored and reviewed/updated annually. Fully implemented Mitigation Plans will inform the public, train and equip emergency responders, mitigate hazards and ultimately result in reduction of risks to both existing and future buildings. This action was labeled E-5 from the original Plan.	EMC	$75,000/Funding: FEMA, Texas DEM supported by existing staff resources	Updated every 5 years	Multi-hazard	Not independently cost-effective, but critical for identifying mitigation actions	Original HMP completed in 2006. Plan update to be adopted in 2011.

No.	Action Item Description / Benefits	Lead Manager	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
10	**Acquisition or elevation of Repetitive Loss Properties.** There is a 25% local share cost associated with HMGP and FMA funding. However there is the possibility that individuals will elevate or flood proof at their own expense once they see the benefits of this mitigation action. Since approval of the Hays County Mitigation Plan as both an all hazards plan and as a flood mitigation plan, funding from these two Federal programs will be available to all participating communities. This action was labeled F-4 from the original Plan.	Hays County Grant Administrator, EMC, and FPM	The estimated acquisition cost is $100,000 per structure. The estimated cost to elevate a residential structure a total of three (3) feet in a shallow flooding area is $30,000 per structure. Funding Sources: FEMA, Texas DEM, Texas Water Development Board (TWDB), Texas Office of Rural and Community Affairs, Hays County	2011 - 2015	Flood	Cost-effectiveness determined on a per structure or project basis.	As of 2011, Hays County has not conducted any buyouts since the approval of the original plan in 2006 – this action will carry into the plan update.

No.	Action Item Description / Benefits	Lead Manager	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
11	**Building Code Improvements.** Phase 1 - Each community should evaluate building code requirements and adopt improvements that will result in more wind and tornado resistant structures. The Capital Area Planning Council of Governments (CAPCOG) may be the ideal agency to identify possible building code improvements, sponsor code workshops and assist communities with code enforcement. Phase 2 – Communities that have adopted building codes should conduct annual code reviews and update codes as changes occur. CAPCOG can assist Hays County communities with code evaluation and upgrades to improve building sustainability. This action has zero cost for participating communities and the benefits for new construction are major. Building code improvements ensure that new construction (buildings and infrastructure) can be more resistant to damage from a wide range of hazards. This action was labeled T-2 from the original Plan.	Hays County Development Services Department	Funding: Texas DEM, CAPCOG, Hays County	Evaluation in 2006 Code updates phased Ongoing	Tornado / Flood / Tropical Storm and Cyclones	Not independently cost-effective	The most recent development regulations (the "rules") were approved by the County on April 3, 2011. On September 15, 2009 County passed resolution adopting provisions of Subchapter F of Chapter 233 of the Local Government Code requiring inspection of new residential construction in unincorporated areas of the County, under the International Residential Code. County does not conduct the inspections, but rather requires that inspections be done by authorized specialists

No.	Action Item Description / Benefits	Lead Manager	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
12	**Adopt 'Higher Standard" Flood Damage Prevention Ordinances.** By adopting "higher standard" requirements, new buildings, infrastructure and critical facilities have a reduced risk of loss of life and property damage during a flood event. Communities are encouraged to follow the guidance outlined in EO 11988 where critical facilities are protected to the 500-year (0.2% annual chance flood event) elevation. This action was labeled F-5 from the original Plan.	FPM	Cost and Funding: Existing staff resources, no cost	A higher standard Flood Damage Prevention Order was adopted in 2009. More restrictive ordinance anticipated in 2011.	Flood	Not independently cost-effective	Complete. In August of 2011, Hays County adopted a new Flood Damage Prevention Order 8-1-2011 which includes higher standards such as one foot freeboard on new or substantially damaged structures and standards on fencing through the floodway.
13	**Designate HAZMAT Cargo Routes in Hays County.** Coordinate with the Texas Department of Transportation (TxDOT), Local Emergency Planning Council (LEPC) and others to identify Hazard Materials (HAZMAT) Cargo Routes in Hays County. The goal is to designate and placard HAZMAT Routes in critical areas. By establishing HAZMAT cargo routes in hays County future buildings can be constructed outside high risk areas. This action was labeled H-1 from the original Plan.	Local Emergency Planning Committee – Hays County EMC is currently the Chair	$3,000 estimated study cost $5,000 estimated cost to placard selected roadways Funding Sources: Texas DOT, Texas DEM, Hays County	2011 to 2015	Hazardous Materials	Not independently cost-effective	No currently designated routes in Hays County
14	**Storm Ready Designation for Hays County Communities** Storm Ready is a proven mitigation action. By Hays County and participating communities becoming Storm Ready Communities there can be mitigation actions in place to save lives and reduce property damage during disaster events. This action was labeled E-6 from the original Plan.	EMC and FPM	Cost and Funding: Existing staff resources, no cost	2011 to 2015	Flood / Tornado / Tropical Storm and Cyclones	Not independently cost-effective, but critical for saving lives and minimizing injuries	To be completed.

No.	Action Item Description / Benefits	Lead Manager	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
15	**Improve Flood Warning in Hays County.** This Action Item is to identify sites where stream and rain gauges and flood warning for the fourteen (14) High Hazard dams is needed in Hays County and coordinate installation requests with the USGS, GBRA and NWS. The Hays County Mitigation Planning Committee recommends to relocate or raise the Blanco River gauge at Kyle because this gauge is inundated during high water events. This action was labeled F-6 from the original Plan.	EMC	Phase 1 – 2 gauges – $40,000 estimated installation cost. Maintenance cost $24,000 (estimated) Phase 2 – 2 gauges - $ 40,000 estimated installation cost. $48,000 (estimated) Phase 3- Flood Warning devices on selected High Hazard dams - $20,000 per dam ($280,000 for all 14 dams). Annual Maintenance cost $5,000 per dam ($70,000 per year for all 14 dams - estimated) Funding: FEMA – Hazard Mitigation Grant Program (HMGP), TWDB, Hays County	2011 to 2015	Flood	Not independently cost-effective	As of 2011, no flood warning systems have been installed at the 14 high hazard dams. However, there are five USGS gauges in Hays County: Blanco River (Wimberley and Kyle), San Marcos (San Marcos), Bear Creek (1826), Onion Creek (Driftwood).

No.	Action Item Description / Benefits	Lead Manager	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
16	**Make Hays County More Drought Resistant.** Coordinate with the Guadalupe Blanco River Authority (GBRA), The Lower Colorado River Authority (LCRA), the Edwards Aquifer Authority, the Texas Water Development Board and others to develop a Hays County Water Conservation or Drought Management Recommendations Plan and implement procedures to minimize the impacts of drought on Hays County. This action was labeled D-1 from the original Plan.	Hays County Commissioners Court	$20,000 Study Cost Funding: Texas Water Development Board	Ongoing	Drought	Not independently cost-effective	Hays County Commissioners Court is working in conjunction with the identified entities to address drought/water shortage concerns
17	**Construct Needed Water System Improvements in Lower Colorado Region K and South Central Texas Region L.** Hays County is located in two regions as defined in the *Texas Water Plan - Water for Texas 2002*. Areas in Hays County north of Onion Creek are located in Lower Colorado Region K and areas south of Onion Creek are located in South Central Texas Region L. Historically the cities of New Braunfels, San Antonio and San Marcos have relied on groundwater from the Edwards-Balcones Aquifer, which affects the base flow of the Guadalupe River. The City of New Braunfels has converted from groundwater to surface water from Canyon Lake. The City of San Marcos and GBRA recently constructed a pipeline and water treatment plant to convert the City's primary water source to Canyon Lake water. This action supports the long range water goals for the region from the Texas Water Plan which include: protection of the San Marcos Springs from over- pumpage of groundwater; improved aquifer recharge; and construction of additional water supply projects to meet water needs until 2050. This action was labeled D-2 from the original Plan.	Hays County Commissioners Court	$4,720 million (South Central Texas Region – 21 counties) $ 256 million (14 county Lower Colorado Region) Funding Sources: TWDB, GBRA, LCRA	Ongoing	Drought	Not independently cost-effective	In February 2011, Hays County completed a Water/Wastewater Regional Facilities Planning Study in part covered by a grant from the TWDB. This addressed those areas primarily west of the IH-35 corridor

No.	Action Item Description / Benefits	Lead Manager	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
18	**Update Hays County FIS and Flood Insurance Rate Map (FIRM).** Update floodplain mapping (DFIRMs) and HAZUS mapping identifies hazard areas, improves public awareness, reduces the risk of loss of life, and new buildings and infrastructure have a reduced risk of damage during a flood event. The City of San Marcos would be an ideal candidate to join other communities and agencies such as the Lower Colorado River Authority (LCRA), the Harris County Flood Control District and the Cities of Grand Prairie, Corsicana, and Austin to become a Cooperative Technical Partner (CTP) with FEMA. The primary goal of the CTP program is to develop digital flood insurance rate maps (DFIRMs) to comply with FEMA's Map Modernization Initiative. Federal funding for a five-year effort beginning in FY 2003 has been designated for FEMA's DFIRM and CTP efforts. This action was labeled F-7 from the original Plan.	FPM	Funding: FEMA Funded Flood Insurance Study, US Army Corp of Engineers Onion Creek Federal Flood Protection Project	2006 – 2007	Flood	Not independently cost-effective, but critical to update aging flood hazard maps	Complete - Effective date September 2, 2005.FEMA is currently updating flood maps in Hays County.
19	**Provide Training for Local Floodplain Managers and Certified Floodplain Managers (CFM's).** By increasing training for local floodplain managers and CFM‟s there should be improved local floodplain management programs, reduced risk of loss of life, and new buildings and infrastructure have a reduced risk of damage during a flood event. The City of San Marcos and/or Hays County would be the logical communities to provide floodplain management training such as hosting FEMA‟s FPM Training Course, "Managing Floodplain Development through the NFIP", hosting NFIP Workshops, and hosting Community Rating System (CRS) Workshops. These training opportunities would assist local communities and provide continuing education credits (CEC‟s) for local floodplain administrators, certified floodplain managers (CFM‟s), engineers, surveyors and the general public. This action was labeled F-8 from the original Plan.	Hays County and City FPMs	Cost and Funding: Existing staff resources, no cost	Ongoing	Flood	Not independently cost-effective	Ongoing project. In 2011, the City of Buda hosted a floodplain management training course taught by the TWDB (State Coordinator for the NFIP). Appropriate training agencies will be notified that there are facilities available free of charge for training opportunities.

No.	Action Item Description / Benefits	Lead Manager	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
20	**Increase Participation in the Community Rating System (CRS) Program.** Currently, the City of San Marcos is the only community within Hays County that participates in FEMA's CRS Program. Encourage additional Hays County communities to participate in FEMA's CRS program and assist communities in preparing the CRS Program Application, documenting CRS activities, preparing annual reports, hosting CRS workshops and training activities, and developing programs that will result in future CRS credits. This action was labeled F-9 from the original Plan.	Hays County and City FPMs	Cost and Funding: Existing staff resources, no cost	2006 - will continue as an action for plan update – 2011 - 2015	Flood	Not independently cost-effective	As of 2011, the City of San Marcos is the only municipality in Hays County that participates in the CRS Program. The City of San Marcos is currently a CRS Class 7 Community.
21	**Reduce Impacts of Extreme Heat on Elderly, Disabled, Low-Income and Infants.** This Mitigation Action is for Hays County and participating community Emergency Managers to launch a public notification effort during extreme heat periods urging elderly and low income persons to seek help if needed. Volunteer organizations such as Rotary International, Lions Club, Jaycees, Red Cross, United Way, and others should be urged to participate. Power Companies will be notified by the County Emergency Manager and requested to participate in the effort to distribute box fans and make minor repairs to air conditioners. The Hays County OEM will coordinate with participating community emergency managers and take the lead to initiate this Mitigation Action. The initial action will include newspaper and radio announcements and public information on both the Hays County and City of San Marcos websites. Public announcements will define the hazard, describe heat related health risks and provide tips on how to prevent illness. Health care officials can play an important role in this mitigation action by providing information to newspapers and radio stations. This action was labeled Heat-1 from the original Plan.	EMC	$ 2,000 to purchase and distribute 100 box fans $ 3,000 estimated cost for a/c repairs Funding Sources: United Way Rotary Clubs Lions Clubs Red Cross Churches and charitable organizations Power Companies	Ongoing, periods of Extreme Heat May be annually	Extreme Heat	Not independently cost-effective	As of 2011, Hays County was in the process of coordinating with each participating community to initiate and carry out this action. Hays County currently coordinates with the local newspaper and radio stations with announcements during periods of extreme heat.

No.	Action Item Description / Benefits	Lead Manager	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
22	**Minimize the risk of loss of life at low water crossings in Hays County.** Expand the network of flood warning systems (warning signs or barricades at all high velocity low water crossings).	EMC	$500,000/State and Federal Grants	2011 - 2015	Flood	Not independently cost-effective, but critical for reducing loss of life and injuries at low water crossings	Ongoing
23	**Wildfire Protection Plan.** Develop a county-wide wildfire protection Plan. Work with local jurisdictions and the Texas Forest Service to produce a Community Wildfire Protection Plan. Recent wildfires have caused significant damage to properties in adjacent counties. Plan would help to address resources/activities necessary to minimize impacts. Coordinate activities with adjoining counties – High Priority	EMC	$50,000/Texas Forest Service, FEMA, DEM	TBD; likely initiated in 2012	Wildfire	Not independently cost-effective	Initiated in 2011 HMP
24	**Wildfire Hazard Areas.** Conduct study to determine and map potential wildfire hazard areas.. As a component of No. 23 above, this would address those areas most susceptible to wildfires. Priority: High	EMC, Hays County Development Services Dept	Minimal - Utilize existing staff resources in conjunction with No. 23 above	TBD; likely initiated in 2012	Wildfire	Not independently cost-effective, but essential in minimizing loss of life, structures and injuries due to wildfire hazard s.	Initiated in 2011 HMP
25	**Evaluate Excess Heat Risks.** Evaluate the risks presented by excessive heat and humidity, especially in terms of high-risk populations such as the elderly/low income. Priority: Medium.	EMC, Hays County Personal Health Dept	No additional cost – uses existing staff resources	TBD; probably initiated in 2011	Extreme heat	Not independently cost-effective, but needed to develop adequate risk reduction efforts	Initiated in 2011 HMP

No.	Action Item Description / Benefits	Lead Manager	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
26	**Review Plans and Resources to Address Risk Posed By Snow and Ice Hazards During Winter Storms**. Conduct a review of the County's current plans and resources to address the risks posed by ice and snow hazards during winter storms. Focus on County's ability to respond to snow and ice emergencies, and on potentially at-risk populations in the community. Priority: Low to medium.	EMC/Transportation Dept.	No additional cost – uses existing staff resources	Ongoing	Winter storm	Not independently cost-effective, but contributes to maintaining public services; protects at-risk populations	Initiated in 2011 HMP
27	**Structural/Engineering Study.** Complete a detailed structural/engineering survey of Hays County public facilities to ensure their soundness with respect to resisting the effects of high winds and extreme roof loading. Forms basis of decisions about any additional actions to mitigate risk. Priority: Low	EMC, Hays County Facilities Maintenance Dept	To be determined, but if initiated probably from General Fund	2011 to 2015	Tropical Storm, Tornadoes, T-storm winds, Winter Storm, Hail	Not independently cost-effective, but the initial step in identifying appropriate mitigation actions	Initiated in 2011 HMP
28	**Understanding Dam Failure Risks.** Engage with County and State floodplain managers, engineers and emergency managers to ensure that local officials have a detailed understanding of potential risks to the community from dam and/or levee failures. Priority: Low to medium.	EMC	No additional cost – uses existing staff resources	Initiated in 2011, then ongoing	Dam Failure	Not independently cost-effective	Initiated in 2011 HMP
29	**Evacuation Plans.** Ensure that the jurisdiction and its citizens are aware of and understand notification and evacuation plans related to dam and/or levee failure. Priority: Low to medium.	EMC	No additional cost – uses existing staff resources	Initiated in 2011, then ongoing	Dam Failure	Not independently cost-effective	Initiated in 2011 HMP

No.	Action Item Description / Benefits	Lead Manager	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
30	Continue to Install Emergency Generators at Fire Stations, EMS organizations, and County EOC	ESDs and EMC	Funding: Texas DEM, FEMA, Hays County	2011 to 2015	Multi-hazard	Not independently cost-effective, but critical for determining which fire stations need emergency generators	Carried Forward from prior plan

Section 8
Integration With Other Plans

Contents of this Section

8.1 IFR Requirements for Incorporating Other Documents
8.2 Incorporating Mitigation Plan Requirements into Other Local Planning Mechanisms
8.3 Review and Incorporation of Plans, Studies, Reports and other Information

8.1 IFR Requirements for Incorporating Other Documents

Requirement §201.6(c)(4)(ii): *[The plan **shall** include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.*

8.2 Incorporating Mitigation Plan Requirements into Other Local Planning Mechanisms

As required by the FEMA Interim Final Rule that governs mitigation planning, actions and strategies from the Hays County mitigation plan must be incorporated into other planning mechanisms, as applicable, during the routine re-evaluation and update of the County HMP. As part of the original HMP development the County did not consider integrating components of the Plan into other planning mechanisms. Both the County and the municipalities will use specific actions from the Strategies section of this Plan as part of their capital budgeting processes, in particular when projects require local match for federal grants. Where possible the county will also use elements of this HMP to supplement Community Rating System (CRS) planning and mitigation activities. The County will also use the HMP as a resource in the process of identifying (and prioritizing) areas of focus in implementing the FEMA Severe Repetitive Loss (SRL) and Repetitive Flood Claims (RFC) mitigation programs. The County will also look for opportunities to use the updated HMP in conjunction with drainage plans.

Where applicable, action items related to the flood hazard from the HMP update will be incorporated into the Hays County *Flood Damage Prevention Ordinance*. The most recent version of the county's *Flood Damage Prevention Ordinance* was adopted on January 13, 1998. Article 3, General Provisions (Section C) established a Development Permit system to ensure compliance with the Ordinance. The Ordinance requires that before a property owner can undertake any development in the Special Flood Hazard area (SFHA), a Development Permit, issued by the Floodplain Administrator, must be obtained from the County. The Ordinance states that "issuance of a Class B (Flood Hazard Development) permit shall be for those developments which qualify for such permit and are located on real property associated with flood hazard areas. Developments located on real property for which there is no flood

hazard area delineated will be given a Class A (Exemption Certificate) permit. The permit shall state that the proposed development is located on real property that does not lie within an identified flood hazard area.[44]

The county is responsible for reviewing the proposed development to ensure that it complies with the floodplain management ordinance. The county is also required to review proposed development in SHFAs to ensure that all necessary permits have been received from those governmental agencies from which approval is required by Federal or State law, such as 404 wetland permits from the Army Corps of Engineers or permits under the Endangered Species Act. When the County or municipalities update their Floodplain Ordinances, the requirements from this HMP will be included in the revisions. This HMP update will be made available to each committee leader responsible for updating or revising the Flood Damage Prevention Ordinance.

8.3 Review and Incorporation of Plans, Studies, Reports and other Information

Other planning documents can be used as a valuable resource for integrating information related to hazard mitigation into the HMP. The 2006 version of the HMP included review and incorporation of other plans, studies, and reports. These documents were reviewed again as part of the plan update, and any new information or changes have been incorporated into the HMP. A search was also conducted to identify additional plans or studies that may have been completed since the release of the original HMP.

The following plans and other documents were considered during the Hays County update: Hays County Stormwater Management Program, the San Marcos Flood Protection Plan – Engineering Report (May 2007), and the 2010 Texas State Hazard Mitigation Plan. The Hays County HMP update has been made available to each committee leader responsible for updating these other plans. In addition, all changes and updates to the September, 2005 Flood Insurance Study (FIS), Flood Insurance Rate Maps (FIRMs) are reflected in the update.

The specific plans, studies and reports are listed below along with a discussion on how they were incorporated into the HMP Update.

- **Hays County Flood Insurance Study (FIS):** The most recent FIS for Hays County is dated September 2, 2005. The FIS and compiles all previous flood information and includes data collected on numerous waterways. The current FIS was used to identify floodprone areas of the county and historical flood events (See Section 5.4.1).
- **Hays County Flood Insurance Rate Map (FIRM):** The Hays County effective FIRM dated September 2, 2005 was reviewed to identify floodprone areas.
- **Hays County Stormwater Management Program:** This document was prepared by Hays County to meet the regulatory requirements of the Texas Commission on Environmental Quality (TCEQ) Phase II General Stormwater Permit for discharges from municipal separate storm sewer systems. The SWMP document was reviewed to identify the Hays County government organization, floodplain regulations, and identify areas of the county that may be susceptible to flooding from local drainage problems.

[44]Hays County Flood Damage Prevention Ordinance. Article 3, Section C, Establishment of Development Permit System

- **San Marcos Flood Protection Plan – Engineering Report (May 2007).** The report was produced in May 2007 and includes hydrologic and hydraulic analysis of the watersheds within and near the City of San Marcos. The Plan was reviewed to identify past flooding events and flood hazards for the City of San Marcos and southern Hays County. See Section 5.4.1 and Appendix H, supplemental jurisdictional appendix for the City of San Marcos.
- **Hays County Flood Damage Prevention Ordinance (Article 1):** Hays County participates in the National Flood Insurance Program (NFIP) and therefore has adopted a floodplain ordinance. The most recent version of the Hays County Flood Damage Prevention Ordinance was again reviewed to incorporate any new requirements. Discussion of the Floodplain Ordinance can be found in Section 8.2, Incorporating Mitigation Plan Requirements into other Local Planning Mechanisms.
- **Texas State Hazard Mitigation Plan (2010 – 2013):** See Section 3.4 of this HMP for a detailed summary and overview of the Texas State Hazard Mitigation Plan. The goals and strategies in the State Plan were considered by the MPC as the planning team updated the Hays County Plan, and to the extent possible the team patterned the update to reflect the spirit and details of the State document.
- **Water and Wastewater Facilities Plan for the Portion of Hays County West of the IH-35 Corridor (February, 2011):** This Plan was developed under the TWDB's regional planning grant program. The scope of the study included a detailed look at water infrastructure needs for the incorporated and unincorporated areas. The study examined the potential wastewater needs of the study area, and possible policy actions that may facilitate the provision of adequate water and wastewater utility service and help protect environmental resources. The Plan was used to identify long-term water goals and potential drought mitigation actions proposed for the Wimberley and Woodcreek areas. See Section 5.4.8 (Drought), for a discussion of long-term goals and proposed projects for the region.
- **Water for Texas 2007. The State Water Plan was adopted by the TWDB in November, 2006.** The state water plan was developed based on a "bottom-up" consensus-driven approach to water planning that involved 16 regional water planning groups. Within TWDB guidelines, each regional planning group reviews water use projections and water availability volumes in dry or drought-of-record conditions. The planning group recommended water management strategies. Regions "K" and "L" of the Plan were reviewed to identify recommendations and strategies to import new water into Hays County.

Section 9
Approval and Adoption

Contents of this Section

9.1 IFR Requirements for Approval and Adoption
9.2 Authority
9.3 Approval and Adoption Procedure
9.4 Multi-Jurisdiction Adoption Resolution

9.1 IFR Requirement for Approval and Adoption

IFR §201.6(c)(5): *[The local hazard mitigation plan shall include] documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Board, County Commissioner, Tribal Board).*

9.2 Authority

The Hays County Office of Emergency Management is designed by the Commissioners Court to coordinate with other appropriate departments and agencies to facilitate the development of the Plan update in conformance with State and federal guidelines.

Authority for the preparation of both the original Hazard Mitigation Plan (HMP) and update is derived from the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988, P.L. 93-288, as amended by the Disaster Mitigation Act of 2000, P.L. 106-390. The Disaster Mitigation Act of 2000 (The Act) required State and local governments to develop and formally adopt natural Hazard Mitigation Plans by November 2003 in order to be eligible to apply for Federal assistance under the HMGP. The Act was further amended to extend the planning requirement deadline to November 2004.

When the DMA 2000 was signed into law on October 30, 2000, the Robert T. Stafford Disaster Relief and Emergency Assistance Act was amended by adding a new section, 322 – Mitigation Planning. Section 322 places new emphasis on local mitigation planning. It requires local governments to develop and submit mitigation plans as a condition of receiving Hazard Mitigation Grant Program (HMGP) project grants. An Interim Final Rule (IFR) for implementing Section 322 was published in the Federal Register, 44 CFR Parts 201 and 206, on February 26, 2002. The requirements for local plans, or Local Mitigation Plan Criteria, are found in part 201.6.

In addition to the Plan requirement, the Act also requires communities to utilize a specific planning process developed for an all hazards approach to mitigation planning. This four-step planning process is crucial to ensure that the effective planning by a community meets all the Plan content criteria required by the Act. The Act requires adoption by the local governing body and specifies a stringent review process, by which States and FEMA Regional Offices will review, evaluate and approve hazard mitigation plans.

The Plan was also prepared pursuant to the Flood Mitigation Assistance Program (44 CFR 78.6), the Hazard Mitigation and Pre-Disaster Mitigation Programs (44 CFR Parts 201 and 206), and the process outlined in materials prepared by the Federal Emergency Management Agency for the Community Rating System of the National Flood Insurance Program.

9.3 Approval and Adoption Procedure

The Hays County Hazard Analysis for the original Plan was completed in March 2004 and was subsequently sent to the State Mitigation Specialist at the Texas Division of Emergency Management (TDEM). The State Mitigation Specialist sent the original plan to FEMA for review in September 2004. Changes were recommended to the HMP and a revised draft was resubmitted in May 2005. On July 8, 2005, FEMA requested further changes, which were completed in March 2006 and the document was re-submitted to the State Mitigation Specialist and FEMA. After FEMA and TDEM reviewed and approved the HMP, the Hays County Commissioners Court formally adopted the original Plan in August 2006.

Throughout the 2011 HMP Update process, the MPC and Stakeholders Group had opportunities to provide comments and feedback. On [insert date] Hays County submitted the draft of the 2011 Plan Update to TDEM for review and comment. After addressing TDEM comments in the document, the HMP was resubmitted for final consideration and approval by TDEM and FEMA. FEMA provided a Letter of Approvability on [insert date], and the Plan was forwarded to the Hays County Commissioners Court for adoption, which occurred on [insert date].The adoption resolution is provided as Appendix X of the 2011 HMP update. Following adoption, the plan was resubmitted to FEMA for final approval, which occurred on [insert date]. The FEMA approval letter is included as Appendix X.

9.4 Multi-Jurisdiction Adoption Resolution

Hays County and the 11 participating municipalities formally adopted the updated version of the HMP. The County adopted the Updated HMP on [insert date], and the municipalities adopted the Plan on the following dates [complete table with approval and adoption dates].

Table 54
Hays County Hazard Mitigation Plan Update –
Municipal Jurisdiction Adoption Dates

Municipality	Approval Date	Adoption Date
Bear Creek, Village of		
Buda, City of		
Dripping Springs, City of		
Hays, City of		
Kyle, City of		
Mountain City, City of		
Niederwald, City of		
San Marcos, City of		
Uhland, City of		
Wimberley, City of		
Woodcreek, City of		

Section 10
Plan Monitoring and Maintenance

Contents of this Section

10.1 IFR Requirements for Plan Monitoring and Maintenance
10.2 Distribution
10.3 Implementation
10.4 Monitoring and Progress Reports
10.5 Circumstances that Will Initiate Plan Review and Updates
10.6 Continued Public Involvement

10.1 IFR Requirements for Plan Monitoring and Maintenance

Requirement §201.6(c)(4)(i): *[The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle*

Requirement §201.6(c)(4)(ii): *[The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.*

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.*

Progress on the mitigation action items will be monitored and evaluated by the Hays County Emergency Management Coordinator. The Lead Manager for each action item will complete an Annual Progress Report and submit them to the Hays County Office of Emergency Management (OEM) for review.

10.2 Distribution

The 2011 *Hays County Hazard Mitigation Plan Update* will be posted on the County's Website, and notices of its availability will be distributed to the following:

- The federal and State agencies that were notified and invited to participate in Plan development (see Section 4.4);
- Citizens who attended public meetings and provided contact information; and
- The organizations, agencies, and elected officials who received notices of public meetings
-

10.3 Implementation

Through the mitigation planning process, Hays County agencies that are involved in managing hazards and implementing measures to minimize future risk considered a range of mitigation actions. Actions were identified and prioritized, and are shown in Table 53.

For each mitigation action, Table 53 identifies the lead agency, support agencies, priority level, and time period for implementation. Each lead agency is responsible for factoring the action into its work plan and schedule over the indicated time period. Annual reports on the status of implementation, including obstacles to progress, will be submitted by lead agencies to the Hays County Office of Emergency Management (OEM).

10.4 Monitoring & Progress Reports

The Hays County Emergency Management Coordinator is responsible for monitoring and maintaining the Hazard Mitigation Plan. This Plan will be monitored by the Hays County OEM for several related purposes:

1. Maintain the currency of hazard and risk information.
2. Ensure that mitigation projects and actions reflect county priorities.
3. To comply with FEMA and State of Texas requirements for Plan maintenance, and maintain Hays County's eligibility for federal disaster assistance and mitigation grants.

The County OEM will periodically review the Plan (as described below), and assemble the MPC when changes are needed. The MPC is responsible for consideration, review and approval of any changes, subject to the authority of the Commissioners Court.

10.5 Circumstances that will initiate Plan Review and Updates

This section identifies the circumstances or conditions under which Hays County will initiate Plan reviews and updates.

1. On the recommendation of the Director of the County OEM.
2. At the request of the Hays Commissioners Court.
3. At approximately the one-year anniversary of the Plan's re-adoption, and every year thereafter.

4. After natural hazard events that appear to significantly change the apparent risk to County and City assets, operations and/or citizens.
5. When activities within the County or State significantly alter the potential effects of natural hazards on County and City assets, operations and/or citizen. Examples include completed mitigation projects that reduce risk, or actions or circumstances that increase risk.
6. When new mitigation opportunities or sources of funding are identified.

In addition to the circumstances listed above, revisions that warrant changing the text of this Plan or incorporating new information may be prompted by a number of circumstances, including identification of specific new mitigation projects, completion of several mitigation actions, or requirements for qualifying for specific funding. Minor revisions may be handled by addenda.

Major comprehensive review of and revisions to the 2011 Hays *County Hazard Mitigation Plan Update* will be considered on a five-year cycle. Adopted in 2011, the Plan will enter its next review cycle sometime in 2015, with adoption of revisions anticipated in 2016. The MPC will be convened to conduct the comprehensive evaluation and revision to include the identification and prioritization of additional mitigation action items, as required.

10.6 Continued Public Involvement

Upon adoption of the 2011 Plan update, the public will be notified of any substantial changes to the document between 2011 and the next scheduled Plan update in 2016. Any changes proposed by the MPC considered significant will be distributed to the list of stakeholders identified in section 4. The Stakeholders will be encouraged to review the changes and provide comments on any proposed plan revisions.

Appendix A
Village of Bear Creek

Contents of this Section

1.1 Background
1.2 Public Facilities
1.3 Hazard Identification
1.4 Vulnerability Assessment and Loss Estimation
1.5 Mitigation Actions
1.6 Plan Adoption by the Village of Bear Creek

This appendix is part of the 2011 Hays County Hazard Mitigation Plan (HMP) update, and includes jurisdiction-specific information about the Village of Bear Creek, which is one of the 11 incorporated jurisdictions within the County that is participating in the Plan update. This appendix supplements the County HMP, so only jurisdiction-specific information is included here.

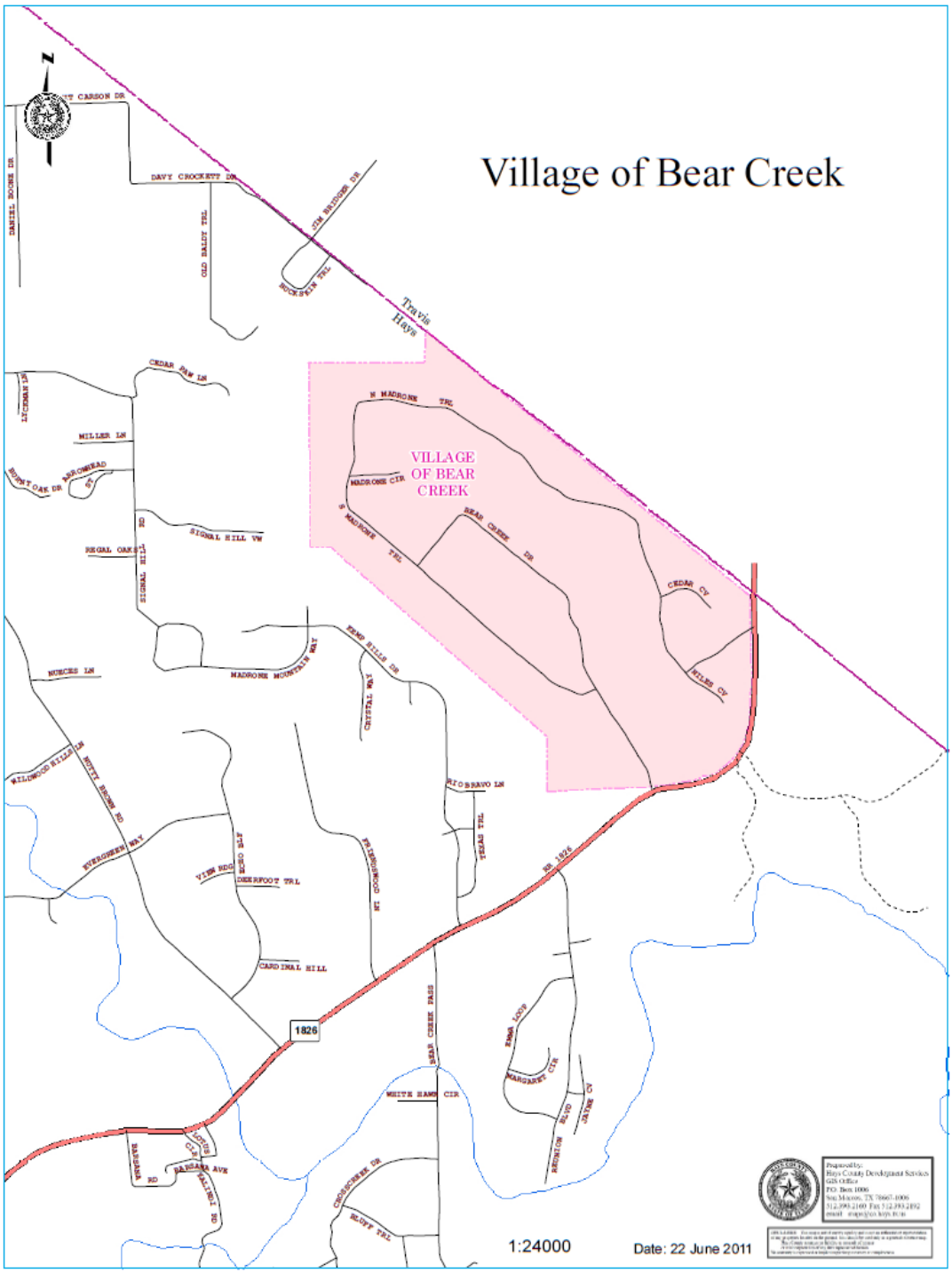
1.1 Background

The Village of Bear Creek is located in the Bear Creek Oaks Subdivision off of U.S. Highway 290 about fifteen miles southwest of Austin in far eastern Hays County. The subdivision was developed in the late 1970's by Robert Ingrum and E. D. Bohls and was originally part of the Koening Family Ranch.[1] The subdivision was planned with five and six acre tracts, some of which have been subdivided. To avoid possible annexation by the City of Austin, the community incorporated as Bear Creek on November 4, 1997 with a reported population of 360. The Village has three elected officials, a mayor and two commissioners. The 2010 U.S. Census reported the Bear Creek population at 382.[2] As of 2010 there were 142 housing units in the Village. The City has not issued any building permits over the past five years.

Figure A-1 is a map of the Village of Bear Creek, which covers approximately 1.1 square miles. See Section 3.3.1 (Geography) of the 2011 Plan update for a jurisdictional map of Hays County.

[1] Official website for the Village of Bear Creek - History
[2] US Census Bureau. 2010 US Census. Race, Hispanic or Latino, Age and Housing Occupancy - Village of Bear Creek.

Figure A-1
Village of Bear Creek, Texas Map
(Source: Village of Bear Creek)



1.2 Public Facilities

As part of the Hays County Plan update, the Village of Bear Creek was contacted by email and requested to provide a list of village owned facilities. As of 2010, the Village owns no public building.

1.3 Hazard Identification

Hays County has received seven Presidential Disaster Declarations since 1965, several of which have affected the Village of Bear Creek. The bullets below summarize some of the more significant events since1980.

Overview of Bear Creek's Recent Natural Hazards History

The bullets below highlight major events that have impacted the Village of Bear Creek. Events that include the Federal Emergency Management Agency (FEMA) disaster number in parenthesis after the date indicate events that received a Presidential Disaster Declaration. The source for the past events listed was a combination of information provided by the Village and the National Oceanic and Atmospheric Administration's (NOAAs) National Climatic Data Center (NCDC).

Query results from the NCDC indicated no specific events in the Village of Bear Creek. Only occasional flooding across a low water crossing on North Madrone Trail.

The 2011 Hays County HMP update includes discussions of the 11 natural hazards with potential to affect the County (see Section 5, *Hazard Identification, Profiling and Ranking*), including the jurisdictions within the County boundaries. The subsections below include only information that supplements the material in Section 5 of the County HMP.

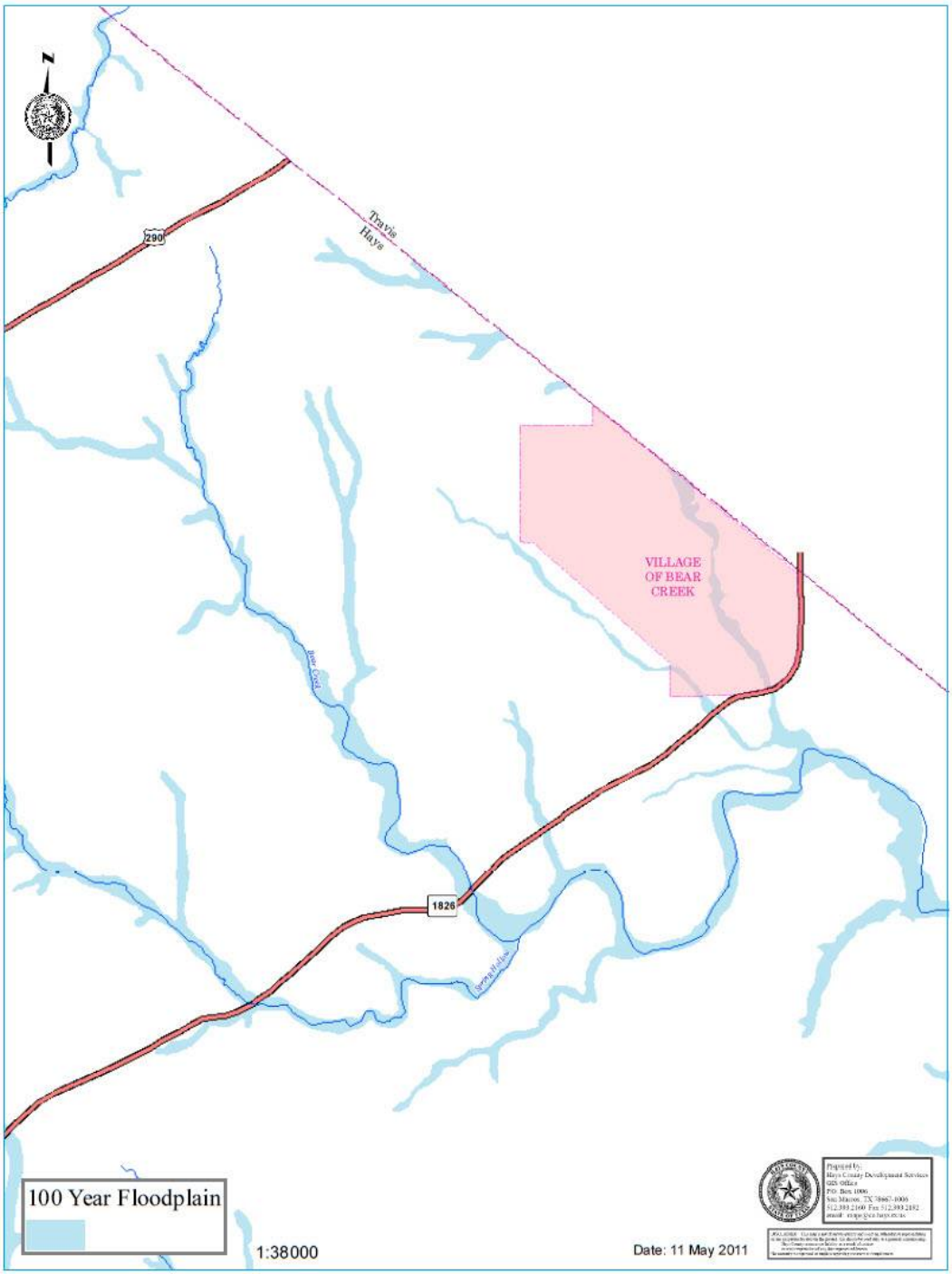
1.3.1 Floods

This subsection addresses the flood hazard. The flood subsection below includes the potential for floods caused by extreme rainfall associated with these hazards. Hazard Description. See Section 5.4.1 of the Hays County Plan update for a description of the flood hazard. Hazard Location. According to the Hays County GIS, a total of 0.06 square miles of the City (1.1 square miles total) is located within the 100-year floodplain. Bear Creek has a total of 40 parcels that have some exposure to the 100-year floodplain. Various floodplain maps for the Village are presented within this subsection. Severity and extent of the hazard. Flood severity is measured in various ways, including frequency, depth, velocity, duration and contamination, among others. The frequency of flooding is often the most common for judging severity. In Bear Creek there have been no significant flood events over the past 10 years. Hazard's impact on life and property. The impacts on life and property from flooding can be significant. Property owners that have experienced repetitive flooding in the past must cope with the disruptions and costly repairs associated with flooding. Occurrences of the hazard. Based on a review of open source documents Bear Creek has experienced no floods over the past 10 years.

One of the best sources for determining flood risk for an area is review of the Flood Insurance Rate Maps (FIRMs) produced by FEMA. The FIRM is the official map of a community on which FEMA has delineated both the special flood hazard areas (1% annual chance of flooding) and the risk premium zones applicable to the community.[3] The Village of Bear Creek is located on two FIRM panels, both with effective dates of September 2, 2005. Figure A-2 identifies the FEMA flood zones for Bear Creek. The FIRM shows there is a section of 100-year floodplain that follows along a branch of Bear Creek.

[3] FEMA online - Floodplain Management. Flood Insurance Rate Map (FIRM) definition

Figure A-2
Village of Bear Creek - Floodplain Map
(Source: FEMA, Effective FIRM September 2, 2005, Hays County GIS Office)



1.3.2 Tornadoes

This subsection addresses the tornado hazard. Hazard Description. The nature of the tornado hazard in this jurisdiction is considered substantially the same as for the County as a whole. Refer to HMP Section 5 for further information. Hazard Location. The hazard affects all parts of this jurisdiction approximately equally. Severity and extent of the hazard. The severity and extent of the hazard are equal across the jurisdiction. Hazard's impact on life and property. The potential impacts on life and property in this jurisdiction vary with the strength of the events. Vulnerability to the tornado hazard is directly correlated to structure type and occupancy; because of this variability, it is not possible to accurately characterize vulnerabilities across the entire jurisdiction. However, Subsection 1.4.2 below includes the results of a basic tornado risk assessment, which was conducted using best-available data at the time of the analysis. Occurrences of the hazard. Tornado occurrences are discussed in HMP Section 5. The statistical probability of these hazards impacting this jurisdiction are the same as for the County as a whole.

1.3.3 Winter Storm

This subsection addresses the winter storm hazard. Hazard Description. The nature of winter storm hazard in this jurisdiction is considered substantially the same as for the County as a whole. Refer to HMP Section 5 for further information. Hazard Location. The hazard affects all parts of this jurisdiction approximately equally. Severity and extent of the hazard. The severity and extent of the hazard are equal across the jurisdiction. Hazard's impact on life and property. The potential impacts on life and property in this jurisdiction vary with the strength of the events. Vulnerability to the winter storm hazard is directly correlated to structure type and occupancy; because of this variability, it is not possible to accurately characterize vulnerabilities across the entire jurisdiction. However, Subsection 1.4.3 below includes the results of a basic winter storm risk assessment, which was conducted using best-available data at the time of the analysis. Occurrences of the hazard. Winter storm occurrences are discussed in HMP Section 5. The statistical probability of these hazards impacting this jurisdiction are the same as for the County as a whole.

The remaining eight hazards profiled as part of the Hays County Plan update are not described within the jurisdictional appendices. The hazard descriptions in the main plan provide sufficient descriptions of these hazards, so they are not repeated in the jurisdictional appendices, although the appendices include actions to address the full range of hazards. See Section 5.4 of the Hays County Plan update for a complete profile of the other hazards.

1.4 Vulnerability Assessment and Loss Estimation

This subsection briefly summarizes the jurisdiction's vulnerabilities and estimated losses from three natural hazards: floods, tornadoes, and winter storms. Because the jurisdiction appendices in this 2011 HMP update have been standardized, in some cases there will be very little risk evident in certain communities, and therefore minimal information in these subsections. The methodologies for completing these analyses are described in Section 6 (and hazard-specific subsections) of the HMP, and are not repeated here.

1.4.1 Flood Loss Estimation

The Village of Bear Creek has been a member of the National Flood Insurance Program (NFIP) since February, 1998. In some municipalities within Hays County, a flood risk assessment can be performed based on analysis of NFIP data on repetitive flood loss properties. The NFIP defines repetitive loss properties as those that have received at least two NFIP insurance payments of more than $1,000 each in any rolling ten-year period. As of May 2010, Hays County had 32 such properties (30 residential and two non-residential properties), based on a query of the FEMA BureauNet NFIP interface. Of this total, none were located within the Village of Bear Creek. With no NFIP repetitive loss properties in Bear Creek an analysis of repetitive loss properties was not performed.

In some cases the number of policies in force (i.e. the number of flood insurance policies currently valid and active in a community) may be a proxy for flood risk. The table below compares the number of policies and claim statistics for the Village of Bear Creek with the unincorporated areas of Hays County. The Table indicates that as of March, 2011, the Village of Bear Creek had no NFIP policies in force. The table also shows that between 1998 and 2010, there have been no NFIP insurance claims in Bear Creek.[4]

Table A-1
Comparison of NFIP Claims for the Village of Bear Creek with Hays County
(Source: FEMA – NFIP Statistics, March, 2011)

Village/County Name	# of Polices In-Force	Insurance In-Force	# of Losses	Total Paid Claims
Village of Bear Creek	1	$350,000	0	$0
Hays County (unincorporated areas)	521	$130,165,500	236	$3,514,972

[4] FEMA – Policy and Claim Statistics for Flood Insurance

1.4.2 Tornado Loss Estimation

Relative to other parts of the nation, the overall tornado risk is moderate in Hays County and the Village of Bear Creek. There is significant enough exposure to the hazard to perform a simple risk assessment to characterize the potential future losses. The tornado loss estimation for the Village of Bear Creek was calculated using FEMA's Benefit-Cost Analysis Tool (BCAR) software (version 4.5.5.0). The BCAR analysis methodology and tornado element of the software are based entirely on avoided injuries and fatalities. As a result, it is not necessary to separate public assets from private ones in order to estimate potential future losses (risk) – the calculation is based on the population at risk, rather than the square footage or value of buildings or functions. The table below summarizes data inputs and expected losses over a 50-year planning horizon.

Table A-2
Tornado Risk Assessment - Project Information
(Source: FEMA BCA Software, Version 4.5.5.0)

Data	Value
Loss estimation horizon (in years)	50
Population (2010 US Census)	382
Zip Code used as center of analysis	78676
Radius in miles for access to safe room	0.59
Assumed safe room structure design wind speed (mph)	200
Occupancy – Jurisdictional Facilities	0
Assumed structure type: residential properties	Wood-frame, one- or two-story
Assumed structure type: jurisdiction-owned facilities	N/A
Estimated annual losses (jurisdiction-owned facilities)	**0**
Estimated losses – 50-year horizon (jurisdiction-owned facilities)	**0**
Estimated Annual losses (residential property)	**$23,358**
Estimated losses – 50-year horizon (residential property)	**$322,356**

It should be noted that this result is typical of tornado analyses (i.e. that the apparent risk is very high compared to other hazards). This occurs because the analysis is based entirely on life safety, and the probabilities of events of various magnitudes combined with the relatively high values assigned to deaths and injuries indicate significant losses over long time horizons. See Section 6.3.2, *Tornado Wind Risk in Hays County*, of the Plan update to see how the residential tornado risk in the Village of Bear Creek compares with the risk to the other municipalities in Hays County.

1.4.3 Winter Storm Loss Estimation

This analysis is based on information provided by the County and community, and uses data from the National Climatic Data Center (NCDC) and estimates from the 2010 U.S. Census. The estimated annual and 100-year risk for each jurisdiction was calculated as a proportion of the total winter storm risk for Hays County. Additional information about the methodology is found in Section 6 of the HMP. Jurisdiction-specific information and analysis output are provided in the table below.

Table A-3
Village of Bear Creek Winter Storm Loss Estimates
Data Parameters and Summary of Results
(Source: FEMA BCA Software, Version 4.5.5.0)

Data	Value
Winter storm events	9
Reporting Years	14
Average annual number of winter storm events	0.64
Total reported damages (Hays County)	$7,500,000
Annual damages (Hays County)	$535,714
Hays County Population (2010 US Census)	157,101
Bear Creek Population (2010 US Census)	382
Percent of County Population	0.24%
Estimated Annual losses	**$1,286**
Estimated losses – 100-year horizon	**$18,347**

See Section 6.3.4, *Winter Storm Risk in Hays County*, of the Plan update to see how the winter storm risk in the Village of Bear Creek compares with the risk to the other municipalities in Hays County.

1.5 Mitigation Actions

The table below lists prioritized mitigation projects and actions identified by the Village of Bear Creek. The list was prioritized by the community using the STAPLEE methodology – see Section 7 of the County HMP for a discussion of this methodology. All of the original actions for Bear Creek (Action Items 1-7) remain in the table for reference purposes. Completed actions are noted in the status column, but also have the action number and action item description highlighted with ~~strikethrough~~ text to indicate completion. Action items 8 – 18 have been added as part of the 2011 Plan update.

Table A-4
Village of Bear Creek Mitigation Actions

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
Note: Action Items 1-7 were identified from the original Hays Co. HMP.							
1	**Reduce Flood Losses and Increase Flood Insurance Coverage in Hays County.** Increasing the flood insurance policy base in Hays County will provide financial relief to property owners and renters that are flooded in future disaster events. By relying on flood insurance property owners and renters have economic security and do not have to rely on a disaster event being declared as a Presidential Declared Disaster. This action was labeled F-2 from the original Plan.	Village of Bear Creek	Cost and Funding: Existing staff resources, no cost	2011 with improvements annually through 2015	Flood	Not independently cost-effective	Ongoing
2	**Adopt 'Higher Standard" Flood Damage Prevention Ordinances.** By adopting "higher standard" requirements, new buildings, infrastructure and critical facilities have a reduced risk of loss of life and property damage during a flood event. Communities are encouraged to follow the guidance outlined in EO 11988 where critical facilities are protected to the 500-year (0.2% annual chance flood event) elevation. This action was labeled F-5 from the original Plan.	Village of Bear Creek	Cost and Funding: Existing staff resources, no cost	2012	Flood	Not independently cost-effective	Not completed in the past five years – moved forward to plan update

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
3	**Provide Training for Local Floodplain Managers and Certified Floodplain Managers (CFM's).** By increasing training for local floodplain managers and CFM‟s there should be improved local floodplain management programs, reduced risk of loss of life, and new buildings and infrastructure have a reduced risk of damage during a flood event. The Village of San Marcos and/or Hays County would be the logical communities to provide floodplain management training such as hosting FEMA‟s FPM Training Course, "Managing Floodplain Development through the NFIP", hosting NFIP Workshops, and hosting Community Rating System (CRS) Workshops. These training opportunities would assist local communities and provide continuing education credits (CEC‟s) for local floodplain administrators, certified floodplain managers (CFM‟s), engineers, surveyors and the general public. This action was labeled F-8 from the original Plan.	Village of Bear Creek	Cost and Funding: Existing staff resources, no cost	Annually 2011 – 2012	Flood	Not independently cost-effective	Ongoing
4	**Improve Emergency Communication Capabilities.** By improving emergency communications Hays County and participating communities can respond faster and coordinate better to save lives and reduce property damage during disaster events. This action was labeled E-2 from the original Plan.	Village of Bear Creek	$620,000 Funding: Capital Area Planning Council (CAPCO), Texas DEM	Ongoing	All hazards	Not independently cost-effective, but critical for saving lives	Ongoing

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
5	**Development of and maintenance of countywide and individual community HAZMAP Plans.** Develop and formally adopt HAZMAP plans prior to the November 2004 deadline established by the Disaster Mitigation Act of 2000. Develop procedures to conduct annual reviews and updates to maintain countywide and individual community HAZMAP plans. Provide annual training opportunities for community emergency managers to assist in the planning and plan maintenance efforts. Create and maintain multi-jurisdictional HAZMAP databases and GIS mapping to support countywide and individual community HAZMAP maintenance efforts. This action was labeled E-5 from the original Plan.	Village of Bear Creek	Existing staff resources	Original Plan adopted on April 20, 2004 - update in 2011	All hazards	Not independently cost-effective	Original HMP Complete. Plan update to be adopted once FEMA review is complete
6	**Storm Ready Designation for Hays County Communities** Storm Ready is a proven mitigation action. By Hays County and participating communities becoming Storm Ready Communities there can be mitigation actions in place to save lives and reduce property damage during disaster events. This action was labeled E-6 from the original Plan.	Village of Bear Creek	Cost and Funding: Existing staff resources, no cost	Ongoing	Floods, thunderstorms, high winds, tornadoes, tropical storms and cyclones	Not independently cost-effective, but critical for saving lives and minimizing injuries	Ongoing

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
7	**Reduce Impacts of Extreme Heat on Elderly, Disabled, Low-Income and Infants.** This Mitigation Action is for Hays County and participating community Emergency Managers to launch a public notification effort during extreme heat periods urging elderly and low income persons to seek help if needed. Volunteer organizations such as Rotary International, Lions Club, Jaycees, Red Cross, United Way, and others should be urged to participate. Power Companies will be notified by the Hays County Emergency Manager and requested to participate in the effort to distribute box fans and make minor repairs to air conditioners. The Hays County OEM will coordinate with participating community emergency managers and take the lead to initiate this Mitigation Action. The initial action will include newspaper and radio announcements and public information on both the Hays County and Village of San Marcos websites. Public announcements will define the hazard, describe heat related health risks and provide tips on how to prevent illness. Health care officials can play an important role in this mitigation action by providing information to newspapers and radio stations. This action was labeled Heat-1 from the original Plan.	Hays County OEM	$ 2,000 to purchase and distribute 100 box fans $ 3,000 estimated cost for a/c repairs Funding Sources: United Way Rotary Clubs Lions Clubs Red Cross Churches and charitable organizations Power Companies	Periods of Extreme Heat May be annually	Extreme heat	Not independently cost-effective	Ongoing

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
8	**Increase Public Awareness of Hazards.** Increase public awareness of hazards and hazardous areas. Distribute public awareness information regarding flood hazards, SFHAs, and potential mitigation measures using the local newspaper, utility bill inserts, inserts in the phone book, a Village hazard awareness website, and an educational program for school age children or "how to" classes in retrofitting by local merchants. Integrate "Disaster Resistance Education" into the public school curriculum. Provide public education on the importance of maintaining the ditches. Priority: Medium	Village of Bear Creek	$2,000	ongoing	All hazards	Not independently cost-effective	Initiated in 2011 HMP
9	**Wildfire Hazard Areas.** Conduct study to determine and map potential wildfire hazard areas. Priority: Medium	Village of Bear Creek	$500	TBD; likely initiated in 2011	Wildfire	Not independently cost-effective, but essential in minimizing loss of life and injuries during significant storms.	Initiated in 2011 HMP
10	**Monitor Drought Conditions.** Continue to monitor drought conditions through contact with State Agencies. Priority: Medium	Village of Bear Creek	No additional cost – uses existing staff	Ongoing	Drought	Not independently cost effective.	Ongoing
11	**Public Information Campaigns.** Cooperate and coordinate with the County and State agencies in developing public information campaigns and/or water use restrictions to ensure sufficient water pressure for fire-fighting and provision of drinking water during periods of drought. Priority: Medium	Village of Bear Creek	No additional cost – uses existing staff resources	Ongoing	Drought	Very difficult to determine, but presumed very cost-effective because actions preserves essential function	Ongoing
12	**Evaluate Excess Heat Risks.** Evaluate the risks presented by excessive heat and humidity, especially in terms of high-risk populations such as the elderly/low income. Priority: Medium.	Village of Bear Creek	No additional cost – uses existing staff resources	TBD; probably initiated in 2011	Extreme heat	Not independently cost-effective, but needed to develop adequate risk reduction efforts	Initiated in 2011 HMP

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
13	**Review Plans and Resources to Address Risk Posed By Snow and Ice Hazards During Winter Storms**. Conduct a review of the Village's current plans and resources to address the risks posed by ice and snow hazards during winter storms. Focus on Village's ability to respond to snow and ice emergencies, and on potentially at-risk populations in the community. Priority: Low to medium.	Village of Bear Creek	No additional cost – uses existing staff resources	Ongoing	Winter storms, Extreme cold, ice storm	Not independently cost-effective, but contributes to maintaining public services; protects at-risk populations	Initiated in 2011 HMP
14	**Various Mitigation Actions to Reduce Wildfire Risk.** On a case-by-case basis, develop and initiate mitigation actions to reduce the wildfire and brushfire risk. Actions may include informing property owners of appropriate actions, clearing vegetation, and monitoring antecedent conditions, among others. Priority: Low.	Village of Bear Creek	No additional cost – uses existing staff resources	TBD/as need is identified	Wildfire	Cost-effective, as measures tend to be in-expensive and prevent fires	Initiated in 2011 HMP
15	**Upgrades to At-Risk Structures.** Based on the results of the study above, initiate upgrades to at-risk structures and/or infrastructure. Mitigates specific risks to structures, people and operations. Priority: Low	Village of Bear Creek	Varies depending on measure. Funding from General Fund or FEMA grant program/s	TBD based on study	Tornadoes, thunderstorm wind, Winter storm, hail, seismic	Cost-effectiveness will vary with level of risk and project cost	TBD, but likely to be initiated no earlier than 2012
16	**Structural/Engineering Study.** Complete a detailed structural/engineering survey of Bear Creek public facilities to ensure their soundness with respect to resisting the effects of high winds, extreme roof loading from snow or ice, and hail. Forms basis of decisions about any additional actions to mitigate risk. Priority: Low	Village of Bear Creek	To be determined, but if initiated probably from General Fund	Not yet established – to be commenced only if funding is available	Tornadoes, thunderstorm wind, winter storm, hail, seismic	Not independently cost-effective, but the initial step in identifying appropriate mitigation actions	Initiated in 2011 HMP

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
17	**Understanding Dam Failure Risks.** Engage with County and State floodplain managers, engineers and emergency managers to ensure that local officials have a detailed understanding of potential risks to the community from dam and/or levee failures. Priority: Low to medium.	Village of Bear Creek	No additional cost – uses existing staff resources	Initiated in 2011, then ongoing	Dam Failure	Not independently cost-effective	Initiated in 2011 HMP
18	**Evacuation Plans.** Ensure that the jurisdiction and its citizens are aware of and understand notification and evacuation plans related to dam and/or levee failure. Priority: Low to medium.	Village of Bear Creek	No additional cost – uses existing staff resources	Initiated in 2011, then ongoing	Dam Failure	Not independently cost-effective	Initiated in 2011 HMP

1.6 Plan Adoption by the Village of Bear Creek

After the draft Plan is approved by the Texas Division of Emergency Management (TDEM) and FEMA Region VI, the 2011 Plan Update will be adopted by the Hays County Commissioners Court. The Bear Creek Village Council will also adopt the updated HMP by resolution. The Village of Bear Creek adoption resolution is provided below. A copy of the County resolution is included in Appendix N.

Figure A-3
Adoption Resolution - Village of Bear Creek

Resolution to be inserted upon Plan adoption

Appendix B
City of Buda

Contents of this Section

1.1 Background
1.2 Public Facilities
1.3 Hazard Identification
1.4 Vulnerability Assessment and Loss Estimation
1.5 Mitigation Actions
1.6 Plan Adoption by the City of Buda

This appendix is part of the 2011 Hays County Hazard Mitigation Plan (HMP) update, and includes jurisdiction-specific information about the City of Buda, which is one of the 11 incorporated jurisdictions within the County that is participating in the Plan update. This appendix supplements the County HMP, so only jurisdiction-specific information is included here.

1.1 Background

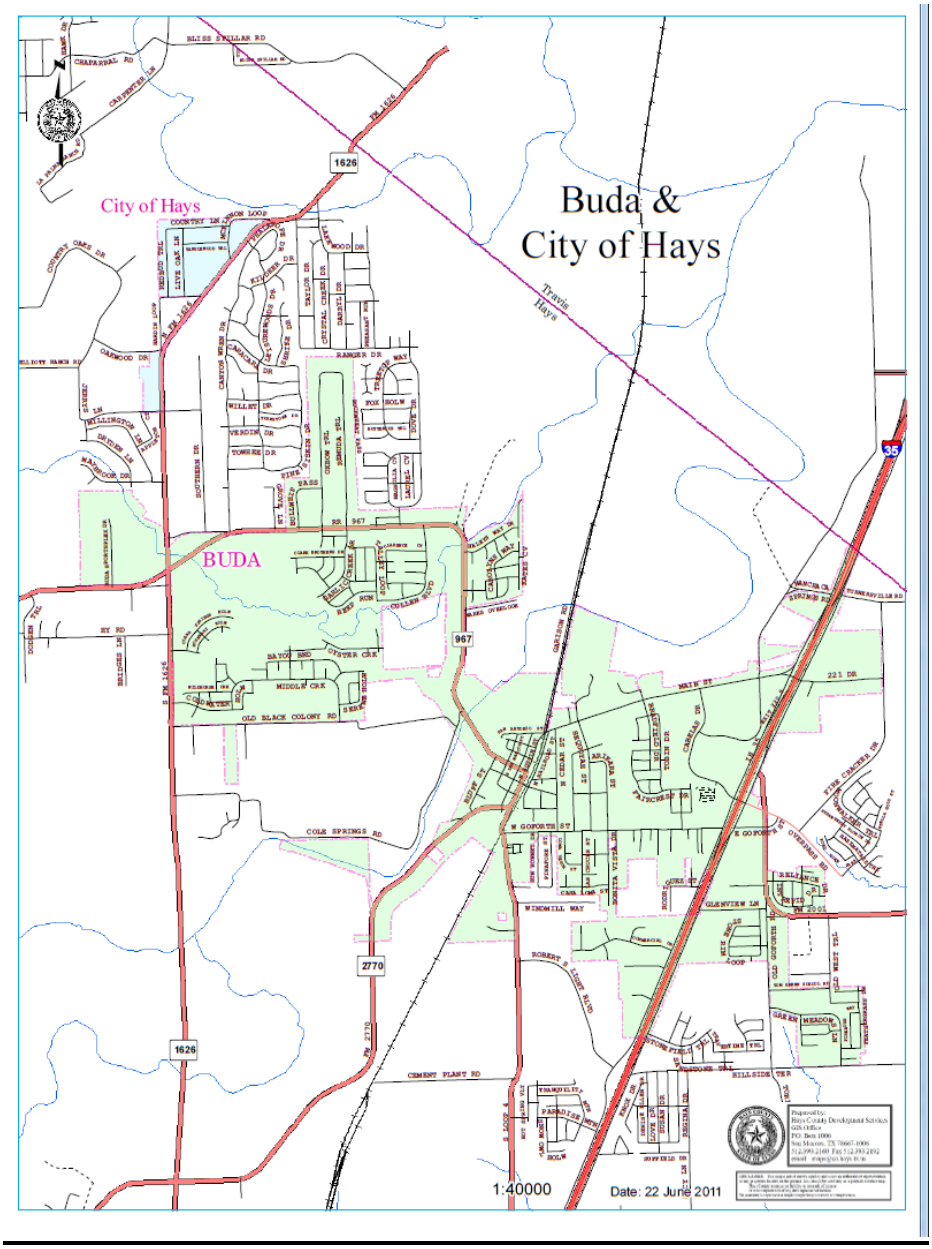
The City of Buda is located along Highway 35 in eastern Hays County 13 miles southwest of Austin. The town was incorporated in 1948, and in 1967 Buda, Kyle, and Wimberley formed the Hays Consolidated Independent School District (only Buda and Kyle remained in the district after 1986). By the mid-1980s Buda had attracted several industries, but the community was still primarily rural and residential. Its population was estimated at 1,795 in 1990 and 2,204 in 2000.[1] The 2010 U.S. Census reported the Buda population at 7,295 with 2,630 housing units.[2]

Year	Residential Permits	Commercial Permits
2005	199	12
2006	363	24
2007	379	28
2008	382	22
2009	380	10
2010	296	14

[1] Texas State Historical Association. The Handbook of Texas Online – Buda, Texas.
[2] US Census Bureau. 2010 US Census. Race, Hispanic or Latino, Age and Housing Occupancy - City of Buda.

Figure B-1 is a map of the City of Buda, which covers approximately 2.4 square miles. See Section 3.3.1 (Geography) of the 2011 Plan update for a jurisdictional map of Hays County.

Figure B-1
City of Buda, Texas Map
(Source: City of Buda, Planning and Zoning Department)



1.2 Public Facilities

As part of the Hays County Plan update, the City of Buda was contacted by email and requested to provide a list of city owned facilities. As of 2010, the City owns four public buildings. These facilities are listed below in Table J-1.

Table B-1
City of Buda Public Facilities
(Source: City of Buda, Texas)

No.	Facility Name	Street Address	Year Built	Use	Square Footage	Occupancy	Structure Type	Replacement Value
1	City Hall	121 Main Street	1991	City Administration	5,861	9	Block	$1,074,400
2	City Hall Annex	100 Houston Street	Unknown	Engineering, Planning, Parks, Tourism & Police Department	7,532	18	Masonry & Wood Structure	$450,00
3	City Library	303 Main Street	1998	Public Library	5,220	5	Brick and Wood	$522,800
4	Public Works	525 Garison Road	2004	Public Works Offices & Warehouse	4,700	20	Metal	$216,000
5	Stagecoach House & Visitor Center	880 Main Street	2011	Visitor Center, Museum & Parks Department Offices	1,500	23	Wood	$500,000

City Hall

1.3 Hazard Identification

Hays County has received seven Presidential Disaster Declarations since 1965, several of which have affected the City of Buda. The bullets below summarize some of the more significant events since1980.

Overview of Buda's Recent Natural Hazards History

The bullets below highlight major events that have impacted the City of Buda. Events that include the Federal Emergency Management Agency (FEMA) disaster number in parenthesis after the date indicate events that received a Presidential Disaster Declaration. The source for the past events listed was a combination of information provided by the City and the National Oceanic and Atmospheric Administration's (NOAAs) National Climatic Data Center (NCDC).

- July 22,1997. High winds from a severe thunderstorm caused approximately $5,000 in damages within the City of Buda.
- August 30, 1998. High winds associated with a severe thunderstorm caused approximately $20,000 in damages. The NCDC indicated that the Sheriff's Department reported numerous downed power lines.

- April 7, 2002. High winds from a severe thunderstorm damaged roofs and windows of several residential homes. Numerous trees were downed. The storm caused an estimated $100,000 in damages.
- May 29, 2005. Strong thunderstorms produced up to four inches of rain between Buda and Creedmoor (southeast Travis County). Heavy rains caused flash flooding, temporarily closing FM2001 near Buda and FM 1327 between Creedmoor and IH-35.

The 2011 Hays County HMP update includes discussions of the 11 natural hazards with potential to affect the County (see Section 5, *Hazard Identification, Profiling and Ranking*), including the jurisdictions within the County boundaries. The subsections below include only information that supplements the material in Section 5 of the County HMP.

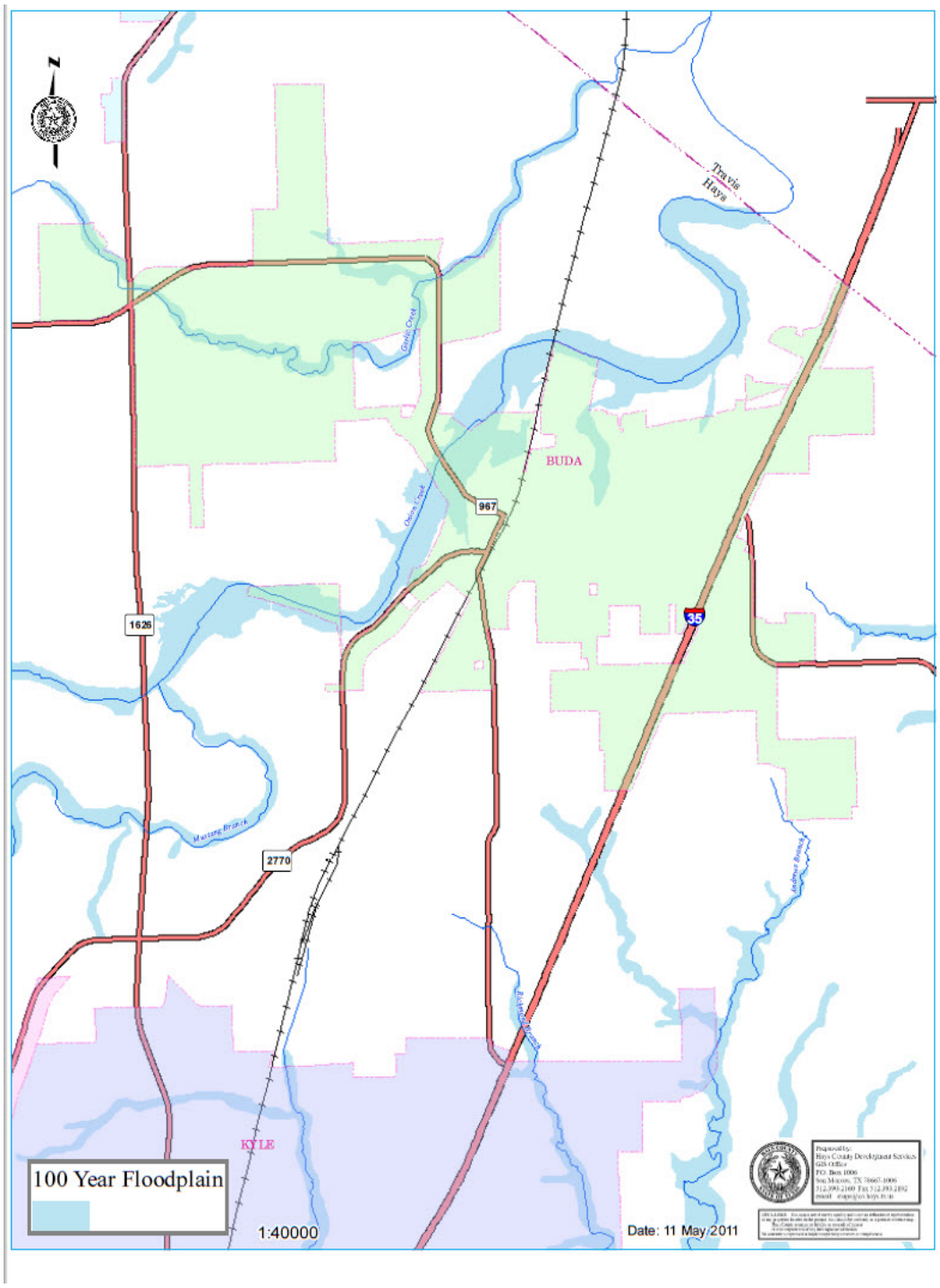
1.3.1 Floods

This subsection addresses the flood hazard. The flood subsection below includes the potential for floods caused by extreme rainfall associated with these hazards. Hazard Description. The City of Buda is vulnerable to shallow and riverine flooding. See Section 5.4.1 of the Hays County Plan update for a description of the flood hazard. Hazard Location. From a review of the FIRM for Buda, the flood hazard is primarily located along the floodplains of Onion and Garlic Creek. According to the Hays County GIS, a total of 0.420 square miles of the City (2.4 square miles total) is located within the 100-year floodplain. Buda has a total of 150 parcels that have some exposure to the 100-year floodplain. Various floodplain maps for the City are presented within this subsection. Severity and extent of the hazard. Flood severity is measured in various ways, including frequency, depth, velocity, duration and contamination, among others. The frequency of flooding is often the most common for judging severity. In Buda there have been no significant flood events over the past 10 years. Hazard's impact on life and property. The impacts on life and property from flooding can be significant. Property owners that have experienced repetitive flooding in the past must cope with the disruptions and costly repairs associated with flooding. Occurrences of the hazard. Based on a review of open source documents Buda has experienced no floods over the past 10 years.

One of the best sources for determining flood risk for an area is review of the Flood Insurance Rate Maps (FIRMs) produced by FEMA. The FIRM is the official map of a community on which FEMA has delineated both the special flood hazard areas (1% annual chance of flooding) and the risk premium zones applicable to the community.[3] The City of Buda is located on three FIRM panels, all with effective dates of September 2, 2005. Figure B-2 identifies the FEMA flood zones for Buda. The map shows that sections of 100-year floodplain follow Onion Creek and Garlic Creek through the northwestern part of the City.

[3] FEMA online - Floodplain Management. Flood Insurance Rate Map (FIRM) definition

Figure B-2
City of Buda - Floodplain Map
(Source: FEMA, Effective FIRM September 2, 2005, Hays County GIS Office)



1.3.2 Tornadoes

This subsection addresses the tornado hazard. **Hazard Description.** The nature of the tornado hazard in this jurisdiction is considered substantially the same as for the County as a whole. Refer to HMP Section 5 for further information. **Hazard Location.** The hazard affects all parts of this jurisdiction approximately equally. **Severity and extent of the hazard.** The severity and extent of the hazard are equal across the jurisdiction. **Hazard's impact on life and property.** The potential impacts on life and property in this jurisdiction vary with the strength of the events. Vulnerability to the tornado hazard is directly correlated to structure type and occupancy; because of this variability, it is not possible to accurately characterize vulnerabilities across the entire jurisdiction. However, Subsection 1.4.2 below includes the results of a basic tornado risk assessment, which was conducted using best-available data at the time of the analysis. **Occurrences of the hazard.** Tornado occurrences are discussed in HMP Section 5. The statistical probability of these hazards impacting this jurisdiction are the same as for the County as a whole.

1.3.3 Winter Storm

This subsection addresses the winter storm hazard. **Hazard Description.** The nature of winter storm hazard in this jurisdiction is considered substantially the same as for the County as a whole. Refer to HMP Section 5 for further information. **Hazard Location.** The hazard affects all parts of this jurisdiction approximately equally. **Severity and extent of the hazard.** The severity and extent of the hazard are equal across the jurisdiction. **Hazard's impact on life and property.** The potential impacts on life and property in this jurisdiction vary with the strength of the events. Vulnerability to the winter storm hazard is directly correlated to structure type and occupancy; because of this variability, it is not possible to accurately characterize vulnerabilities across the entire jurisdiction. However, Subsection 1.4.3 below includes the results of a basic winter storm risk assessment, which was conducted using best-available data at the time of the analysis. **Occurrences of the hazard.** Winter storm occurrences are discussed in HMP Section 5. The statistical probability of these hazards impacting this jurisdiction are the same as for the County as a whole.

The remaining eight hazards profiled as part of the Hays County Plan update are not described within the jurisdictional appendices. The hazard descriptions in the main plan provide sufficient descriptions of these hazards, so they are not repeated in the jurisdictional appendices, although the appendices include actions to address the full range of hazards. See Section 5.4 of the Hays County Plan update for a complete profile of the other hazards.

1.4 Vulnerability Assessment and Loss Estimation

This subsection briefly summarizes the jurisdiction's vulnerabilities and estimated losses from three natural hazards: floods, tornadoes, and winter storms. Because the jurisdiction appendices in this 2011 HMP update have been standardized, in some cases there will be very little risk evident in certain communities, and therefore minimal information in these subsections. The methodologies for completing these analyses are described in Section 6 (and hazard-specific subsections) of the HMP, and are not repeated here.

1.4.1 Flood Loss Estimation

The City of Buda has been a member of the National Flood Insurance Program (NFIP) since June, 1993. In some municipalities within Hays County, a flood risk assessment can be performed based on analysis of NFIP data on repetitive flood loss properties. The NFIP defines repetitive loss properties as those that have received at least two NFIP insurance payments of more than $1,000 each in any rolling ten-year period. As of May 2010, Hays County had 32 such properties (30 residential and two non-residential properties), based on a query of the FEMA BureauNet NFIP interface. Of this total, none were located within the City of Buda. With no NFIP repetitive loss properties in Buda an analysis of repetitive loss properties was not performed.

In some cases the number of policies in force (i.e. the number of flood insurance policies currently valid and active in a community) may be a proxy for flood risk. The table below compares the number of policies and claim statistics for the City of Buda with Hays County. The Table indicates that as of March, 2011, the City of Buda had 12 NFIP policies in force valued at approximately $3,472,000. The table also shows that between 1993 and 2010, there have been no NFIP insurance claims in Buda.[4]

Table B-2
Comparison of NFIP Claims for the City of Buda with Hays County
(Source: FEMA – NFIP Statistics, March, 2011)

City/County Name	# of Polices In-Force	Insurance In-Force	# of Losses	Total Paid Claims
City of Buda	12	$3,472,000	$0	$0
Hays County	521	$130,165,500	236	$3,514,972

[4] FEMA – Policy and Claim Statistics for Flood Insurance

1.4.2 Tornado Loss Estimation

Relative to other parts of the nation, the overall tornado risk is moderate in Hays County and the City of Buda. There is significant enough exposure to the hazard to perform a simple risk assessment to characterize the potential future losses. The tornado loss estimation for the City of Buda was calculated using FEMA's Benefit-Cost Analysis Tool (BCAR) software (version 4.5.5.0). The BCAR analysis methodology and tornado element of the software are based entirely on avoided injuries and fatalities. The table below summarizes residential data inputs and expected losses over a 50-year planning horizon.

Table B-3
Residential Tornado Risk Assessment - Project Information
(Source: FEMA BCA Software, Version 4.5.5.0)

Data	Value
Loss estimation horizon (in years)	50
Population (2010 US Census)	7,295
Zip Code used as center of analysis	78676
Radius in miles for access to safe room	0.87
Assumed safe room structure design wind speed (m.p.h.)	200
Assumed structure type: residential properties	Wood-frame, one- or two-story
Occupancy Percentage	
Day	50%
Evening	80%
Night	100%
Estimated Annual losses (residential property)	**$446,062**
Estimated losses – 50-year horizon (residential property)	**$6,155,990**

It should be noted that this result is typical of tornado analyses (i.e. that the apparent risk is very high compared to other hazards). This occurs because the analysis is based entirely on life safety, and the probabilities of events of various magnitudes combined with the relatively high values assigned to deaths and injuries indicate significant losses over long time horizons. See Section 6.3.2, *Tornado Wind Risk in Hays County*, of the Plan update to see how the residential tornado risk in the City of Buda compares with the risk to the County other municipalities in Hays County.

Tornado Risk – Public Assets

In addition to the residential tornado risk assessment an analysis was also completed for the City's four public facilities. The analysis was completed based on data provided by the City of Buda and entered into the tornado module of the FEMA BCAR software. Within the tornado module, separate analyses were completed for each structure by entering data such as the building square footage and occupancy. As part of the analysis it was assumed that the safe room design wind speed was 200 m.p.h. This data input is related to the fact that the software is designed to evaluate safe rooms; this figure is not intended to represent the design wind speed of individual facilities. Table B-4 below summarizes the non-residential data inputs.

Table B-4
Non-Residential Tornado Risk Assessment - Project Information
(Source: FEMA BCA Software, Version 4.5.5.0)

Data	Value
Loss estimation horizon	50
Assumed safe room structure design wind speed (mph)	200
Assumed structure type	Small professional building (steel frame)
Occupancy Percentage	
Day	100%
Evening	25%
Night	5%

The software uses inputs related to building occupancy by time of day to calculate the expected loss of life and number of injuries for tornado classes F0 to F5. The results of the analysis are shown below in Table B-5. The table shows that Public Works building has the highest annual and 50-year risk for public facilities in the City of Buda.

Table B-5
Tornado Risk Assessment – City of Buda Public Assets, Annual and 50-Year Tornado Risk
(Source: FEMA BCA Software, Version 4.5.5.0)

Facility Name	Square Footage	Occupancy	Replacement Value	Annual Risk	50-Year Risk
Public Works	4,700	20	$216,000	$3,239	$44,698
City Hall Annex	7,532	18	$450,00	$2,915	$40,226
City Hall	5,861	9	$1,074,400	$1,458	$20,115
City Library	5,220	5	$522,800	$810	$11,174
Grand Total	**23,313**	**52**	**$1,813,200**	**$8,422**	**$116,213**

Figure B-3 is the Public Works Building which has the highest tornado risk of the four public facilities in the City of Buda. This facility has a 50-year tornado risk of $44,698.

Figure B-3
City of Buda Public Works Building
(Source: City of Buda)

Public Works Building

1.4.3 Winter Storm Loss Estimation

This analysis is based on information provided by the County and community, and uses data from the National Climatic Data Center (NCDC) and estimates from the 2010 U.S. Census. The estimated annual and 100-year risk for each jurisdiction was calculated as a proportion of the total winter storm risk for Hays County. Additional information about the methodology is found in Section 6 of the HMP. Jurisdiction-specific information and analysis output are provided in the table below.

Table B-6
City of Buda Winter Storm Loss Estimates
Data Parameters and Summary of Results
(Source: FEMA BCA Software, Version 4.5.5.0)

Data	Value
Winter storm events	9
Reporting Years	14
Average annual number of winter storm events	0.64
Total reported damages (Hays County)	$7,500,000
Annual damages (Hays County)	$535,714
Hays County Population (2010 US Census)	157,101
Buda Population (2010 US Census)	7,295
Percent of County Population	4.64%
Estimated Annual losses	**$24,857**
Estimated losses – 100-year horizon	**$354,711**

See Section 6.3.4, *Winter Storm Risk in Hays County*, of the Plan update to see how the winter storm risk in the City of Buda compares with the risk to the other municipalities in Hays County.

1.5 Mitigation Actions

The table below lists prioritized mitigation projects and actions identified by the City of Buda. The list was prioritized by the community using the STAPLEE methodology – see Section 7 of the County HMP for a discussion of this methodology. All of the original actions for Buda (Action Items 1-7) remain in the table for reference purposes. Completed actions are noted in the status column, but also have the action number and action item description highlighted with ~~strikethrough~~ text to indicate completion. Action items 8 – 21 have been added as part of the 2011 Plan update.

Table B-7
City of Buda Mitigation Actions

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
Note: Action Items 1-7 were identified from the original Hays Co. HMP.							
1	**Reduce flood losses and increase flood insurance coverage in Hays County.** This Action Item includes hosting a Flood Insurance Workshop by the NFIP Regional Coordinator. Local community floodplain managers, insurance agents, developers, homeowners and the general public can be invited. The purpose of the workshop is to inform attendees that flood insurance is available for all structures located in communities that participate in the NFIP and that flood insurance policies protect against losses both for structures and contents. This action was labeled F-2 from the original Plan.	Engineering	Existing staff resources	Annually 2006 - 2010	Flood	Not independently cost-effective	Ongoing

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
2	**Adopt "Higher Standard" Flood Damage Prevention Ordinances.** Adopt a "Higher Standard" Flood Damage Prevention Ordinance similar to the City of San Marcos ordinance that requires all new construction and substantial improvement structures to be elevated a minimum of one foot above the established base flood (100-year) elevation. A "Higher Standard" Flood Damage Prevention Ordinance can assist a community's efforts to reduce future flood losses and provide additional Community Rating System (CRS) credits for communities desiring to participate in FEMA"s CRS Program. This action was labeled F-5 from the original Plan.	Engineering Department	Existing staff resources	2004 - 2005	Flood	Not independently cost-effective, but critical for reducing property damage and minimizing loss of life and injuries during flood events.	Ordinance was adopted on August 16, 2005
3	**Provide Training for Local Floodplain Managers and CFM's.** Provide floodplain management training such as hosting FEMA"s FPM Training Course, "Managing Floodplain Development through the NFIP", hosting NFIP Workshops, and hosting Community Rating System (CRS) Workshops. These training opportunities would assist local communities and provide continuing education credits (CEC"s) for local floodplain administrators, certified floodplain managers (CFM"s), engineers, surveyors and the general public. This action was labeled F-8 from the original Plan.	Engineering Department	Existing staff resources	Annually 2006 - 2010	Flood	Not independently cost-effective	Ongoing - City staff joined forces with a representative from the Texas Water Development Board in hosting a Letter of Map Change training class in Buda in April 2011

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
4	**Improve Emergency Communication Systems.** This Action Item is to conduct a survey of emergency communication systems in Hays County, the City of San Marcos and other communities, purchase needed equipment and train personnel to create an effective system to improve emergency communications throughout Hays County. The ultimate goal is to develop a county-owned or leased emergency communications system. This action was labeled E-2 from the original Plan.	Public Works	$5,000 – Survey $15,000 Equipment $600,000 Emergency Communication System Funding: Capital Area Planning Council	Phased over 5 years: 2006 - 2010	All hazards	Not independently cost-effective, but critical for minimizing loss of life and injuries during emergencies.	Ongoing
5	**Development of and maintenance of countywide and individual community HAZMAP Plan.** Develop and formally adopt HAZMAP plans prior to the November 2004 deadline established by the Disaster Mitigation Act of 2000. Develop procedures to conduct annual reviews and updates to maintain countywide and individual community HAZMAP plans. Provide annual training opportunities for community emergency managers to assist in the planning and plan maintenance efforts. Create and maintain multi-jurisdictional HAZMAP databases and GIS mapping to support countywide and individual community HAZMAP maintenance efforts. This action was labeled E-5 from the original Plan.	Public Works	Existing staff resources	Original Plan adopted on April 20, 2004	All hazards	Not independently cost-effective	Original HMP Complete. Plan update to be adopted in 2011.

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
6	**Storm Ready Designation for Hays County Communities.** There are no communities within Hays County that have been designated as a "Storm Ready" community by the National Weather Service (NWS). The NWS Office in New Braunfels is available to assist Hays County communities to become "Storm Ready". The Mitigation Plan Goal is to classify every community within Hays County as "Storm Ready". This action was labeled E-6 from the original Plan.	Public Works	Existing staff resources	Phased over 5 years: 2006 - 2010	Thunderstorms, high winds, tropical storms and cyclones, tornadoes, floods	Not independently cost-effective	Ongoing

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
7	**Reduce Impacts of Extreme Heat on Elderly, Disabled, Low-Income and Infants.** This Mitigation Action is for Hays County and participating community Emergency Managers to launch a public notification effort during extreme heat periods urging elderly and low income persons to seek help if needed. Volunteer organizations such as Rotary International, Lions Club, Jaycees, Red Cross, United Way, and others should be urged to participate. Power Companies will be notified by the Wichita County Emergency Manager and requested to participate in the effort to distribute box fans and make minor repairs to air conditioners. The Hays County Office of Emergency Management will coordinate with participating community emergency managers and take the lead to initiate this Mitigation Action. The initial action will include newspaper and radio announcements and public information on both the Hays County and City of San Marcos websites. Public announcements will define the hazard, describe heat related health risks and provide tips on how to prevent illness. Health care officials can play an important role in this mitigation action by providing information to newspapers and radio stations. This action was labeled Heat-1 from the original Plan.	Public Works	$ 2,000 to purchase and distribute 100 box fans $ 3,000 estimated cost for a/c repairs Funding Sources: United Way Rotary Clubs Lions Clubs Red Cross Churches and charitable organizations Power Companies	Ongoing, as needed during events	Extreme heat	Not independently cost-effective	Ongoing
~~8~~	~~**Lifschultz Drainage project.** Protect nearby homes from flooding.~~ ~~Priority: High~~	Planning and Engineering, Mr. Stanley Fees	$750,000	Phases 1 & 2 completed in 2007. Phase 4 completed in 2009. Phase 3 is outstanding	Flood	Not independently cost-effective, but critical for reducing property damage and minimizing loss of life and injuries during flood events.	Complete

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
~~9~~	~~**Garlic Creek Flood wall.** Protect Water Booster Station from flooding Priority: High~~	Planning and Engineering, Mr. Stanley Fees	$55,000	Complete	Flood	Not independently cost-effective, but critical for reducing property damage to City infrastructure and minimizing loss of life and injuries during flood events.	Complete
10	**Promote Flood Insurance.** Promote the purchase of Flood insurance. Advertise the availability, cost, and coverage of Flood insurance through the National Flood Insurance Program (NFIP). Develop NFIP brochure and promote using City website and newsletter. Priority: High	Engineering Department	$2,000	Ongoing	Flood	Not independently cost-effective, but the initial step in identifying appropriate mitigation actions	Ongoing
11	**Increase Public Awareness of Hazards.** Increase public awareness of hazards and hazardous areas. Distribute public awareness information regarding flood hazards, SFHAs, and potential mitigation measures using the local newspaper, utility bill inserts, inserts in the phone book, a City hazard awareness website, and an educational program for school age children or "how to" classes in retrofitting by local merchants. Integrate "Disaster Resistance Education" into the public school curriculum. Provide public education on the importance of maintaining the ditches. Priority: Medium	Public Works	$2,000	ongoing	Floods, thunderstorms, high winds, tornadoes	Not independently cost-effective	Initiated in 2011 HMP
12	**Wildfire Hazard Areas.** Conduct study to determine and map potential wildfire hazard areas. Priority: Medium	Public Works	$500	TBD; likely initiated in 2011	Wildfire	Not independently cost-effective, but essential in minimizing loss of life and injuries during significant storms.	Initiated in 2011 HMP

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
13	**Monitor Drought Conditions.** Continue to monitor drought conditions through contact with State Agencies. Priority: Medium	Public Works	No additional cost – uses existing staff	Ongoing	Drought	Not independently cost effective.	Ongoing
14	**Public Information Campaigns.** Cooperate and coordinate with the County and State agencies in developing public information campaigns and/or water use restrictions to ensure sufficient water pressure for fire-fighting and provision of drinking water during periods of drought. Priority: Medium	Public Works	No additional cost – uses existing staff resources	Ongoing	Drought	Very difficult to determine, but presumed very cost-effective because actions preserves essential function	Ongoing
15	**Evaluate Excess Heat Risks.** Evaluate the risks presented by excessive heat and humidity, especially in terms of high-risk populations such as the elderly/low income. Priority: Medium.	Public Works	No additional cost – uses existing staff resources	TBD; probably initiated in 2011	Extreme heat	Not independently cost-effective, but needed to develop adequate risk reduction efforts	Initiated in 2011 HMP
16	**Review Plans and Resources to Address Risk Posed By Snow and Ice Hazards During Winter Storms**. Conduct a review of the City's current plans and resources to address the risks posed by ice and snow hazards during winter storms. Focus on City's ability to respond to snow and ice emergencies, and on potentially at-risk populations in the community. Priority: Low to medium.	Public Works	No additional cost – uses existing staff resources	Ongoing	Winter storms, extreme cold, winter storm	Not independently cost-effective, but contributes to maintaining public services; protects at-risk populations	Initiated in 2011 HMP
17	**Various Mitigation Actions to Reduce Wildfire Risk.** On a case-by-case basis, develop and initiate mitigation actions to reduce the wildfire and brushfire risk. Actions may include informing property owners of appropriate actions, clearing vegetation, and monitoring antecedent conditions, among others. Priority: Low.	Fire Dept.	No additional cost – uses existing staff resources	TBD/as need is identified	Wildfire	Cost-effective, as measures tend to be in-expensive and prevent fires	Initiated in 2011 HMP

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
18	**Upgrades to At-Risk Structures.** Based on the results of the study above, initiate upgrades to at-risk structures and/or infrastructure. Mitigates specific risks to structures, people and operations. Priority: Low	Engineering, Planning, Public Works, Fire Dept.	Varies depending on measure. Funding from General Fund or FEMA grant program/s	TBD based on study	Floods, thunderstorms, high winds, tornadoes , seismic	Cost-effectiveness will vary with level of risk and project cost	TBD, but likely to be initiated no earlier than 2012
19	**Structural/Engineering Study.** Complete a detailed structural/engineering survey of Buda public facilities to ensure their soundness with respect to resisting the effects of high winds, extreme roof loading from snow or ice, and hail. Forms basis of decisions about any additional actions to mitigate risk. Priority: Low	Engineering, Planning, Public Works, Fire Dept.	To be determined, but if initiated probably from General Fund	Not yet established – to be commence d only if funding is available	Floods, thunderstorms, high winds, tornadoes, seismic	Not independently cost-effective, but the initial step in identifying appropriate mitigation actions	Initiated in 2011 HMP
20	**Understanding Dam Failure Risks.** Engage with County and State floodplain managers, engineers and emergency managers to ensure that local officials have a detailed understanding of potential risks to the community from dam and/or levee failures. Priority: Low to medium.	Engineering, Planning, Public Works, Fire Dept.	No additional cost – uses existing staff resources	Initiated in 2011, then ongoing	Dam Failure	Not independently cost-effective	Initiated in 2011 HMP
21	**Evacuation Plans.** Ensure that the jurisdiction and its citizens are aware of and understand notification and evacuation plans related to dam and/or levee failure. Priority: Low to medium.	Engineering, Planning, Public Works, Fire Dept.	No additional cost – uses existing staff resources	Initiated in 2011, then ongoing	Dam Failure	Not independently cost-effective	Initiated in 2011 HMP

1.6 Plan Adoption by the City of Buda

After the draft Plan is approved by the Texas Division of Emergency Management (TDEM) and FEMA Region VI, the 2011 Plan Update will be adopted by the Hays County Commissioners Court. The Buda City Council will also adopt the updated HMP by resolution. The City of Buda adoption resolution is provided below. A copy of the County resolutions is included in Appendix N.

Figure F-7
Adoption Resolution - City of Buda

Resolution to be inserted upon Plan adoption

Appendix C
City of Dripping Springs

Contents of this Section

1.1 Background
1.2 Public Facilities
1.3 Hazard Identification
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1.6 Plan Adoption by the City of Dripping Springs

This appendix is part of the 2011 Hays County Hazard Mitigation Plan (HMP) update, and includes jurisdiction-specific information about the City of Dripping Springs, which is one of the 11 incorporated jurisdictions within the County that is participating in the Plan update. This appendix supplements the County HMP, so only jurisdiction-specific information is included here.

1.1 Background

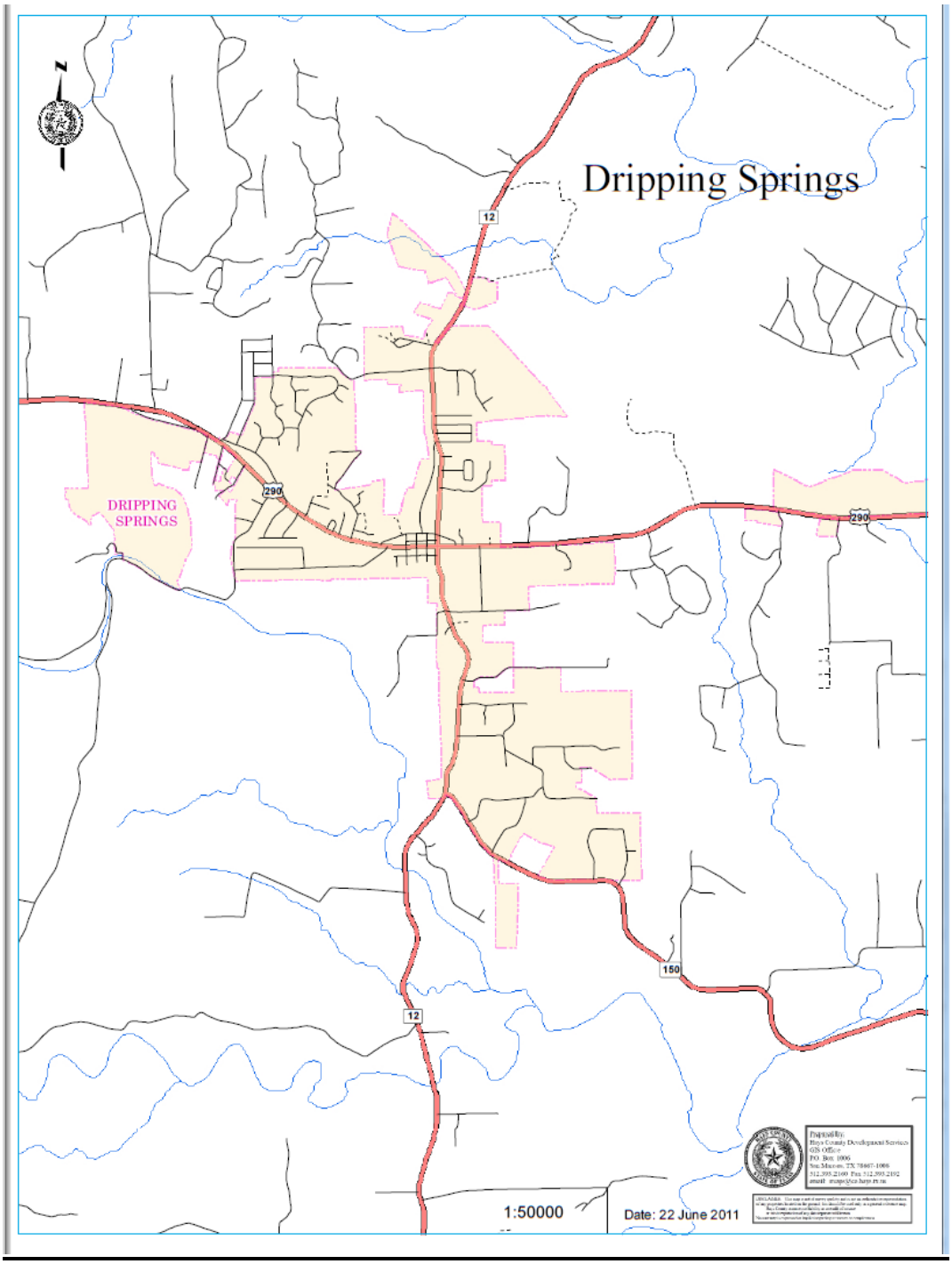
The City of Dripping Springs is located off U.S. Highway 290 approximately 25 miles west of Austin in northern Hays County. Following the great depression in the 1930s, Dripping Springs developed into the principal town in northern Hays County during the twentieth century. The City's population has slowly increased since World War II. The community of Dripping Springs was incorporated on April 4th, 1981. The City's main motivation for incorporation was to prevent the city of Austin from annexing Dripping Springs into its extraterritorial jurisdiction.[1] By the mid-1980s the City included roughly twenty businesses and more than 600 residents. By 1990 its population had risen to over 1,000, and by 2000 it had grown to 1,548.[2] The 2010 U.S. Census reported the Dripping Springs population at 1,788.[3] As of 2010 there were 723 housing units in the City.

Insert Building Permit Data if available

Figure C-1 is a map of the City of Dripping Springs, which covers approximately 3.3 square miles. See Section 3.3.1 (Geography) of the 2011 Plan update for a jurisdictional map of Hays County.

[1] The City of Dripping Springs Official Website. Information – History.
[2] Texas State Historical Association. The Handbook of Texas Online – Dripping Springs.
[3] US Census Bureau. 2010 US Census. Race, Hispanic or Latino, Age and Housing Occupancy - City of Dripping Springs.

Figure C-1
City of Dripping Springs, Texas Map
(Source: City of Dripping Springs)



1.2 Public Facilities

As part of the Hays County Plan update, the City of Dripping Springs was contacted by email and requested to provide a list of city owned facilities. As of 2010, the City owns XX public buildings. These facilities are listed below in Table C-1

Table C-1
City of Dripping Springs Public Facilities
(Source: City of Dripping Springs, Texas)

No.	Facility Name	Street Address	Year Built	Use	Square Footage	Occupancy	Structure Type	Replacement Value

1.3 Hazard Identification

Hays County has received seven Presidential Disaster Declarations since 1965, several of which have affected the City of Dripping Springs. The bullets below summarize some of the more significant events since1980.

Overview of Dripping Springs' Recent Natural Hazards History

The bullets below highlight major events that have impacted the City of Dripping Springs. Events that include the Federal Emergency Management Agency (FEMA) disaster number in parenthesis after the date indicate events that received a Presidential Disaster Declaration. The source for the past events listed was a combination of information provided by the City and the National Oceanic and Atmospheric Administration's (NOAAs) National Climatic Data Center (NCDC).

- June 20, 2007: Flood resulted in approximately $100,000 in property damage in Dripping Springs.

The 2011 Hays County HMP update includes discussions of the 11 natural hazards with potential to affect the County (see Section 5, *Hazard Identification, Profiling and Ranking*), including the jurisdictions within the County boundaries. The subsections below include only information that supplements the material in Section 5 of the County HMP.

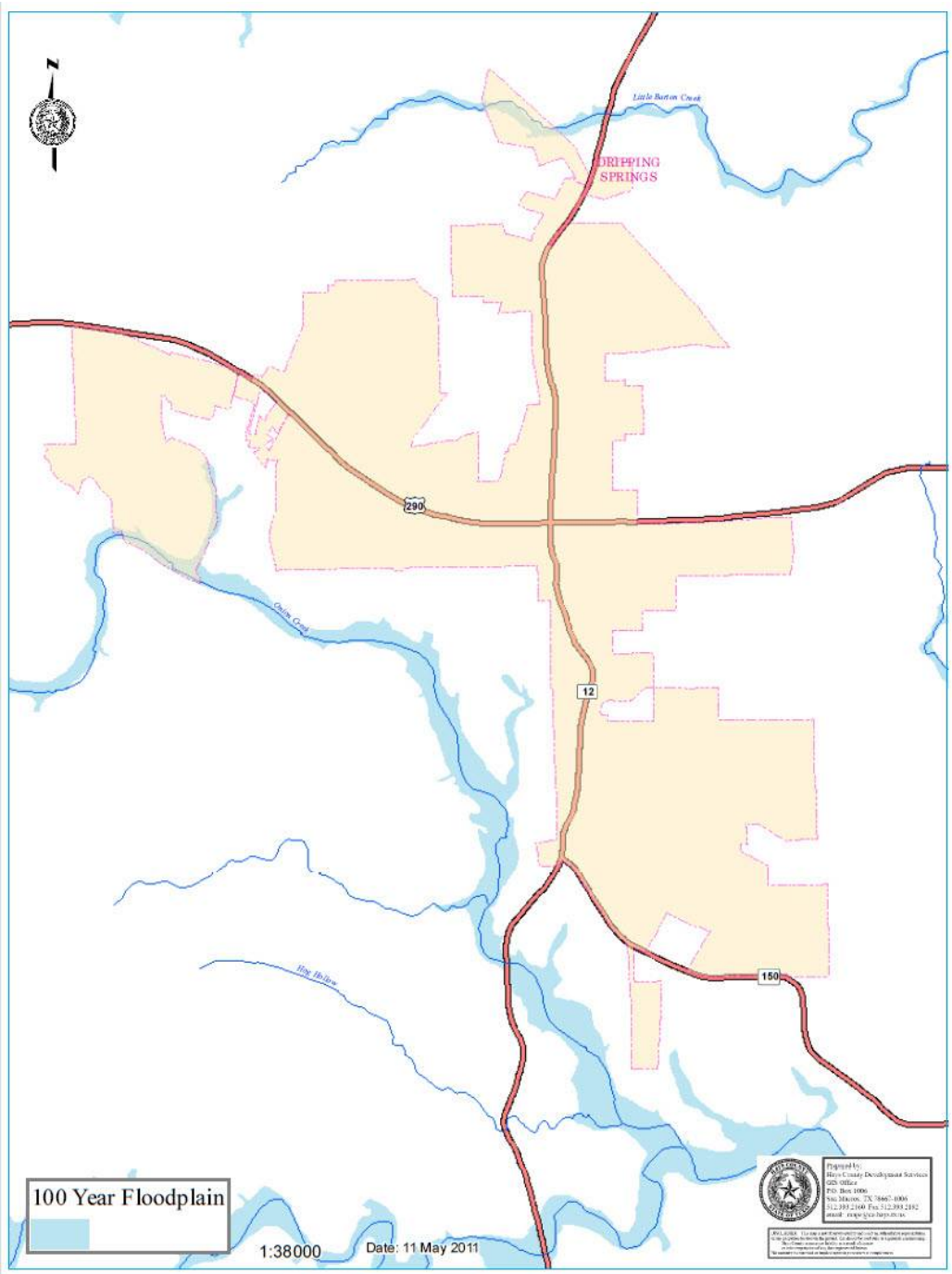
1.3.1 Floods

This subsection addresses the flood hazard. The flood subsection below includes the potential for floods caused by extreme rainfall associated with these hazards. Hazard Description. The City of Dripping Springs is vulnerable to shallow and riverine flooding. See Section 5.4.1 of the Hays County Plan update for a description of the flood hazard. Hazard Location. From a review of the FIRM for Dripping Springs, the flood hazard is primarily located along the floodplains of Onion Creek and Little Barton Creek. According to the Hays County GIS, a total of 0.06 square miles of the City (3.3 square miles total) is located within the 100-year floodplain. Dripping Springs has a total of two parcels that have some exposure to the 100-year floodplain. Various floodplain maps for the City are presented within this subsection. Severity and extent of the hazard. Flood severity is measured in various ways, including frequency, depth, velocity, duration and contamination, among others. The frequency of flooding is often the most common for judging severity. In Dripping Springs there have been no significant flood events over the past 10 years. Hazard's impact on life and property. The impacts on life and property from flooding can be significant. Property owners that have experienced repetitive flooding in the past must cope with the disruptions and costly repairs associated with flooding. Occurrences of the hazard. Based on a review of open source documents Dripping Springs has experienced no floods over the past 10 years.

One of the best sources for determining flood risk for an area is review of the Flood Insurance Rate Maps (FIRMs) produced by FEMA. The FIRM is the official map of a community on which FEMA has delineated both the special flood hazard areas (1% annual chance of flooding) and the risk premium zones applicable to the community.[4] The City of Dripping Springs is located on two FIRM panels, both with effective dates of September 2, 2005. Figure C-2 identifies the FEMA flood zones for Dripping Springs. The map shows that a section of 100-year floodplain follows Onion Creek, which generally flows in a southeasterly direction along the western and southern part of the City. In the far northern section of the City, a small section of floodplain also follows Little Barton Creek.

[4] FEMA online - Floodplain Management. Flood Insurance Rate Map (FIRM) definition

Figure C-2
City of Dripping Springs - Floodplain Map
(Source: FEMA, Effective FIRM September 2, 2005, Hays County GIS Office)



1.3.2 Tornadoes

This subsection addresses the tornado hazard. Hazard Description. The nature of the tornado hazard in this jurisdiction is considered substantially the same as for the County as a whole. Refer to HMP Section 5 for further information. Hazard Location. The hazard affects all parts of this jurisdiction approximately equally. Severity and extent of the hazard. The severity and extent of the hazard are equal across the jurisdiction. Hazard's impact on life and property. The potential impacts on life and property in this jurisdiction vary with the strength of the events. Vulnerability to the tornado hazard is directly correlated to structure type and occupancy; because of this variability, it is not possible to accurately characterize vulnerabilities across the entire jurisdiction. However, Subsection 1.4.2 below includes the results of a basic tornado risk assessment, which was conducted using best-available data at the time of the analysis. Occurrences of the hazard. Tornado occurrences are discussed in HMP Section 5. The statistical probability of these hazards impacting this jurisdiction are the same as for the County as a whole.

1.3.3 Winter Storm

This subsection addresses the winter storm hazard. Hazard Description. The nature of winter storm hazard in this jurisdiction is considered substantially the same as for the County as a whole. Refer to HMP Section 5 for further information. Hazard Location. The hazard affects all parts of this jurisdiction approximately equally. Severity and extent of the hazard. The severity and extent of the hazard are equal across the jurisdiction. Hazard's impact on life and property. The potential impacts on life and property in this jurisdiction vary with the strength of the events. Vulnerability to the winter storm hazard is directly correlated to structure type and occupancy; because of this variability, it is not possible to accurately characterize vulnerabilities across the entire jurisdiction. However, Subsection 1.4.3 below includes the results of a basic winter storm risk assessment, which was conducted using best-available data at the time of the analysis. Occurrences of the hazard. Winter storm occurrences are discussed in HMP Section 5. The statistical probability of these hazards impacting this jurisdiction are the same as for the County as a whole.

The remaining eight hazards profiled as part of the Hays County Plan update are not described within the jurisdictional appendices. The hazard descriptions in the main plan provide sufficient descriptions of these hazards, so they are not repeated in the jurisdictional appendices, although the appendices include actions to address the full range of hazards. See Section 5.4 of the Hays County Plan update for a complete profile of the other hazards.

1.4 Vulnerability Assessment and Loss Estimation

This subsection briefly summarizes the jurisdiction's vulnerabilities and estimated losses from three natural hazards: floods, tornadoes, and winter storms. Because the jurisdiction appendices in this 2011 HMP update have been standardized, in some cases there will be very little risk evident in certain communities, and therefore minimal information in these subsections. The methodologies for completing these analyses are described in Section 6 (and hazard-specific subsections) of the HMP, and are not repeated here.

1.4.1 Flood Loss Estimation

The City of Dripping Springs has been a member of the National Flood Insurance Program (NFIP) since February, 1998. In some municipalities within Hays County, a flood risk assessment can be performed based on analysis of NFIP data on repetitive flood loss properties. The NFIP defines repetitive loss properties as those that have received at least two NFIP insurance payments of more than $1,000 each in any rolling ten-year period. As of May 2010, Hays County had 32 such properties (all residential and no non-residential properties), based on a query of the FEMA BureauNet NFIP interface. Of this total, none were located within the City of Dripping Springs. With no NFIP repetitive loss properties in Dripping Springs an analysis of repetitive loss properties was not performed.

In some cases the number of policies in force (i.e. the number of flood insurance policies currently valid and active in a community) may be a proxy for flood risk. The table below compares the number of policies and claim statistics for the City of Dripping Springs with Hays County. The Table indicates that as of March, 2011, the City of Dripping Springs had four NFIP policies in force valued at $1,225,000. The table also shows that between 1998 and 2010, there have been no NFIP insurance claims in Dripping Springs.[5]

Table C-2
Comparison of NFIP Claims for the City of Dripping Springs with Hays County
(Source: FEMA – NFIP Statistics, March, 2011)

City/County Name	# of Polices In-Force	Insurance In-Force	# of Losses	Total Paid Claims
City of Dripping Springs	4	$1,225,000	0	$0
Hays County	521	$130,165,500	236	$3,514,972

[5] FEMA – Policy and Claim Statistics for Flood Insurance

1.4.2 Tornado Loss Estimation

Relative to other parts of the nation, the overall tornado risk is moderate in Hays County and the City of Dripping Springs. There is significant enough exposure to the hazard to perform a simple risk assessment to characterize the potential future losses. The tornado loss estimation for the City of Dripping Springs was calculated using FEMA's Benefit-Cost Analysis Tool (BCAR) software (version 4.5.5.0). The BCAR analysis methodology and tornado element of the software are based entirely on avoided injuries and fatalities. As a result, it is not necessary to separate public assets from private ones in order to estimate potential future losses (risk) – the calculation is based on the population at risk, rather than the square footage or value of buildings or functions. The table below summarizes data inputs and expected losses over a 50-year planning horizon.

Table C-3
Tornado Risk Assessment - Project Information
(Source: FEMA BCA Software, Version 4.5.5.0)

Data	Value
Loss estimation horizon (in years)	50
Population (2010 US Census)	1,788
Zip Code used as center of analysis	78676
Radius in miles for access to safe room	1.02
Assumed safe room structure design wind speed (mph)	200
Occupancy – Jurisdictional facilities	
Assumed structure type: residential properties	Wood-frame, one- or two-story
Assumed structure type: jurisdiction-owned facilities	
Estimated annual losses (jurisdiction-owned facilities)	
Estimated losses – 50-year horizon (jurisdiction-owned facilities)	
Estimated Annual losses (residential property)	**$109,330**
Estimated losses – 50-year horizon (residential property)	**$1,508,829**

It should be noted that this result is typical of tornado analyses (i.e. that the apparent risk is very high compared to other hazards). This occurs because the analysis is based entirely on life safety, and the probabilities of events of various magnitudes combined with the relatively high values assigned to deaths and injuries indicate significant losses over long time horizons. See Section 6.3.2, *Tornado Wind Risk in Hays County*, of the Plan update to see how the residential tornado risk in the City of Dripping Springs compares with the risk to the other municipalities in Hays County.

1.4.3 Winter Storm Loss Estimation

This analysis is based on information provided by the County and community, and uses data from the National Climatic Data Center (NCDC) and estimates from the 2010 U.S. Census. The estimated annual and 100-year risk for each jurisdiction was calculated as a proportion of the total winter storm risk for Hays County. Additional information about the methodology is found in Section 6 of the HMP. Jurisdiction-specific information and analysis output are provided in the table below.

Table C-4
City of Dripping Springs Winter Storm Loss Estimates
Data Parameters and Summary of Results
(Source: FEMA BCA Software, Version 4.5.5.0)

Data	Value
Winter storm events	9
Reporting Years	14
Average annual number of winter storm events	0.64
Total reported damages (Hays County)	$7,500,000
Annual damages (Hays County)	$535,714
Hays County Population (2010 US Census)	157,107
Dripping Springs Population (2010 US Census)	1,788
Percent of County Population	1.14%
Estimated Annual losses	**$6,097**
Estimated losses – 100-year horizon	**$87,002**

See Section 6.3.4, *Winter Storm Risk in Hays County*, of the Plan update to see how the winter storm risk in the City of Dripping Springs compares with the risk to the other municipalities in Hays County.

1.5 Mitigation Actions

The table below lists prioritized mitigation projects and actions identified by the City of Dripping Springs. The list was prioritized by the community using the STAPLEE methodology – see Section 7 of the County HMP for a discussion of this methodology. All of the original actions for Dripping Springs (Action Items 1-7) remain in the table for reference purposes. Completed actions are noted in the status column, but also have the action number and action item description highlighted with ~~strikethrough~~ text to indicate completion. Action items 8 – 19 have been added as part of the 2011 Plan update.

Table C-5
City of Dripping Springs Mitigation Actions

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
Note: Action Items 1-7 were identified from the original Hays Co. HMP.							
1	**Reduce Flood Losses and Increase Flood Insurance Coverage in Hays County.** Increasing the flood insurance policy base in Hays County will provide financial relief to property owners and renters that are flooded in future disaster events. By relying on flood insurance property owners and renters have economic security and do not have to rely on a disaster event being declared as a Presidential Declared Disaster. This action was labeled F-2 from the original Plan.	City of Dripping Springs	Cost and Funding: Existing staff resources, no cost	2011 with improvements annually through 2015	Flood	Not independently cost-effective	Ongoing
2	**Adopt 'Higher Standard" Flood Damage Prevention Ordinances.** By adopting "higher standard" requirements, new buildings, infrastructure and critical facilities have a reduced risk of loss of life and property damage during a flood event. Communities are encouraged to follow the guidance outlined in EO 11988 where critical facilities are protected to the 500-year (0.2% annual chance flood event) elevation. This action was labeled F-5 from the original Plan.	City of Dripping Springs	Cost and Funding: Existing staff resources, no cost	2012 and 2013	Flood	Not independently cost-effective	To be completed

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
3	**Provide Training for Local Floodplain Managers and Certified Floodplain Managers (CFM's).** By increasing training for local floodplain managers and CFM"s there should be improved local floodplain management programs, reduced risk of loss of life, and new buildings and infrastructure have a reduced risk of damage during a flood event. The City of San Marcos and/or Hays County would be the logical communities to provide floodplain management training such as hosting FEMA"s FPM Training Course, "Managing Floodplain Development through the NFIP", hosting NFIP Workshops, and hosting Community Rating System (CRS) Workshops. These training opportunities would assist local communities and provide continuing education credits (CEC"s) for local floodplain administrators, certified floodplain managers (CFM"s), engineers, surveyors and the general public. This action was labeled F-8 from the original Plan.	City of Dripping Springs	Cost and Funding: Existing staff resources, no cost	Annually 2011 – 2015	Flood	Not independently cost-effective	Ongoing
4	**Improve Emergency Communication Capabilities.** By improving emergency communications Hays County and participating communities can respond faster and coordinate better to save lives and reduce property damage during disaster events. This action was labeled E-2 from the original Plan.	City of Dripping Springs	$620,000 Funding: Capital Area Planning Council (CAPCO), Texas DEM	Phased over 5 years (2011-2015)	Multi-hazard	Not independently cost-effective, but critical for saving lives	Ongoing

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
5	**Development of and maintenance of countywide and individual community HAZMAP Plans.** Develop and formally adopt HAZMAP plans prior to the November 2004 deadline established by the Disaster Mitigation Act of 2000. Develop procedures to conduct annual reviews and updates to maintain countywide and individual community HAZMAP plans. Provide annual training opportunities for community emergency managers to assist in the planning and plan maintenance efforts. Create and maintain multi-jurisdictional HAZMAP databases and GIS mapping to support countywide and individual community HAZMAP maintenance efforts. This action was labeled E-5 from the original Plan.	City of Dripping Springs	Existing staff resources	Original Plan adopted in 2006 – update underway	Multi-hazard	Not independently cost-effective	Original HMP Complete. Plan update to be adopted in 2011.
6	**Storm Ready Designation for Hays County Communities** Storm Ready is a proven mitigation action. By Hays County and participating communities becoming Storm Ready Communities there can be mitigation actions in place to save lives and reduce property damage during disaster events. This action was labeled E-6 from the original Plan.	City of Dripping Springs	Cost and Funding: Existing staff resources, no cost	Phased over five years 2011-2015	Flood / Tornado / Tropical Storm and Cyclones	Not independently cost-effective, but critical for saving lives and minimizing injuries	Ongoing

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
7	**Reduce Impacts of Extreme Heat on Elderly, Disabled, Low-Income and Infants.** This Mitigation Action is for Hays County and participating community Emergency Managers to launch a public notification effort during extreme heat periods urging elderly and low income persons to seek help if needed. Volunteer organizations such as Rotary International, Lions Club, Jaycees, Red Cross, United Way, and others should be urged to participate. Power Companies will be notified by the Wichita County Emergency Manager and requested to participate in the effort to distribute box fans and make minor repairs to air conditioners. The Hays County OEM will coordinate with participating community emergency managers and take the lead to initiate this Mitigation Action. The initial action will include newspaper and radio announcements and public information on both the Hays County and City of San Marcos websites. Public announcements will define the hazard, describe heat related health risks and provide tips on how to prevent illness. Health care officials can play an important role in this mitigation action by providing information to newspapers and radio stations. This action was labeled Heat-1 from the original Plan.	Hays County OEM and Local ESD	$ 2,000 to purchase and distribute 100 box fans $ 3,000 estimated cost for a/c repairs Funding Sources: United Way Rotary Clubs Lions Clubs Red Cross Churches and charitable organizations Power Companies	Periods of Extreme Heat May be annually	Extreme Heat	Not independently cost-effective	Ongoing
8	**Promote Flood Insurance.** Promote the purchase of Flood insurance. Advertise the availability, cost, and coverage of Flood insurance through the National Flood Insurance Program (NFIP). Develop NFIP brochure and promote using City website and newsletter. Priority: High	City of Dripping Springs	$2,000	Ongoing	Flood	Not independently cost-effective, but the initial step in identifying appropriate mitigation actions	Ongoing

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
9	**Increase Public Awareness of Hazards.** Increase public awareness of hazards and hazardous areas. Distribute public awareness information regarding flood hazards, SFHAs, and potential mitigation measures using the local newspaper, utility bill inserts, inserts in the phone book, a City hazard awareness website, and an educational program for school age children or "how to" classes in retrofitting by local merchants. Integrate "Disaster Resistance Education" into the public school curriculum. Provide public education on the importance of maintaining the ditches. Priority: Medium	City of Dripping Springs	$2,000	ongoing	Floods / Thunderstorms-high winds / Tornadoes /	Not independently cost-effective	Initiated in 2011 HMP
10	**Wildfire Hazard Areas.** Conduct study to determine and map potential wildfire hazard areas. Priority: Medium	City of Dripping Springs	$500	TBD; likely initiated in 2011	Wildfire	Not independently cost-effective, but essential in minimizing loss of life and injuries during significant storms.	Initiated in 2011 HMP
11	**Monitor Drought Conditions.** Continue to monitor drought conditions through contact with State Agencies. Priority: Medium	City of Dripping Springs	No additional cost – uses existing staff	Ongoing	Drought	Not independently cost effective.	Ongoing
12	**Public Information Campaigns.** Cooperate and coordinate with the County and State agencies in developing public information campaigns and/or water use restrictions to ensure sufficient water pressure for fire-fighting and provision of drinking water during periods of drought. Priority: Medium	City of Dripping Springs	No additional cost – uses existing staff resources	Ongoing	Drought	Very difficult to determine, but presumed very cost-effective because actions preserves essential function	Ongoing
13	**Evaluate Excess Heat Risks.** Evaluate the risks presented by excessive heat and humidity, especially in terms of high-risk populations such as the elderly/low income. Priority: Medium.	City of Dripping Springs	No additional cost – uses existing staff resources	TBD; probably initiated in 2011	Extreme heat	Not independently cost-effective, but needed to develop adequate risk reduction efforts	Initiated in 2011 HMP

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
14	**Review Plans and Resources to Address Risk Posed By Snow and Ice Hazards During Winter Storms**. Conduct a review of the City's current plans and resources to address the risks posed by ice and snow hazards during winter storms. Focus on City's ability to respond to snow and ice emergencies, and on potentially at-risk populations in the community. Priority: Low to medium.	City of Dripping Springs	No additional cost – uses existing staff resources	Ongoing	Winter storms/ Extreme Cold / Ice Storm	Not independently cost-effective, but contributes to maintaining public services; protects at-risk populations	Initiated in 2011 HMP
15	**Various Mitigation Actions to Reduce Wildfire Risk.** On a case-by-case basis, develop and initiate mitigation actions to reduce the wildfire and brushfire risk. Actions may include informing property owners of appropriate actions, clearing vegetation, and monitoring antecedent conditions, among others. Priority: Low.	City of Dripping Springs	No additional cost – uses existing staff resources	TBD/as need is identified	Wildfire	Cost-effective, as measures tend to be in-expensive and prevent fires	Initiated in 2011 HMP
16	**Upgrades to At-Risk Structures.** Based on the results of the study above, initiate upgrades to at-risk structures and/or infrastructure. Mitigates specific risks to structures, people and operations. Priority: Low	City of Dripping Springs	Varies depending on measure. Funding from General Fund or FEMA grant program/s	TBD based on study	Tornadoes, Thunderstorm Wind, Winter Storm, Hail	Cost-effectiveness will vary with level of risk and project cost	TBD, but likely to be initiated no earlier than 2012
17	**Structural/Engineering Study.** Complete a detailed structural/engineering survey of Dripping Springs public facilities to ensure their soundness with respect to resisting the effects of high winds, extreme roof loading from snow or ice, and hail. Forms basis of decisions about any additional actions to mitigate risk. Priority: Low	City of Dripping Springs	To be determined, but if initiated probably from General Fund	Not yet established – to be commence d only if funding is available	Tornadoes, Thunderstorm Wind, Winter Storm, Hail	Not independently cost-effective, but the initial step in identifying appropriate mitigation actions	Initiated in 2011 HMP

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
18	**Understanding Dam Failure Risks.** Engage with County and State floodplain managers, engineers and emergency managers to ensure that local officials have a detailed understanding of potential risks to the community from dam and/or levee failures. Priority: Low to medium.	City of Dripping Springs	No additional cost – uses existing staff resources	Initiated in 2011, then ongoing	Dam Failure	Not independently cost-effective	Initiated in 2011 HMP
19	**Evacuation Plans.** Ensure that the jurisdiction and its citizens are aware of and understand notification and evacuation plans related to dam and/or levee failure. Priority: Low to medium.	City of Dripping Springs	No additional cost – uses existing staff resources	Initiated in 2011, then ongoing	Dam Failure	Not independently cost-effective	Initiated in 2011 HMP

1.6 Plan Adoption by the City of Dripping Springs

After the draft Plan is approved by the Texas Division of Emergency Management (TDEM) and FEMA Region VI, the 2011 Plan Update will be adopted by the Hays County Commissioners Court. The Dripping Springs City Council will also adopt the updated HMP by resolution. The City of Dripping Springs adoption resolution is provided below. A copy of the Hays County resolution is included in Appendix N.

Figure C-3
Adoption Resolution - City of Dripping Springs

Resolution to be inserted upon Plan adoption

Appendix D
City of Hays

Contents of this Section

1.1 Background
1.2 Public Facilities
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1.6 Plan Adoption by the City of Hays

This appendix is part of the 2011 Hays County Hazard Mitigation Plan (HMP) update, and includes jurisdiction-specific information about the City of Hays, which is one of the 11 incorporated jurisdictions within the County that is participating in the Plan update. This appendix supplements the County HMP, so only jurisdiction-specific information is included here.

1.1 Background

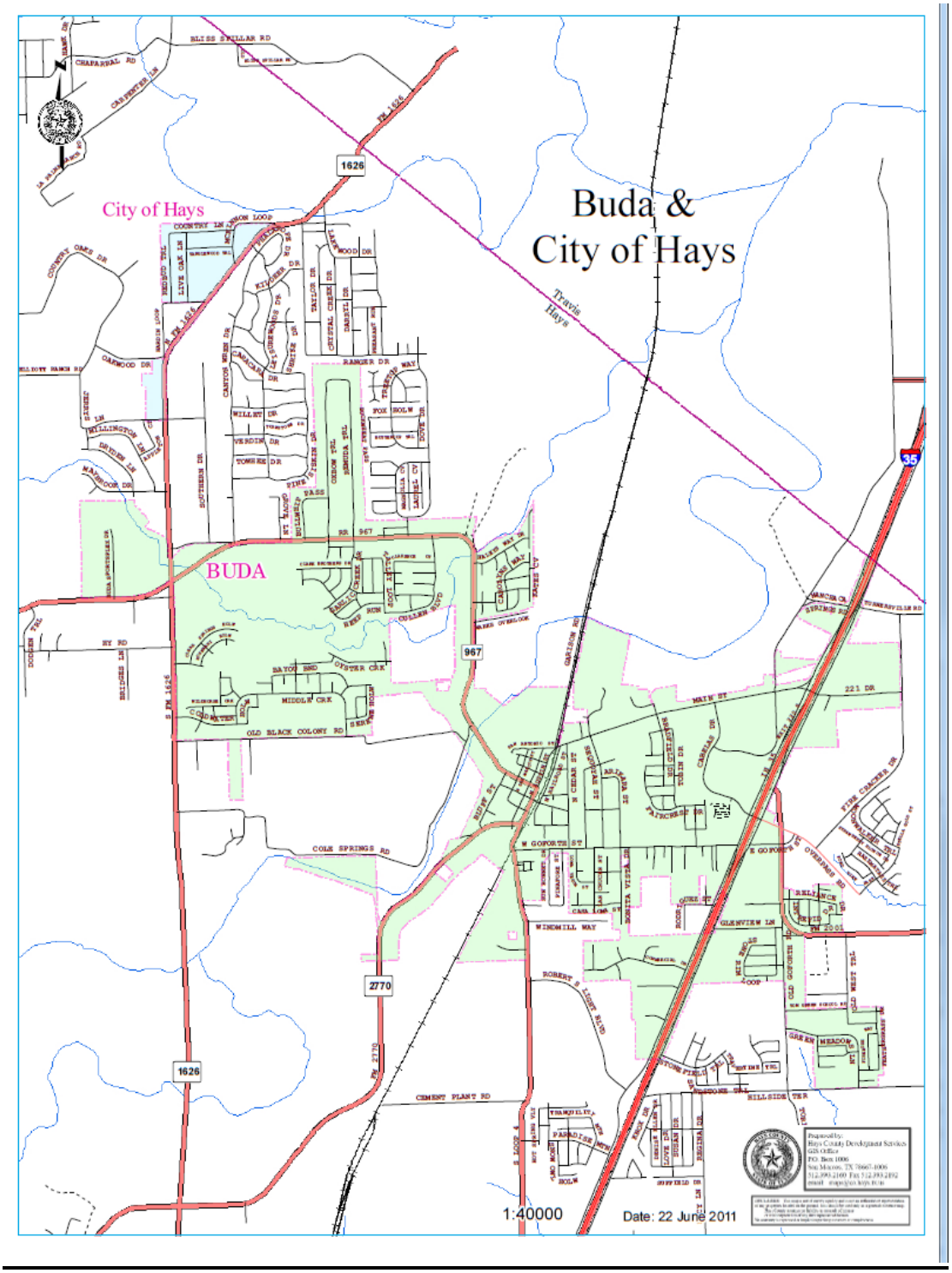
The City of Hays is located in northeastern Hays County, approximately three miles northwest of Buda adjacent to FM 1626. The City of Hays was founded in the 1970s following a movement to incorporate the Country Estates subdivision. The 2010 U.S. Census reported the City of Hays population at 217.[1] This is a slight decline from the 2000 Census, which reported the population at 233. Between 2000 and 2010, the population has decreased 6.8 percent. As of 2010 there were 92 housing units in the City.

The City of Hays has not issued any building permits in the past 5 years.

Figure D-1 is a map of the City of Hays, which covers approximately 0.2 square miles. See Section 3.3.1 (Geography) of the 2011 Plan update for a jurisdictional map of Hays County.

[1] US Census Bureau. 2010 US Census. Race, Hispanic or Latino, Age and Housing Occupancy - City of Hays.

Figure D-1
City of Hays, Texas Map
(Source: Hays County Development Services – GIS Office)



1.2 Public Facilities

As part of the Hays County Plan update, the City of Hays was contacted by email and requested to provide a list of city owned facilities. As of 2010, the City owns 1 public building. This facilities is listed below in Table D-1. The occupancy was estimated based on the size and use of the building.

Table D-1
City of Hays Public Facilities
(Source: City of Hays, Texas)

No.	Facility Name	Street Address	Year Built	Use	Square Footage	Occu-pancy	Structure Type	Replacement Value
1	City Hall	520 County Lane	1998	Multipurpose/City	1,400	3	1-story masonry	$152,000

Figure D-2 is the City of Hays City Hall.

Figure D-2
City of Hays Coty Hall
(Source: City of Hays)

1.3 Hazard Identification

Hays County has received seven Presidential Disaster Declarations since 1965, several of which have affected the City of Hays. The bullets below summarize some of the more significant events since 1980.

Overview of Hays's Recent Natural Hazards History

The bullets below highlight major events that have impacted the City of Hays. Events that include the Federal Emergency Management Agency (FEMA) disaster number in parenthesis after the date indicate events that received a Presidential Disaster Declaration. The source for the past events listed was a combination of information provided by the City and the National Oceanic and Atmospheric Administration's (NOAAs) National Climatic Data Center (NCDC).

The 2011 Hays County HMP update includes discussions of the 11 natural hazards with potential to affect the County (see Section 5, *Hazard Identification, Profiling and Ranking*), including the jurisdictions within the County boundaries. The subsections below include only information that supplements the material in Section 5 of the County HMP.

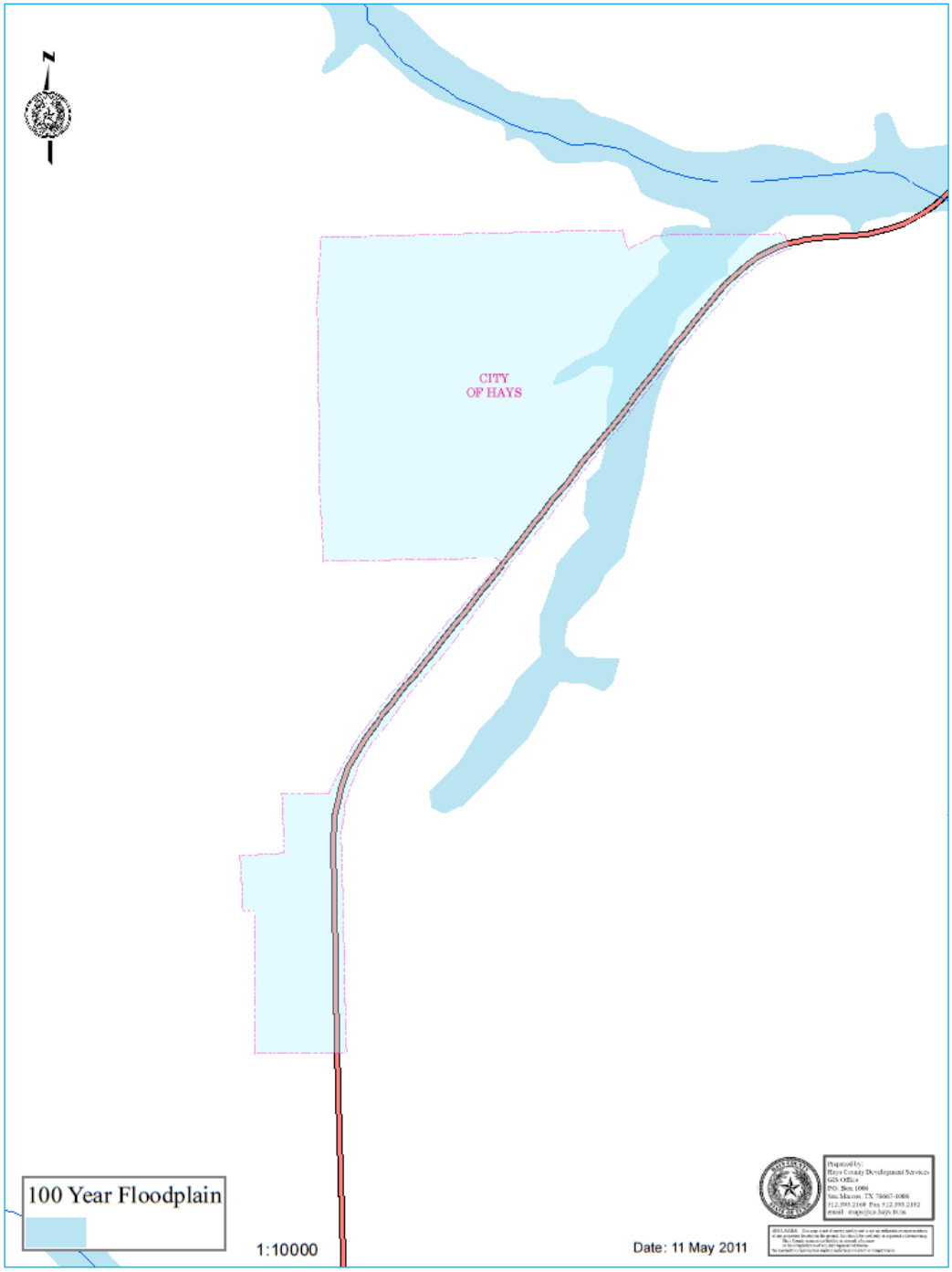
1.3.1 Floods

This subsection addresses the flood hazard. The flood subsection below includes the potential for floods caused by extreme rainfall associated with these hazards. Hazard Description. The City of Hays is vulnerable to shallow and riverine flooding. See Section 5.4.1 of the Hays County Plan update for a description of the flood hazard. Hazard Location. From a review of the FIRM for the City of Hays, the flood hazard is primarily located along the floodplain of an unnamed Creek. According to the Hays County GIS, a total of 0.02 square miles of the City (0.2 square miles total) is located within the 100-year floodplain. The City of Hays has a total of five parcels that have some exposure to the 100-year floodplain. Various floodplain maps for the City are presented within this subsection. Severity and extent of the hazard. Flood severity is measured in various ways, including frequency, depth, velocity, duration and contamination, among others. The frequency of flooding is often the most common for judging severity. In the City of Hays there have been no significant flood events over the past 10 years. Hazard's impact on life and property. The impacts on life and property from flooding can be significant. Property owners that have experienced repetitive flooding in the past must cope with the disruptions and costly repairs associated with flooding. Occurrences of the hazard. Based on a review of open source documents the City of Hays has experienced no floods over the past 10 years.

One of the best sources for determining flood risk for an area is review of the Flood Insurance Rate Maps (FIRMs) produced by FEMA. The FIRM is the official map of a community on which FEMA has delineated both the special flood hazard areas (1% annual chance of flooding) and the risk premium zones applicable to the community.[2] The City of Hays is located on four FIRM panels, all with effective dates of September 2, 2005. Figure D-3 identifies the FEMA flood zones for the City of Hays. The map shows a section of 100-year floodplain is located in the eastern section of the City along a tributary to Little Bear Creek.

[2] FEMA online - Floodplain Management. Flood Insurance Rate Map (FIRM) definition

Figure D-3
City of Hays - Floodplain Map
(Source: FEMA, FIRM Effective September 2, 2005, Hays County GIS Office)



1.3.2 Tornadoes

This subsection addresses the tornado hazard. Hazard Description. The nature of the tornado hazard in this jurisdiction is considered substantially the same as for the County as a whole. Refer to HMP Section 5 for further information. Hazard Location. The hazard affects all parts of this jurisdiction approximately equally. Severity and extent of the hazard. The severity and extent of the hazard are equal across the jurisdiction. Hazard's impact on life and property. The potential impacts on life and property in this jurisdiction vary with the strength of the events. Vulnerability to the tornado hazard is directly correlated to structure type and occupancy; because of this variability, it is not possible to accurately characterize vulnerabilities across the entire jurisdiction. However, Subsection 1.4.2 below includes the results of a basic tornado risk assessment, which was conducted using best-available data at the time of the analysis. Occurrences of the hazard. Tornado occurrences are discussed in HMP Section 5. The statistical probability of these hazards impacting this jurisdiction are the same as for the County as a whole.

1.3.3 Winter Storm

This subsection addresses the winter storm hazard. Hazard Description. The nature of winter storm hazard in this jurisdiction is considered substantially the same as for the County as a whole. Refer to HMP Section 5 for further information. Hazard Location. The hazard affects all parts of this jurisdiction approximately equally. Severity and extent of the hazard. The severity and extent of the hazard are equal across the jurisdiction. Hazard's impact on life and property. The potential impacts on life and property in this jurisdiction vary with the strength of the events. Vulnerability to the winter storm hazard is directly correlated to structure type and occupancy; because of this variability, it is not possible to accurately characterize vulnerabilities across the entire jurisdiction. However, Subsection 1.4.3 below includes the results of a basic winter storm risk assessment, which was conducted using best-available data at the time of the analysis. Occurrences of the hazard. Winter storm occurrences are discussed in HMP Section 5. The statistical probability of these hazards impacting this jurisdiction are the same as for the County as a whole.

The remaining eight hazards profiled as part of the Hays County Plan update are not described within the jurisdictional appendices. The hazard descriptions in the main plan provide sufficient descriptions of these hazards, so they are not repeated in the jurisdictional appendices, although the appendices include actions to address the full range of hazards. See Section 5.4 of the Hays County Plan update for a complete profile of the other hazards.

1.4 Vulnerability Assessment and Loss Estimation

This subsection briefly summarizes the jurisdiction's vulnerabilities and estimated losses from three natural hazards: floods, tornadoes, and winter storms. Because the jurisdiction appendices in this 2011 HMP update have been standardized, in some cases there will be very little risk evident in certain communities, and therefore minimal information in these subsections. The methodologies for completing these analyses are described in Section 6 (and hazard-specific subsections) of the HMP, and are not repeated here.

1.4.1 Flood Loss Estimation

The City of Hays has been a member of the National Flood Insurance Program (NFIP) since March, 1978. In some municipalities within Hays County, a flood risk assessment can be performed based on analysis of NFIP data on repetitive flood loss properties. The NFIP defines repetitive loss properties as those that have received at least two NFIP insurance payments of more than $1,000 each in any rolling ten-year period. As of May 2010, Hays County had 32 such properties (30 residential and two non-residential properties), based on a query of the FEMA BureauNet NFIP interface. Of this total, none were located within the City of Hays. With no NFIP repetitive loss properties in Hays an analysis of repetitive loss properties was not performed.

In some cases the number of policies in force (i.e. the number of flood insurance policies currently valid and active in a community) may be a proxy for flood risk. The table below compares the number of policies and claim statistics for the City of Hays with Hays County. The Table indicates that as of March, 2011, the City of Hays had no NFIP policies in force. The table also shows that between 1978 and 2010, there have been no NFIP insurance claims in Hays.[3]

Table D-2
Comparison of NFIP Claims for the City of Hays with Hays County
(Source: FEMA – NFIP Statistics, March, 2011)

City/County Name	# of Polices In-Force	Insurance In-Force	# of Losses	Total Paid Claims
City of Hays	0	$0	0	$0
Hays County	521	$130,165,500	236	$3,514,972

[3] FEMA – Policy and Claim Statistics for Flood Insurance

1.4.2 Tornado Loss Estimation

Relative to other parts of the nation, the overall tornado risk is moderate in Hays County and the City of Hays. There is significant enough exposure to the hazard to perform a simple risk assessment to characterize the potential future losses. The tornado loss estimation for the City of Hays was calculated using FEMA's Benefit-Cost Analysis Tool (BCAR) software (version 4.5.5.0). The BCAR analysis methodology and tornado element of the software are based entirely on avoided injuries and fatalities. As a result, it is not necessary to separate public assets from private ones in order to estimate potential future losses (risk) – the calculation is based on the population at risk, rather than the square footage or value of buildings or functions. The table below summarizes data inputs and expected losses over a 50-year planning horizon.

Table D-3
Tornado Risk Assessment - Project Information
(Source: FEMA BCA Software, Version 4.5.5.0)

Data	Value
Loss estimation horizon (in years)	50
Population (2010 US Census)	217
Zip Code used as center of analysis	78676
Radius in miles for access to safe room	0.25
Assumed safe room structure design wind speed (mph)	200
Occupancy – Public Facilities	Insert
Assumed structure type: residential properties	Wood-frame, one- or two-story
Assumed structure type: jurisdiction-owned facilities	Wood-frame, one-story
Estimated annual losses (jurisdiction-owned facilities)	**$486**
Estimated losses – 50-year horizon (jurisdiction-owned facilities)	**$6,707**
Estimated Annual losses (residential property)	**$13,269**
Estimated losses – 50-year horizon (residential property)	**$183,119**

It should be noted that this result is typical of tornado analyses (i.e. that the apparent risk is very high compared to other hazards). This occurs because the analysis is based entirely on life safety, and the probabilities of events of various magnitudes combined with the relatively high values assigned to deaths and injuries indicate significant losses over long time horizons. See Section 6.3.2, *Tornado Wind Risk in Hays County*, of the Plan update to see how the residential tornado risk in the City of Hays compares with the risk to the other municipalities in Hays County.

1.4.3 Winter Storm Loss Estimation

This analysis is based on information provided by the County and community, and uses data from the National Climatic Data Center (NCDC) and results from the 2010 U.S. Census. The estimated annual and 100-year risk for each jurisdiction was calculated as a proportion of the total winter storm risk for Hays County. Additional information about the methodology is found in Section 6 of the HMP. Jurisdiction-specific information and analysis output are provided in the table below.

Table D-4
City of Hays Winter Storm Loss Estimates
Data Parameters and Summary of Results
(Source: FEMA BCA Software, Version 4.5.5.0)

Data	Value
Winter storm events	9
Reporting Years	14
Average annual number of winter storm events	0.64
Total reported damages (Hays County)	$7,500,000
Annual damages (Hays County)	$535,714
Hays County Population (2010 US Census)	157,101
Hays Population (2010 US Census)	217
Percent of County Population	0.14%
Estimated Annual losses	**$740**
Estimated losses – 100-year horizon	**$10,559**

See Section 6.3.4, *Winter Storm Risk in Hays County*, of the Plan update to see how the winter storm risk in the City of Hays compares with the risk to the other municipalities in Hays County.

1.5 Mitigation Actions

The table below lists prioritized mitigation projects and actions identified by the City of Hays. The list was prioritized by the community using the STAPLEE methodology – see Section 7 of the County HMP for a discussion of this methodology. All of the original actions for Hays (Action Items 1-7) remain in the table for reference purposes. Completed actions are noted in the status column, but also have the action number and action item description highlighted with ~~strikethrough~~ text to indicate completion. Action items 8 – 19 have been added as part of the 2011 Plan update.

Table D-5
City of Hays Mitigation Actions

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
Note: Action Items 1-7 were identified from the original Hays Co. HMP.							
~~1~~	~~**Increase the number of Hays County communities that participate in the NFIP.** Accomplishing this action makes flood insurance available throughout Hays County and requires that all communities enforce the minimum requirements of the NFIP. Future buildings cannot be constructed within designated floodways and cannot be constructed below the base flood elevation. This action establishes sound floodplain management programs throughout Hays County. This action was labeled F-1 from the original Plan.~~	City of Hays	Cost and Funding: Existing staff resources, no cost	2006-2007	Flood	Not independently cost-effective	Complete. The City of Hays joined the NFIP in 1978.
2	**Adopt 'Higher Standard" Flood Damage Prevention Ordinances.** By adopting "higher standard" requirements, new buildings, infrastructure and critical facilities have a reduced risk of loss of life and property damage during a flood event. Communities are encouraged to follow the guidance outlined in EO 11988 where critical facilities are protected to the 500-year (0.2% annual chance flood event) elevation. This action was labeled F-5 from the original Plan.	City of Hays	Cost and Funding: Existing staff resources, no cost	Completed September 2011	Flood	Not independently cost-effective	Complete

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
3	**Provide Training for Local Floodplain Managers and Certified Floodplain Managers (CFM's).** By increasing training for local floodplain managers and CFM‟s there should be improved local floodplain management programs, reduced risk of loss of life, and new buildings and infrastructure have a reduced risk of damage during a flood event. The City of San Marcos and/or Hays County would be the logical communities to provide floodplain management training such as hosting FEMA‟s FPM Training Course, "Managing Floodplain Development through the NFIP", hosting NFIP Workshops, and hosting Community Rating System (CRS) Workshops. These training opportunities would assist local communities and provide continuing education credits (CEC‟s) for local floodplain administrators, certified floodplain managers (CFM‟s), engineers, surveyors and the general public. This action was labeled F-8 from the original Plan.	City of Hays	Cost and Funding: Existing staff resources, no cost	Annually 2011 – 2015	Flood	Not independently cost-effective	Ongoing
4	**Improve Emergency Communication Capabilities.** By improving emergency communications Hays County and participating communities can respond faster and coordinate better to save lives and reduce property damage during disaster events. This action was labeled E-2 from the original Plan.	City of Hays	$620,000 Funding: Capital Area Planning Council (CAPCO), Texas DEM	Phased over 5 years (2011-2015)	All hazards	Not independently cost-effective, but critical for saving lives	Ongoing

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
5	**Development of and maintenance of countywide and individual community HAZMAP Plans.** Develop and formally adopt HAZMAP plans prior to the November 2004 deadline established by the Disaster Mitigation Act of 2000. Develop procedures to conduct annual reviews and updates to maintain countywide and individual community HAZMAP plans. Provide annual training opportunities for community emergency managers to assist in the planning and plan maintenance efforts. Create and maintain multi-jurisdictional HAZMAP databases and GIS mapping to support countywide and individual community HAZMAP maintenance efforts. This action was labeled E-5 from the original Plan.	City of Hays	Existing staff resources	Original Plan adopted oin 2006	All hazards	Not independently cost-effective	Original HMP Complete. Plan update to be adopted in 2012.
6	**Storm Ready Designation for Hays County Communities** Storm Ready is a proven mitigation action. By Hays County and participating communities becoming Storm Ready Communities there can be mitigation actions in place to save lives and reduce property damage during disaster events. This action was labeled E-6 from the original Plan.	City of Hays	Cost and Funding: Existing staff resources, no cost	Phased over five years 2011-2015	Thunderstorms, high winds, tropical storms and cyclones, tornadoes, floods	Not independently cost-effective, but critical for saving lives and minimizing injuries	Ongoing

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
7	**Reduce Impacts of Extreme Heat on Elderly, Disabled, Low-Income and Infants.** This Mitigation Action is for Hays County and participating community Emergency Managers to launch a public notification effort during extreme heat periods urging elderly and low income persons to seek help if needed. Volunteer organizations such as Rotary International, Lions Club, Jaycees, Red Cross, United Way, and others should be urged to participate. Power Companies will be notified by the Wichita County Emergency Manager and requested to participate in the effort to distribute box fans and make minor repairs to air conditioners. The Hays County OEM will coordinate with participating community emergency managers and take the lead to initiate this Mitigation Action. The initial action will include newspaper and radio announcements and public information on both the Hays County and City of San Marcos websites. Public announcements will define the hazard, describe heat related health risks and provide tips on how to prevent illness. Health care officials can play an important role in this mitigation action by providing information to newspapers and radio stations. This action was labeled Heat-1 from the original Plan.	Local ESD	$ 2,000 to purchase and distribute 100 box fans $ 3,000 estimated cost for a/c repairs Funding Sources: United Way Rotary Clubs Lions Clubs Red Cross Churches and charitable organizations Power Companies	Periods of Extreme Heat May be annually	Extreme heat	Not independently cost-effective	Ongoing
8	**Promote Flood Insurance.** Promote the purchase of Flood insurance. Advertise the availability, cost, and coverage of Flood insurance through the National Flood Insurance Program (NFIP). Develop NFIP brochure and promote using City website and newsletter. Priority: High	City of Hays	$2,000	Ongoing	Flood	Not independently cost-effective, but the initial step in identifying appropriate mitigation actions	Ongoing

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
9	**Increase Public Awareness of Hazards.** Increase public awareness of hazards and hazardous areas. Distribute public awareness information regarding flood hazards, SFHAs, and potential mitigation measures using the local newspaper, utility bill inserts, inserts in the phone book, a City hazard awareness website, and an educational program for school age children or "how to" classes in retrofitting by local merchants. Integrate "Disaster Resistance Education" into the public school curriculum. Provide public education on the importance of maintaining the ditches. Priority: Medium	City of Hays	$2,000	ongoing	Floods, thunderstorms, high winds, tornadoes	Not independently cost-effective	Initiated in 2011 HMP
10	**Wildfire Hazard Areas.** Conduct study to determine and map potential wildfire hazard areas. Priority: Medium	City of Hays	$500	TBD; likely initiated in 2011	Wildfire	Not independently cost-effective, but essential in minimizing loss of life and injuries during significant storms.	Initiated in 2011 HMP
11	**Monitor Drought Conditions.** Continue to monitor drought conditions through contact with State Agencies. Priority: Medium	City of Hays	No additional cost – uses existing staff	Ongoing	Drought	Not independently cost effective.	Ongoing
12	**Public Information Campaigns.** Cooperate and coordinate with the County and State agencies in developing public information campaigns and/or water use restrictions to ensure sufficient water pressure for fire-fighting and provision of drinking water during periods of drought. Priority: Medium	City of Hays	No additional cost – uses existing staff resources	Ongoing	Drought	Very difficult to determine, but presumed very cost-effective because actions preserves essential function	Ongoing
13	**Evaluate Excess Heat Risks.** Evaluate the risks presented by excessive heat and humidity, especially in terms of high-risk populations such as the elderly/low income. Priority: Medium.	City of Hays	No additional cost – uses existing staff resources	TBD; probably initiated in 2011	Extreme heat	Not independently cost-effective, but needed to develop adequate risk reduction efforts	Initiated in 2011 HMP

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
14	**Review Plans and Resources to Address Risk Posed By Snow and Ice Hazards During Winter Storms**. Conduct a review of the City's current plans and resources to address the risks posed by ice and snow hazards during winter storms. Focus on City's ability to respond to snow and ice emergencies, and on potentially at-risk populations in the community. Priority: Low to medium.	City of Hays	No additional cost – uses existing staff resources	Ongoing	Winter storms, extreme cold, winter storm	Not independently cost-effective, but contributes to maintaining public services; protects at-risk populations	Initiated in 2011 HMP
15	**Various Mitigation Actions to Reduce Wildfire Risk.** On a case-by-case basis, develop and initiate mitigation actions to reduce the wildfire and brushfire risk. Actions may include informing property owners of appropriate actions, clearing vegetation, and monitoring antecedent conditions, among others. Priority: Low.	City of Hays	No additional cost – uses existing staff resources	TBD/as need is identified	Wildfire	Cost-effective, as measures tend to be in-expensive and prevent fires	Initiated in 2011 HMP
16	**Upgrades to At-Risk Structures.** Based on the results of the study above, initiate upgrades to at-risk structures and/or infrastructure. Mitigates specific risks to structures, people and operations. Priority: Low	City of Hays	Varies depending on measure. Funding from General Fund or FEMA grant program/s	TBD based on study	Floods, thunderstorms, high winds, tornadoes, seismic	Cost-effectiveness will vary with level of risk and project cost	TBD, but likely to be initiated no earlier than 2012
17	**Structural/Engineering Study.** Complete a detailed structural/engineering survey of Hays public facilities to ensure their soundness with respect to resisting the effects of high winds, extreme roof loading from snow or ice, and hail. Forms basis of decisions about any additional actions to mitigate risk. Priority: Low	City of Hays	To be determined, but if initiated probably from General Fund	Not yet established – to be commence d only if funding is available	Floods, thunderstorms, high winds, tornadoes, seismic	Not independently cost-effective, but the initial step in identifying appropriate mitigation actions	Initiated in 2011 HMP
18	**Understanding Dam Failure Risks.** Engage with County and State floodplain managers, engineers and emergency managers to ensure that local officials have a detailed understanding of potential risks to the community from dam and/or levee failures. Priority: Low to medium.	City of Hays	No additional cost – uses existing staff resources	Initiated in 2011, then ongoing	Dam Failure	Not independently cost-effective	Initiated in 2011 HMP

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
19	**Evacuation Plans.** Ensure that the jurisdiction and its citizens are aware of and understand notification and evacuation plans related to dam and/or levee failure. Priority: Low to medium.	City of Hays	No additional cost – uses existing staff resources	Initiated in 2011, then ongoing	Dam Failure	Not independently cost-effective	Initiated in 2011 HMP

1.6 Plan Adoption by the City of Hays

After the draft Plan is approved by the Texas Division of Emergency Management (TDEM) and FEMA Region VI, the 2011 Plan Update will be adopted by the Hays County Commissioners Court. The Hays City Council will also adopt the updated HMP by resolution. The City of Hays adoption resolution is provided below. A copy of the County resolution is included in Appendix N.

Figure D-4
Adoption Resolution - City of Hays

Resolution to be inserted upon Plan adoption

Appendix E
City of Kyle

Contents of this Section

1.1 Background
1.2 Public Facilities
1.3 Hazard Identification
1.4 Vulnerability Assessment and Loss Estimation
1.5 Mitigation Actions
1.6 Plan Adoption by the City of Kyle

This appendix is part of the 2011 Hays County Hazard Mitigation Plan (HMP) update, and includes jurisdiction-specific information about the City of Kyle, which is one of the 11 incorporated jurisdictions within the County that is participating in the Plan update. This appendix supplements the County HMP, so only jurisdiction-specific information is included here.

1.1 Background

The City of Kyle is located on Interstate Highway 35 eight miles north of San Marcos and twenty miles south of Austin in northeastern Hays County. Kyle was founded in 1881 by Captain Fergus Kyle as a stop on the International and Great Northern Railroad between Austin and San Antonio. Interstate 35 has contributed to the same north/south linear development of Kyle as a city. Over the last two decades, robust population and business growth has been experienced in the immediate Austin vicinity. This growth has now spread to the nearby rural communities, such as the City of Kyle. As a result, Kyle has experienced significant growth and development over the past decade and is currently undergoing a transformation from a primarily rural to an urbanized area.[1]

The population in the City of Kyle has also increased dramatically over the past 20 years. From 1990 to 2000 Kyle experienced growth of 139 percent when the population increased from 2,225 to 5,314. The 2010 U.S. Census estimated the Kyle population at 28,016.[2] Between 2000 and 2010, the population has increased 426 percent. A portion of this growth can be attributed to the fact that Kyle's city limits have increased significantly since 2001 through annexation. This growth can also be attributed to the remarkable changes that have occurred as Austin continues to push outward from its urban center.[3]

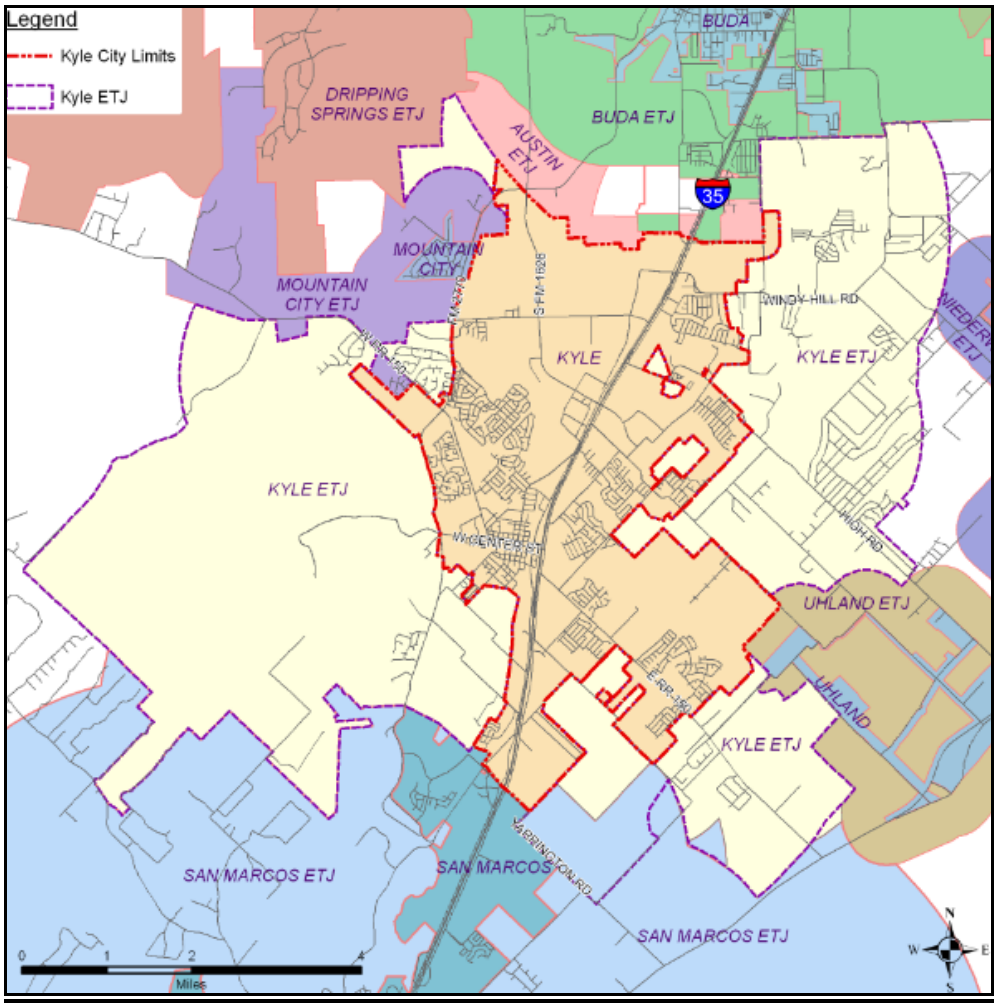
As of 2010 there were 9,226 housing units in the City.

[1] City of Kyle Comprehensive Plan. June 15, 2010
[2] US Census Bureau. 2010 US Census. Race, Hispanic or Latino, Age and Housing Occupancy - City of Kyle.
[3] City of Kyle Comprehensive Plan. June 15, 2010

	2005	2006	2007	2008	2009	2010
Residential	967	925	591	401	311	282
Commercial	11	No Info	41	67	23	24
Total	**978**	**925**	**632**	**468**	**334**	**306**

Figure E-1 is a map of the City of Kyle, which covers 18.86 square miles. See Section 3.3.1 (Geography) of the 2011 Plan update for a jurisdictional map of Hays County.

Figure E-1
City of Kyle, Texas Map
(Source: City of Kyle, GIS Department)



1.2 Public Facilities

As part of the Hays County Plan update, the City of Kyle was contacted by email and requested to provide a list of city owned facilities. As of 2011, the City owns 33 public building. These facilities are listed below in Table 1.2-1.

Table E-1
City of Kyle Public Facilities
(Source: City of Kyle, Texas)

#	Depart	Building Name	Physical Address	Approx Occupancy	Approx Sq Feet	Replacement Value
	Admin					
1		Kyle City Hall	100 W. Center St	165	16,000	$ 2,519,900.00
2		Historic Kyle City Hall	101 S. Burleson	120	5,000	$ 551,700.00
3		Kyle Train Depot	101 N. Front	40	1,350	$ 216,800.00
4		IT/VFW Building	101 S. Front	25	1,100	$ 119,100.00
5		County Annex	120 N. Front	95	10,500	$ 1,041,000.00
	Police Dept					
6		Main Administration Building	300 W Center	25	1,100	$ 269,700.00
7		Chief's Office	300 W Center	3	250	$ 7,900.00
8		Detective's Office	300 W Center	8	450	$ 33,900.00
	Library					
9		Kyle Public Library	Scott Street	225	20,000	$ 4,500,000.00
10		Kyle Community Library	409 W. Blanco St.	55	5,000	$ 460,000.00
11		Thrift Store	200 N Front	40	2,100	$ 336,300.00
	Public Works					
12		Administration	520 E. RR 150	40	4,287	$ 348,900.00

#	Depart	Building Name	Physical Address	Approx Occupancy	Approx Sq Feet	Replacement Value
13		Maintenance	520 E. RR 150	45	9,850	$ 814,100.00
14		Street Dept. Storage (white cinder block)	520 E. RR 150	2	300	$ 30,000.00
15		Well 1 & 5 Chlorine and Pump Station (white cinder block)	225 Rebel Rd.	2	200	$ 20,000.00
16		Well 1 & 5 Chlorine and Pump Station (white cinder block)	225 Rebel Rd.	2	200	$ 20,000.00
17		Well 3 Chlorine Room (white cinder block)	260 N. Old Stagecoach Rd.	2	150	$ 15,000.00
18		Well 3 Pump Station (white cinder block)	260 N. Old Stagecoach Rd.	2	100	$ 10,000.00
19		1626 Chlorine and Pump Station (white cinder block)	5155 S. FM 1626	2	200	$ 20,000.00
20		Yarrington Chlorine and Pump Station (white cinder block)	1193 Yarrington Rd.	2	100	$ 10,000.00
21		Lehman Chlorine and Pump Station (white cinder block)	150 Agate Lake Dr.	2	200	$ 20,000.00
	Parks					
22		Lake Kyle Admin Building & Restrooms	700 Lehman Rd	20	2,032	$ 250,000.00
23		City Square Park - Gazebo	Main & Miller	25	150	$ 80,000.00
24		Gregg-Clarke Park - Concession/Restrooms	Park Road 1 and Gregg Dr	15	600	$ 80,000.00
25		Gregg-Clarke Park - Pavilion/Restrooms	Park Road 1	35	250	$ 80,000.00
26		Gregg-Clarke Park - Sports Complex RR/Concession	1100 W Center	225	600	$ 80,000.00
27		Gregg-Clarke Park - Pool Office/Restrooms	1100 W Center	2	550	$ 508,700.00
28		Gregg-Clarke Park - Pool Pump Rooms	1100 W Center	2	100	$ 35,000.00
29		Maintenance Yard Main Building	225 Rebel Rd	25	2,800	$ 150,600.00
30		Maintenance Yard Storage Building	225 Rebel Rd	10	700	$ 35,000.00

#	Depart	Building Name	Physical Address	Approx Occupancy	Approx Sq Feet	Replacement Value
31		Steeplechase Park Pavilion/Restrooms	Park Road 2 and Hallie Dr	35	250	$ 25,000.00
32		Waterleaf Park Storage/Restrooms	Abundance Dr	15	250	$ 25,000.00
	Other					
33		Fire Station #2	150 Bunton Creek Rd	100	11,000	$ 968,600.00

1.3 Hazard Identification

Hays County has received seven Presidential Disaster Declarations since 1965, several of which have affected the City of Kyle. The bullets below summarize some of the more significant events since1980.

Overview of Kyle's Recent Natural Hazards History

The bullets below highlight major events that have impacted the City of Kyle. Events that include the Federal Emergency Management Agency (FEMA) disaster number in parenthesis after the date indicate events that received a Presidential Disaster Declaration. The source for the past events listed was a combination of information provided by the City and the National Oceanic and Atmospheric Administration's (NOAAs) National Climatic Data Center (NCDC).

- May 27, 1997. An F1 tornado just north and west of Kyle knocked down numerous trees and power lines. The tornado caused an estimated $5,000 in damages.
- October 22, 2000. A strong downburst from a severe thunderstorm downed trees and damaged homes between Martindale and the City of Kyle. The high winds caused approximately $15,000 in damages.
- November 15, 2001. Severe thunderstorms produced a total of 16 tornadoes in central and southern Texas. In Hays County, two F1 tornadoes formed along I-35 between mile markers 215 and 217 from 2.5 miles north of Kyle to five miles northeast of Kyle. The two tornadoes continued together for several minutes, causing extensive tree damage along the frontage road with tops of trees sheared off. Large oak tree branches between five to eight inches round were twisted and scattered across the area. Numerous road signs were bent over and twisted at the base along with uprooted trees. Several power line poles were snapped. The two tornadoes damaged a truck stop at exit #217 which sustained extensive damage to the awnings and roof. Several 18-wheelers were knocked over by the tornadoes. A hotel under construction was also damaged along with a restaurant along I-35. The Hays County Independent School District Headquarters building was also damaged. In total, over 100 homes were damaged by the tornadoes and two were destroyed. Almost 20 businesses suffered damage. Repair costs to area roads and bridges were estimated at near $500,000.
- January 13, 2007. Heavy rains produced up to seven inches of rain in the San Marcos area. Flash flooding temporarily closed roads FM 12, FM 150, and FM 621, along with many other rural roads and streets.
- June 20, 2007. Thunderstorms produced two to three inch rain totals from Kyle eastward to the Caldwell County line, with up to four inches just east of Kyle. Flash flooding temporarily closed FM 150 and FM 2001 through the early afternoon due to high water.
- May 15, 2010. A lightning strike from a severe thunderstorm struck a house in Kyle starting a fire. The house was destroyed as a result of the fire, causing approximately $100,000 in damages.

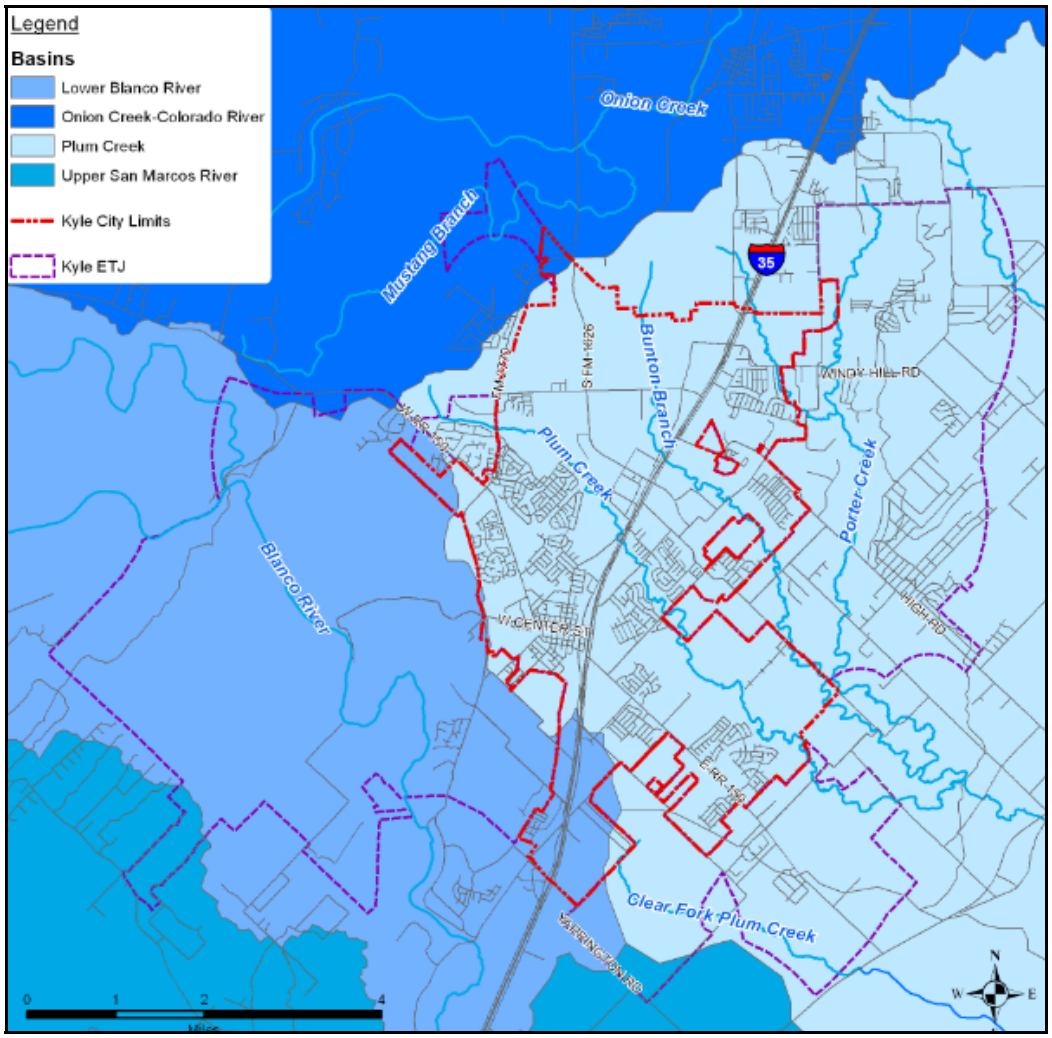
The 2011 Hays County HMP update includes discussions of the 11 natural hazards with potential to affect the County (see Section 5, *Hazard Identification, Profiling and Ranking*), including the jurisdictions within the County boundaries. The subsections below include only information that supplements the material in Section 5 of the County HMP.

1.3.1 Floods

This subsection addresses the flood hazard. The flood subsection below includes the potential for floods caused by extreme rainfall associated with these hazards. Hazard Description. The City of Kyle is vulnerable to both shallow and riverine flooding. See Section 5.4.1 of the Hays County Plan update for a description of the flood hazard. Hazard Location. From a review of the FIRM for Kyle, the flood hazard is primarily located along the floodplains of the Blanco River and Plum Creek another other smaller tributaries. According to the Kyle GIS, the City has a total of 11,020 parcels, of which 530 (or 4.8%) have exposure to the 100-year floodplain. Various floodplain maps for the City are presented within this subsection. Severity and extent of the hazard. Flood severity is measured in various ways, including frequency, depth, velocity, duration and contamination, among others. The frequency of flooding is often the most common for judging severity. In Kyle there have been two flood events over the past 10 years. Hazard's impact on life and property. The impacts on life and property from flooding can be significant. Property owners that have experienced repetitive flooding in the past must cope with the disruptions and costly repairs associated with flooding. Occurrences of the hazard. Based on a review of open source documents Kyle has recently experienced flood events in January and June of 2007. With two events over the past 10 years, the City is likely to be impacted by floods slightly less than every five years, an annual statistical probability of about 20 percent.

The City of Kyle is located within or in close proximity to four river basins that include Plum Creek, the Lower Blanco River Basin, the Onion Creek-Colorado River Basin, and the Upper San Marcos River Basin. Figure E-2 identifies the river basins in the City of Kyle and surrounding area. The map shows the majority of the City is found within the Plum Creek River Basin with a small portion located within the Lower Blanco River Basin.

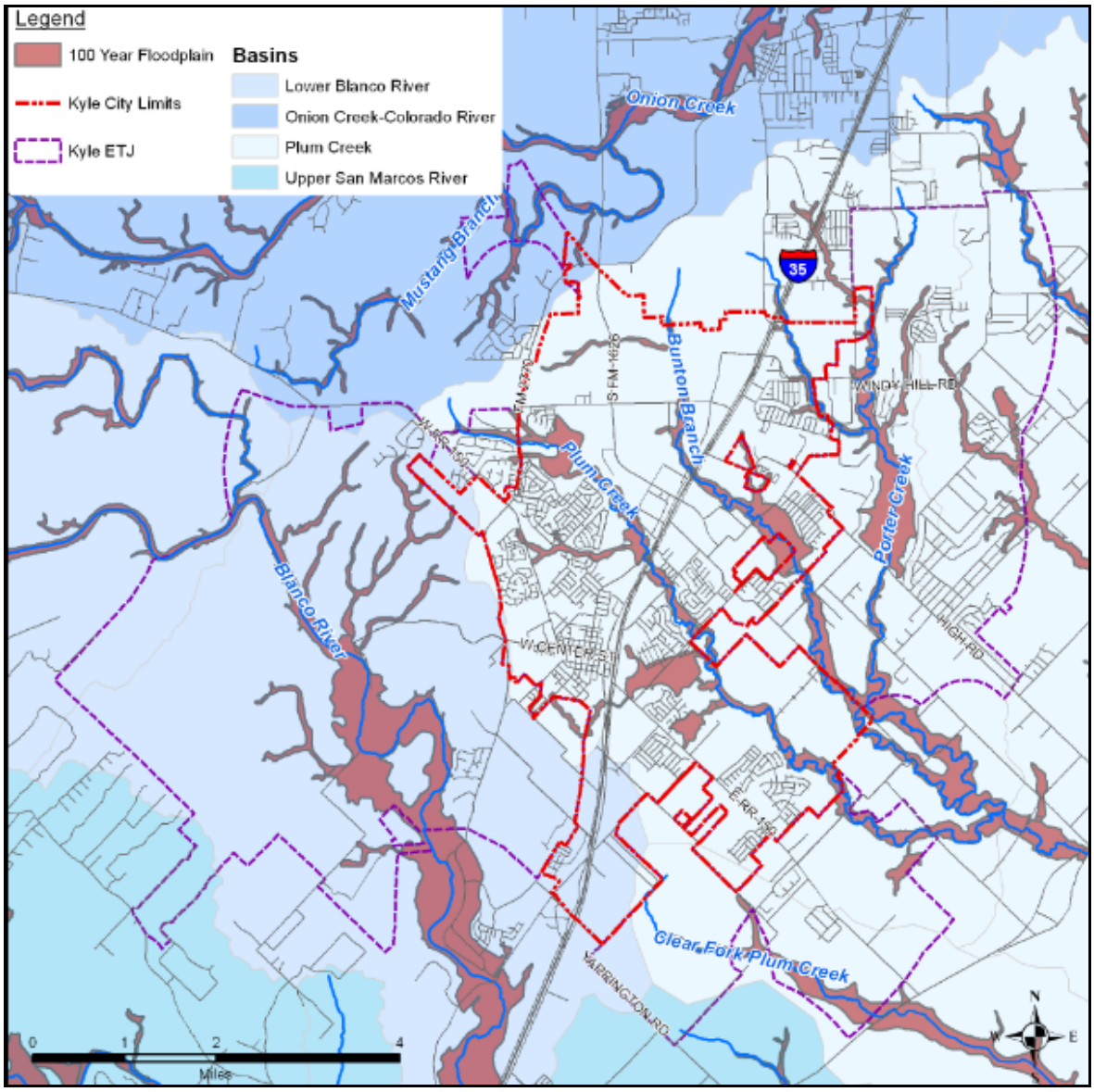
Figure E-2
City of Kyle – River Basins
(Source: City of Kyle GIS Department)



One of the best sources for determining flood risk for an area is review of the Flood Insurance Rate Maps (FIRMs) produced by FEMA. The FIRM is the official map of a community on which FEMA has delineated both the special flood hazard areas (1% annual chance of flooding) and the risk premium zones applicable to the community.[4] The City of Kyle is located on four FIRM panels, all with effective dates of September 2, 2005. Figure E-3 identifies the FEMA flood zones for Kyle. The map shows that a section of 100-year floodplain follows the Blanco River, which generally flows in a southerly direction through the western part of the City. Another section of floodplain follows Plum Creek through the central part of Kyle. Additional floodplain areas are also located along several other smaller streams and tributaries that flow throughout the City.

[4] FEMA online - Floodplain Management. Flood Insurance Rate Map (FIRM) definition

Figure E-3
City of Kyle - Floodplain Map
(Source: FEMA, Effective FIRM September 2, 2005, City of Kyle)



1.3.2 Tornadoes

This subsection addresses the tornado hazard. **Hazard Description.** The nature of the tornado hazard in this jurisdiction is considered substantially the same as for the County as a whole. Refer to HMP Section 5 for further information. **Hazard Location.** The hazard affects all parts of this jurisdiction approximately equally. **Severity and extent of the hazard.** The severity and extent of the hazard are equal across the jurisdiction. **Hazard's impact on life and property.** The potential impacts on life and property in this jurisdiction vary with the strength of the events. Vulnerability to the tornado hazard is directly correlated to structure type and occupancy; because of this variability, it is not possible to accurately characterize vulnerabilities across the entire jurisdiction. However, Subsection 1.4.2 below includes the results of a basic tornado risk assessment, which was conducted using best-available data at the time of the analysis. **Occurrences of the hazard.** Tornado occurrences are discussed in HMP Section 5. The statistical probability of these hazards impacting this jurisdiction are the same as for the County as a whole.

1.3.3 Winter Storm

This subsection addresses the winter storm hazard. **Hazard Description.** The nature of winter storm hazard in this jurisdiction is considered substantially the same as for the County as a whole. Refer to HMP Section 5 for further information. **Hazard Location.** The hazard affects all parts of this jurisdiction approximately equally. **Severity and extent of the hazard.** The severity and extent of the hazard are equal across the jurisdiction. **Hazard's impact on life and property.** The potential impacts on life and property in this jurisdiction vary with the strength of the events. Vulnerability to the winter storm hazard is directly correlated to structure type and occupancy; because of this variability, it is not possible to accurately characterize vulnerabilities across the entire jurisdiction. However, Subsection 1.4.3 below includes the results of a basic winter storm risk assessment, which was conducted using best-available data at the time of the analysis. **Occurrences of the hazard.** Winter storm occurrences are discussed in HMP Section 5. The statistical probability of these hazards impacting this jurisdiction are the same as for the County as a whole.

The remaining eight hazards profiled as part of the Hays County Plan update are not described within the jurisdictional appendices. The hazard descriptions in the main plan provide sufficient descriptions of these hazards, so they are not repeated in the jurisdictional appendices, although the appendices include actions to address the full range of hazards. See Section 5.4 of the Hays County Plan update for a complete profile of the other hazards.

1.4 Vulnerability Assessment and Loss Estimation

This subsection briefly summarizes the jurisdiction's vulnerabilities and estimated losses from three natural hazards: floods, tornadoes, and winter storms. Because the jurisdiction appendices in this 2011 HMP update have been standardized, in some cases there will be very little risk evident in certain communities, and therefore minimal information in these subsections. The methodologies for completing these analyses are described in Section 6 (and hazard-specific subsections) of the HMP, and are not repeated here.

1.4.1 Flood Loss Estimation

The City of Kyle has been a member of the National Flood Insurance Program (NFIP) since May, 1975. In some municipalities within Hays County, a flood risk assessment can be performed based on analysis of NFIP data on repetitive flood loss properties. The NFIP defines repetitive loss properties as those that have received at least two NFIP insurance payments of more than $1,000 each in any rolling ten-year period. As of May 2010, Hays County had 32 such properties (30 residential and two non-residential properties), based on a query of the FEMA BureauNet NFIP interface. Of this total, none were located within the City of Kyle. With no NFIP repetitive loss properties in Kyle an analysis of repetitive loss properties was not performed.

In some cases the number of policies in force (i.e. the number of flood insurance policies currently valid and active in a community) may be a proxy for flood risk. The table below compares the number of policies and claim statistics for the City of Kyle with Hays County. The Table indicates that as of March, 2011, the City of Kyle had 35 NFIP policies in force valued at $8,776,800. The table also shows that between 1975 and 2010, there has been one NFIP insurance claim in Kyle totaling $3,213.[5]

Table E-2
Comparison of NFIP Claims for the City of Kyle with Hays County
(Source: FEMA – NFIP Statistics, March, 2011)

City/County Name	# of Polices In-Force	Insurance In-Force	# of Losses	Total Paid Claims
City of Kyle	35	$8,776,800	1	$3,213
Hays County	521	$130,165,500	236	$3,514,972

[5] FEMA – Policy and Claim Statistics for Flood Insurance

1.4.2 Tornado Loss Estimation

Relative to other parts of the nation, the overall tornado risk is moderate in Hays County and the City of Kyle. There is significant enough exposure to the hazard to perform a simple risk assessment to characterize the potential future losses. The tornado loss estimation for the City of Kyle was calculation using FEMA's Benefit-Cost Analysis Tool (BCAR) software (version 4.5.5.0). The BCAR analysis methodology and tornado element of the software are based entirely on avoided injuries and fatalities. As a result, it is not necessary to separate public assets from private ones in order to estimate potential future losses (risk) – the calculation is based on the population at risk, rather than the square footage or value of buildings or functions. The table below summarizes data inputs and expected losses over a 50-year planning horizon.

Table E-3
Tornado Risk Assessment - Project Information
(Source: FEMA BCA Software, Version 4.5.5.0)

Data	Value
Loss estimation horizon (in years)	50
Population (2010 US Census)	28,016
Zip Code used as center of analysis	78676
Radius in miles for access to safe room	1.38
Assumed safe room structure design wind speed (mph)	200
Occupancy – Public Facilities	1,316
Assumed structure type: residential properties	Wood-frame, one- or two-story
Assumed structure type: jurisdiction-owned facilities	Varies
Estimated annual losses (jurisdiction-owned facilities)	$213,192
Estimated losses – 50-year horizon (jurisdiction-owned facilities)	$2,942,050
Estimated Annual losses (residential property)	$1,713,074
Estimated losses – 50-year horizon (residential property)	$23,641,703

It should be noted that this result is typical of tornado analyses (i.e. that the apparent risk is very high compared to other hazards). This occurs because the analysis is based entirely on life safety, and the probabilities of events of various magnitudes combined with the relatively high values assigned to deaths and injuries indicate significant losses over long time horizons. See Section 6.3.3, *Tornado Wind Risk in Hays County*, of the Plan update to see how the residential tornado risk in the City of Kyle compares with the risk to the County other municipalities in Hays County.

1.4.3 Winter Storm Loss Estimation

This analysis is based on information provided by the County and community, and uses data from the National Climatic Data Center (NCDC) and estimates from the 2010 U.S. Census. The estimated annual and 100-year risk for each jurisdiction was calculated as a proportion of the total winter storm risk for Hays County. Additional information about the methodology is found in Section 6 of the HMP. Jurisdiction-specific information and analysis output are provided in the table below.

Table E-4
City of Kyle Winter Storm Loss Estimates
Data Parameters and Summary of Results
(Source: FEMA BCA Software, Version 4.5.5.0)

Data	Value
Winter storm events	9
Reporting Years	14
Average annual number of winter storm events	0.64
Total reported damages (Hays County)	$7,500,000
Annual damages (Hays County)	$535,714
Hays County Population (2010 US Census)	157,101
Kyle Population (2010 US Census)	28,016
Percent of County Population	17.83%
Estimated Annual losses	**$95,518**
Estimated losses – 100-year horizon	**$1,363,040**

1.5 Mitigation Actions

The table below lists prioritized mitigation projects and actions identified by the City of Kyle. The list was prioritized by the community using the STAPLEE methodology – see Section 7 of the County HMP for a discussion of this methodology. All of the original actions for Kyle (Action Items 1-7) remain in the table for reference purposes. Completed actions are noted in the status column, but also have the action number and action item description highlighted with ~~strikethrough~~ text to indicate completion. Action items 8 – 19 have been added as part of the 2011 Plan update.

Table E-5
City of Kyle Mitigation Actions

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
Note: Action Items 1-7 were identified from the original Hays Co. HMP.							
1	**Reduce Flood Losses and Increase Flood Insurance Coverage in Hays County.** Increasing the flood insurance policy base in Hays County will provide financial relief to property owners and renters that are flooded in future disaster events. By relying on flood insurance property owners and renters have economic security and do not have to rely on a disaster event being declared as a Presidential Declared Disaster. This action was labeled F-2 from the original Plan.	City of Kyle	Cost and Funding: Existing staff resources, no cost	2010 with improvements annually through 2015	Flood	Not independently cost-effective	Ongoing

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
2	**Adopt 'Higher Standard" Flood Damage Prevention Ordinances.** By adopting "higher standard" requirements, new buildings, infrastructure and critical facilities have a reduced risk of loss of life and property damage during a flood event. Communities are encouraged to follow the guidance outlined in EO 11988 where critical facilities are protected to the 500-year (0.2% annual chance flood event) elevation. This action was labeled F-5 from the original Plan.	City of Kyle	Cost and Funding: Existing staff resources, no cost	2011 and 2012	Flood	Not independently cost-effective	Ongoing
3	**Provide Training for Local Floodplain Managers and Certified Floodplain Managers (CFM's).** By increasing training for local floodplain managers and CFM‟s there should be improved local floodplain management programs, reduced risk of loss of life, and new buildings and infrastructure have a reduced risk of damage during a flood event. The City of San Marcos and/or Hays County would be the logical communities to provide floodplain management training such as hosting FEMA‟s FPM Training Course, "Managing Floodplain Development through the NFIP", hosting NFIP Workshops, and hosting Community Rating System (CRS) Workshops. These training opportunities would assist local communities and provide continuing education credits (CEC‟s) for local floodplain administrators, certified floodplain managers (CFM‟s), engineers, surveyors and the general public. This action was labeled F-8 from the original Plan.	City of Kyle	Cost and Funding: Existing staff resources, no cost	Annually 2011 – 2015	All hazards	Not independently cost-effective	Ongoing

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
4	**Improve Emergency Communication Capabilities.** By improving emergency communications Hays County and participating communities can respond faster and coordinate better to save lives and reduce property damage during disaster events. This action was labeled E-2 from the original Plan.	City of Kyle	$620,000 Funding: Capital Area Planning Council (CAPCO), Texas DEM	Phased over 5 years (2011-2015)	All hazards	Not independently cost-effective, but critical for saving lives	Ongoing
5	**Development of and maintenance of countywide and individual community HAZMAP Plans.** Develop and formally adopt HAZMAP plans prior to the November 2004 deadline established by the Disaster Mitigation Act of 2000. Develop procedures to conduct annual reviews and updates to maintain countywide and individual community HAZMAP plans. Provide annual training opportunities for community emergency managers to assist in the planning and plan maintenance efforts. Create and maintain multi-jurisdictional HAZMAP databases and GIS mapping to support countywide and individual community HAZMAP maintenance efforts. This action was labeled E-5 from the original Plan.	City of Kyle and Hays County MPC	Existing staff resources	Original Plan adopted in 2006	All hazards	Not independently cost-effective	Original HMP Complete. Plan update to be adopted in 2012.
6	**Storm Ready Designation for Hays County Communities** Storm Ready is a proven mitigation action. By Hays County and participating communities becoming Storm Ready Communities there can be mitigation actions in place to save lives and reduce property damage during disaster events. This action was labeled E-6 from the original Plan.	City of Kyle	Cost and Funding: Existing staff resources, no cost	Phased over five years 2011-2015	Thunderstorms, high winds, tropical storms and cyclones, tornadoes, floods	Not independently cost-effective, but critical for saving lives and minimizing injuries	Ongoing

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
7	**Reduce Impacts of Extreme Heat on Elderly, Disabled, Low-Income and Infants.** This Mitigation Action is for Hays County and participating community Emergency Managers to launch a public notification effort during extreme heat periods urging elderly and low income persons to seek help if needed. Volunteer organizations such as Rotary International, Lions Club, Jaycees, Red Cross, United Way, and others should be urged to participate. Power Companies will be notified by the Wichita County Emergency Manager and requested to participate in the effort to distribute box fans and make minor repairs to air conditioners. The Hays County OEM will coordinate with participating community emergency managers and take the lead to initiate this Mitigation Action. The initial action will include newspaper and radio announcements and public information on both the Hays County and City of San Marcos websites. Public announcements will define the hazard, describe heat related health risks and provide tips on how to prevent illness. Health care officials can play an important role in this mitigation action by providing information to newspapers and radio stations. This action was labeled Heat-1 from the original Plan.	Local ESD	$ 2,000 to purchase and distribute 100 box fans $ 3,000 estimated cost for a/c repairs Funding Sources: United Way Rotary Clubs Lions Clubs Red Cross Churches and charitable organizations Power Companies	Periods of Extreme Heat May be annually	Extreme heat	Not independently cost-effective	Ongoing
8	**Promote Flood Insurance.** Promote the purchase of Flood insurance. Advertise the availability, cost, and coverage of Flood insurance through the National Flood Insurance Program (NFIP). Develop NFIP brochure and promote using City website and newsletter. Priority: High	City of Kyle	$2,000	Ongoing	Flood	Not independently cost-effective, but the initial step in identifying appropriate mitigation actions	Ongoing

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
9	**Increase Public Awareness of Hazards.** Increase public awareness of hazards and hazardous areas. Distribute public awareness information regarding flood hazards, SFHAs, and potential mitigation measures using the local newspaper, utility bill inserts, inserts in the phone book, a City hazard awareness website, and an educational program for school age children or "how to" classes in retrofitting by local merchants. Integrate "Disaster Resistance Education" into the public school curriculum. Provide public education on the importance of maintaining the ditches. Priority: Medium	City of Kyle	$2,000	ongoing	Floods, thunderstorms, high winds, tornadoes	Not independently cost-effective	Initiated in 2011 HMP
10	**Wildfire Hazard Areas.** Conduct study to determine and map potential wildfire hazard areas. Priority: Medium	City of Kyle and Local ESD	$500	TBD; likely initiated in 2011	Wildfire	Not independently cost-effective, but essential in minimizing loss of life and injuries during significant storms.	Initiated in 2011 HMP
11	**Monitor Drought Conditions.** Continue to monitor drought conditions through contact with State Agencies. Priority: Medium	City of Kyle	No additional cost – uses existing staff	Ongoing	Drought	Not independently cost effective.	Ongoing
12	**Public Information Campaigns.** Cooperate and coordinate with the County and State agencies in developing public information campaigns and/or water use restrictions to ensure sufficient water pressure for fire-fighting and provision of drinking water during periods of drought. Priority: Medium	City of Kyle	No additional cost – uses existing staff resources	Ongoing	Drought	Very difficult to determine, but presumed very cost-effective because actions preserves essential function	Ongoing
13	**Evaluate Excess Heat Risks.** Evaluate the risks presented by excessive heat and humidity, especially in terms of high-risk populations such as the elderly/low income. Priority: Medium.	City of Kyle	No additional cost – uses existing staff resources	TBD; probably initiated in 2011	Extreme heat	Not independently cost-effective, but needed to develop adequate risk reduction efforts	Initiated in 2011 HMP

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
14	**Review Plans and Resources to Address Risk Posed By Snow and Ice Hazards During Winter Storms**. Conduct a review of the City's current plans and resources to address the risks posed by ice and snow hazards during winter storms. Focus on City's ability to respond to snow and ice emergencies, and on potentially at-risk populations in the community. Priority: Low to medium.	City of Kyle	No additional cost – uses existing staff resources	Ongoing	Winter storms, extreme cold, winter storm	Not independently cost-effective, but contributes to maintaining public services; protects at-risk populations	Initiated in 2011 HMP
15	**Various Mitigation Actions to Reduce Wildfire Risk.** On a case-by-case basis, develop and initiate mitigation actions to reduce the wildfire and brushfire risk. Actions may include informing property owners of appropriate actions, clearing vegetation, and monitoring antecedent conditions, among others. Priority: Low.	City of Kyle	No additional cost – uses existing staff resources	TBD/as need is identified	Wildfire	Cost-effective, as measures tend to be in-expensive and prevent fires	Initiated in 2011 HMP
16	**Upgrades to At-Risk Structures.** Based on the results of the study above, initiate upgrades to at-risk structures and/or infrastructure. Mitigates specific risks to structures, people and operations. Priority: Low	City of Kyle	Varies depending on measure. Funding from General Fund or FEMA grant program/s	TBD based on study	Floods, thunderstorms, high winds, tornadoes, seismic	Cost-effectiveness will vary with level of risk and project cost	TBD, but likely to be initiated no earlier than 2012
17	**Structural/Engineering Study.** Complete a detailed structural/engineering survey of Kyle public facilities to ensure their soundness with respect to resisting the effects of high winds, extreme roof loading from snow or ice, and hail. Forms basis of decisions about any additional actions to mitigate risk. Priority: Low	City of Kyle	To be determined, but if initiated probably from General Fund	Not yet established – to be commenced only if funding is available	Floods, thunderstorms, high winds, tornadoes, seismic	Not independently cost-effective, but the initial step in identifying appropriate mitigation actions	Initiated in 2011 HMP

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
18	**Understanding Dam Failure Risks.** Engage with County and State floodplain managers, engineers and emergency managers to ensure that local officials have a detailed understanding of potential risks to the community from dam and/or levee failures. Priority: Low to medium.	City of Kyle	No additional cost – uses existing staff resources	Initiated in 2011, then ongoing	Dam Failure	Not independently cost-effective	Initiated in 2011 HMP
19	**Evacuation Plans.** Ensure that the jurisdiction and its citizens are aware of and understand notification and evacuation plans related to dam and/or levee failure. Priority: Low to medium.	City of Kyle	No additional cost – uses existing staff resources	Initiated in 2011, then ongoing	Dam Failure	Not independently cost-effective	Initiated in 2011 HMP

1.6 Plan Adoption by the City of Kyle

After the draft Plan is approved by the Texas Division of Emergency Management (TDEM) and FEMA Region VI, the 2011 Plan Update will be adopted by the Hays County Commissioners Court. The Kyle City Council will also adopt the updated HMP by resolution. The City of Kyle adoption resolution is provided below. A copy of the County resolution is included in Appendix N.

Figure E-4
Adoption Resolution - City of Kyle

Resolution to be inserted upon Plan adoption

Appendix F
Mountain City

Contents of this Section

1.1 Background
1.2 Public Facilities
1.3 Hazard Identification
1.4 Vulnerability Assessment and Loss Estimation
1.5 Mitigation Actions
1.6 Plan Adoption by Mountain City

This appendix is part of the 2011 Hays County Hazard Mitigation Plan (HMP) update, and includes jurisdiction-specific information about Mountain City, which is one of the 11 incorporated jurisdictions within the County that is participating in the Plan update. This appendix supplements the County HMP, so only jurisdiction-specific information is included here.

1.1 Background

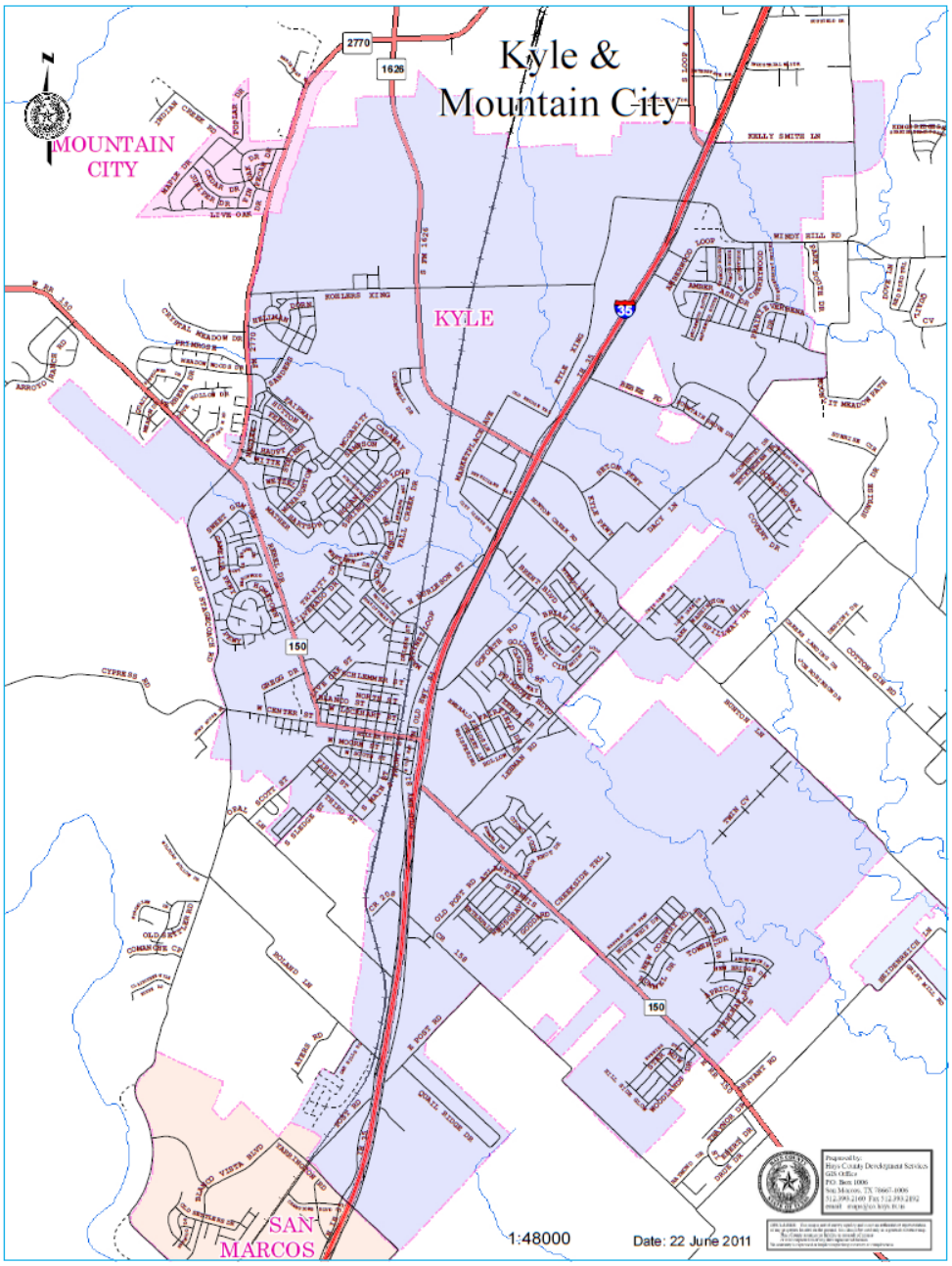
Mountain City is located 12 miles north of San Marcos in Central Hays County. The City was settled before the Civil War as the supply center for an extensive farming and ranching community. Mountain City had one of the first post offices and stagecoach stops between Austin and San Marcos. The City reportedly received its name from William Walton Haupt when he became postmaster in the late 1850's. In the 1970's, almost a century later, the towns of Wimberley, Kyle, and Buda selected the area as the site of a new consolidated school. In 1984 a subdivision previously known as Mountain City Oaks incorporated on the site under the name Mountain City and elected a mayor and city council.[1]

The population in Mountain City has remained fairly steady over the past 10 years. In 2000 the population was 671. The 2010 U.S. Census reported the Mountain City population at 648. As of 2010 there were 229 housing units in the City. [2]

Figure F-1 is a map of Mountain City, which covers approximately 0.5 square miles. See Section 3.3.1 (Geography) of the 2011 Plan update for a jurisdictional map of Hays County.

[1] Official website for Mountain City, Texas – About Mountain City
[2] US Census Bureau. 2010 US Census. Race, Hispanic or Latino, Age and Housing Occupancy - Mountain City.

Figure F-1
Mountain City, Texas Map
(Source: Hays County Development Services – GIS Office)



1.2 Public Facilities

As part of the Hays County Plan update, Mountain City was contacted by email and requested to provide a list of city owned facilities. As of 2010, the City owns 2 public building. These facilities are listed below in Table F-1.

Table F-1
Mountain City Public Facilities
(Source: Mountain City, Texas)

No.	Facility Name	Street Address	Year Built	Use	Square Footage	Occupancy	Structure Type	Replacement Value
1	City Hall	101 Mountain City Dr.	1999	City Hall	2259	NA	SFR	$225,000
2	Old City Hall	103 Mountain City Cr	1978	Rental Property	150	1-2	Portable Bldg	$20,000

Figure F-2
Photo of Mountain City City Hall Building

1.3 Hazard Identification

Hays County has received seven Presidential Disaster Declarations since 1965, several of which have affected the Mountain City. The bullets below summarize some of the more significant events since1980.

Overview of Mountain City's Recent Natural Hazards History

The bullets below highlight major events that have impacted Mountain City. Events that include the Federal Emergency Management Agency (FEMA) disaster number in parenthesis after the date indicate events that received a Presidential Disaster Declaration. The source for the past events listed was a combination of information

provided by the City and the National Oceanic and Atmospheric Administration's (NOAAs) National Climatic Data Center (NCDC).

Query results from the NCDC indicated no specific events in Mountain City and this has been confirmed by Mountain City

The 2011 Hays County HMP update includes discussions of the 11 natural hazards with potential to affect the County (see Section 5, *Hazard Identification, Profiling and Ranking*), including the jurisdictions within the County boundaries. The subsections below include only information that supplements the material in Section 5 of the County HMP.

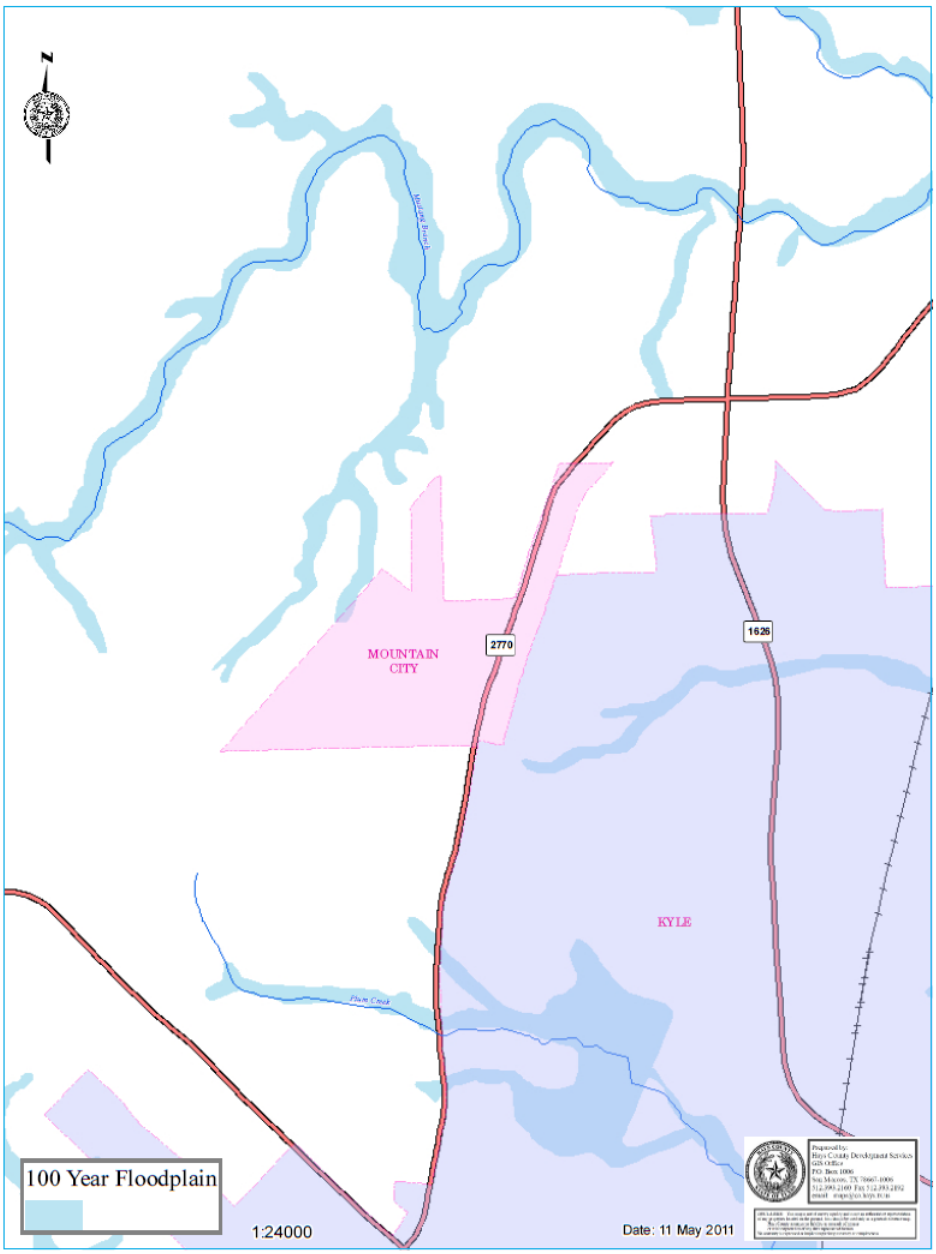
1.3.1 Floods

This subsection addresses the flood hazard. The flood subsection below includes the potential for floods caused by extreme rainfall associated with these hazards. Hazard Description. Mountain City is vulnerable to shallow and riverine flooding. See Section 5.4.1 of the Hays County Plan update for a description of the flood hazard. Hazard Location. From a review of the FIRM for Mountain City, the flood hazard is primarily located along the floodplain of Mustang Branch. Various floodplain maps for the City are presented within this subsection. Severity and extent of the hazard. Flood severity is measured in various ways, including frequency, depth, velocity, duration and contamination, among others. The frequency of flooding is often the most common for judging severity. In Mountain City there have been no significant flood events over the past 10 years. Hazard's impact on life and property. The impacts on life and property from flooding can be significant. Property owners that have experienced repetitive flooding in the past must cope with the disruptions and costly repairs associated with flooding. Occurrences of the hazard. Based on a review of open source documents Mountain City has experienced no floods over the past 10 years.

One of the best sources for determining flood risk for an area is review of the Flood Insurance Rate Maps (FIRMs) produced by FEMA. The FIRM is the official map of a community on which FEMA has delineated both the special flood hazard areas (1% annual chance of flooding) and the risk premium zones applicable to the community.[3] Mountain City is located on one FIRM panel with an effective date of September 2, 2005. Figure F-2 identifies the 100-year floodplain for Mountain City. The map shows that a small section of floodplain is located in the northwestern part of the City. The floodplain extends out from Mustang Branch, a tributary of the Blanco River.

[3] FEMA online - Floodplain Management. Flood Insurance Rate Map (FIRM) definition

Figure F-3
Mountain City - Floodplain Map
(Source: FEMA, Effective FIRM September 2, 2005, Hays County GIS Office)



1.3.2 Tornadoes

This subsection addresses the tornado hazard. **Hazard Description.** The nature of the tornado hazard in this jurisdiction is considered substantially the same as for the County as a whole. Refer to HMP Section 5 for further information. **Hazard Location.** The hazard affects all parts of this jurisdiction approximately equally. **Severity and extent of the hazard.** The severity and extent of the hazard are equal across the jurisdiction. **Hazard's impact on life and property.** The potential impacts on life and property in this jurisdiction vary with the strength of the events. Vulnerability to the tornado hazard is directly correlated to structure type and occupancy; because of this variability, it is not possible to accurately characterize vulnerabilities across the entire jurisdiction. However, Subsection 1.4.2 below includes the results of a basic tornado risk assessment, which was conducted using best-available data at the time of the analysis. **Occurrences of the hazard.** Tornado occurrences are discussed in HMP Section 5. The statistical probability of these hazards impacting this jurisdiction are the same as for the County as a whole.

1.3.3 Winter Storm

This subsection addresses the winter storm hazard. **Hazard Description.** The nature of winter storm hazard in this jurisdiction is considered substantially the same as for the County as a whole. Refer to HMP Section 5 for further information. **Hazard Location.** The hazard affects all parts of this jurisdiction approximately equally. **Severity and extent of the hazard.** The severity and extent of the hazard are equal across the jurisdiction. **Hazard's impact on life and property.** The potential impacts on life and property in this jurisdiction vary with the strength of the events. Vulnerability to the winter storm hazard is directly correlated to structure type and occupancy; because of this variability, it is not possible to accurately characterize vulnerabilities across the entire jurisdiction. However, Subsection 1.4.3 below includes the results of a basic winter storm risk assessment, which was conducted using best-available data at the time of the analysis. **Occurrences of the hazard.** Winter storm occurrences are discussed in HMP Section 5. The statistical probability of these hazards impacting this jurisdiction are the same as for the County as a whole.

The remaining eight hazards profiled as part of the Hays County Plan update are not described within the jurisdictional appendices. The hazard descriptions in the main plan provide sufficient descriptions of these hazards, so they are not repeated in the jurisdictional appendices, although the appendices include actions to address the full range of hazards. See Section 5.4 of the Hays County Plan update for a complete profile of the other hazards.

1.4 Vulnerability Assessment and Loss Estimation

This subsection briefly summarizes the jurisdiction's vulnerabilities and estimated losses from three natural hazards: floods, tornadoes, and winter storms. Because the jurisdiction appendices in this 2011 HMP update have been standardized, in some cases there will be very little risk evident in certain communities, and therefore minimal information in these subsections. The methodologies for completing these analyses are described in Section 6 (and hazard-specific subsections) of the HMP, and are not repeated here.

1.4.1 Flood Loss Estimation

The Mountain City has been a member of the National Flood Insurance Program (NFIP) since March, 1978. In some municipalities within Hays County, a flood risk assessment can be performed based on analysis of NFIP data on repetitive flood loss properties. The NFIP defines repetitive loss properties as those that have received at least two NFIP insurance payments of more than $1,000 each in any rolling ten-year period. As of May 2010, Hays County had 32 such properties (30 residential and two non-residential properties), based on a query of the FEMA BureauNet NFIP interface. Of this total, none were located within Mountain City. With no NFIP repetitive loss properties in Mountain City an analysis of repetitive loss properties was not performed.

In some cases the number of policies in force (i.e. the number of flood insurance policies currently valid and active in a community) may be a proxy for flood risk. The table below compares the number of policies and claim statistics for Mountain City with Hays County. The Table indicates that as of March, 2011, Mountain City had no NFIP policies in force. The table also shows that between 1978 and 2010, there have been no NFIP insurance claims in Mountain City.[4]

Table F-2
Comparison of NFIP Claims for Mountain City with Hays County
(Source: FEMA – NFIP Statistics, March, 2011)

City/County Name	# of Polices In-Force	Insurance In-Force	# of Losses	Total Paid Claims
Mountain City	1	$350,000	0	$0
Hays County	521	$130,165,500	236	$3,514,972

[4] FEMA – Policy and Claim Statistics for Flood Insurance

1.4.2 Tornado Loss Estimation

Relative to other parts of the nation, the overall tornado risk is moderate in Hays County and Mountain City. There is significant enough exposure to the hazard to perform a simple risk assessment to characterize the potential future losses. The tornado loss estimation for Mountain City was calculated using FEMA's Benefit-Cost Analysis Tool (BCAR) software (version 4.5.5.0). The BCAR analysis methodology and tornado element of the software are based entirely on avoided injuries and fatalities. As a result, it is not necessary to separate public assets from private ones in order to estimate potential future losses (risk) – the calculation is based on the population at risk, rather than the square footage or value of buildings or functions. The table below summarizes data inputs and expected losses over a 50-year planning horizon.

Table F-3
Tornado Risk Assessment - Project Information
(Source: FEMA BCA Software, Version 4.5.5.0)

Data	Value
Loss estimation horizon (in years)	50
Population (2010 US Census)	648
Zip Code used as center of analysis	78676
Radius in miles for access to safe room	0.39
Assumed safe room structure design wind speed (mph)	200
Occupancy – Public Facilities	
Assumed structure type: residential properties	Wood-frame, one- or two-story
Assumed structure type: jurisdiction-owned facilities	
Estimated annual losses (jurisdiction-owned facilities)	
Estimated losses – 50-year horizon (jurisdiction-owned facilities)	
Estimated Annual losses (residential property)	**$39,623**
Estimated losses – 50-year horizon (residential property)	**$546,824**

It should be noted that this result is typical of tornado analyses (i.e. that the apparent risk is very high compared to other hazards). This occurs because the analysis is based entirely on life safety, and the probabilities of events of various magnitudes combined with the relatively high values assigned to deaths and injuries indicate significant losses over long time horizons. See Section 6.3.3, *Tornado Wind Risk in Hays County*, of the Plan update to see how the residential tornado risk in Mountain City compares with the risk to the County other municipalities in Hays County.

1.4.3 Winter Storm Loss Estimation

This analysis is based on information provided by the County and community, and uses data from the National Climatic Data Center (NCDC) and estimates from the 2010 U.S. Census. The estimated annual and 100-year risk for each jurisdiction was calculated as a proportion of the total winter storm risk for Hays County. Additional information about the methodology is found in Section 6 of the HMP. Jurisdiction-specific information and analysis output are provided in the table below.

Table F-4
Mountain City Winter Storm Loss Estimates
Data Parameters and Summary of Results
(Source: FEMA BCA Software, Version 4.5.5.0)

Data	Value
Winter storm events	9
Reporting Years	14
Average annual number of winter storm events	0.64
Total reported damages (Hays County)	$7,500,000
Annual damages (Hays County)	$535,714
Hays County Population (2010 US Census)	157,101
Mountain City Population (2010 US Census)	648
Percent of County Population	0.41%
Estimated Annual losses	**$2,210**
Estimated losses – 100-year horizon	**$31,531**

1.5 Mitigation Actions

The table below lists prioritized mitigation projects and actions identified by Mountain City. The list was prioritized by the community using the STAPLEE methodology – see Section 7 of the County HMP for a discussion of this methodology. All of the original actions for Mountain City (Action Items 1-7) remain in the table for reference purposes. Completed actions are noted in the status column, but also have the action number and action item description highlighted with ~~strikethrough~~ text to indicate completion. Action items 8 – 19 have been added as part of the 2011 Plan update.

Table F-5
Mountain City Mitigation Actions

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
Note: Action Items 1-7 were identified from the original Hays Co. HMP.							
~~1~~	**Increase the number of Hays County communities that participate in the NFIP.** Accomplishing this action makes flood insurance available throughout Hays County and requires that all communities enforce the minimum requirements of the NFIP. Future buildings cannot be constructed within designated floodways and cannot be constructed below the base flood elevation. This action establishes sound floodplain management programs throughout Hays County. This action was labeled F-1 from the original Plan.	Mountain City	Cost and Funding: Existing staff resources, no cost	2006-2007	Flood	Not independently cost-effective	Complete. Mountain City joined the NFIP in 1998.

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
2	**Adopt 'Higher Standard" Flood Damage Prevention Ordinances.** By adopting "higher standard" requirements, new buildings, infrastructure and critical facilities have a reduced risk of loss of life and property damage during a flood event. Communities are encouraged to follow the guidance outlined in EO 11988 where critical facilities are protected to the 500-year (0.2% annual chance flood event) elevation. This action was labeled F-5 from the original Plan.	Mountain City	Cost and Funding: Existing staff resources, no cost	2011 to 2015	Flood	Not independently cost-effective	Ongoing
3	**Provide Training for Local Floodplain Managers and Certified Floodplain Managers (CFM's).** By increasing training for local floodplain managers and CFM‟s there should be improved local floodplain management programs, reduced risk of loss of life, and new buildings and infrastructure have a reduced risk of damage during a flood event. The City of San Marcos and/or Hays County would be the logical communities to provide floodplain management training such as hosting FEMA‟s FPM Training Course, "Managing Floodplain Development through the NFIP", hosting NFIP Workshops, and hosting Community Rating System (CRS) Workshops. These training opportunities would assist local communities and provide continuing education credits (CEC‟s) for local floodplain administrators, certified floodplain managers (CFM‟s), engineers, surveyors and the general public. This action was labeled F-8 from the original Plan.	Mountain City	Cost and Funding: Existing staff resources, no cost	Annually 2011 – 2015	Flood	Not independently cost-effective	Ongoing

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
4	**Improve Emergency Communication Capabilities.** By improving emergency communications Hays County and participating communities can respond faster and coordinate better to save lives and reduce property damage during disaster events. This action was labeled E-2 from the original Plan.	Mountain City	$620,000 Funding: Capital Area Planning Council (CAPCO), Texas DEM	Ongoing	All hazards	Not independently cost-effective, but critical for saving lives	Ongoing
5	**Development of and maintenance of countywide and individual community HAZMAP Plans.** Develop and formally adopt HAZMAP plans prior to the November 2004 deadline established by the Disaster Mitigation Act of 2000. Develop procedures to conduct annual reviews and updates to maintain countywide and individual community HAZMAP plans. Provide annual training opportunities for community emergency managers to assist in the planning and plan maintenance efforts. Create and maintain multi-jurisdictional HAZMAP databases and GIS mapping to support countywide and individual community HAZMAP maintenance efforts. This action was labeled E-5 from the original Plan.	Mountain City	Existing staff resources	Original Plan adopted on April 20, 2004 - update in 2011	All hazards	Not independently cost-effective	Original HMP Complete. Plan update to be adopted once FEMA review is complete
6	**Storm Ready Designation for Hays County Communities** Storm Ready is a proven mitigation action. By Hays County and participating communities becoming Storm Ready Communities there can be mitigation actions in place to save lives and reduce property damage during disaster events. This action was labeled E-6 from the original Plan.	Mountain City	Cost and Funding: Existing staff resources, no cost	Ongoing	Floods, thunderstorms, high winds, tropical storms/cyclonet ornadoes, hail	Not independently cost-effective, but critical for saving lives and minimizing injuries	ongoing

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
7	**Reduce Impacts of Extreme Heat on Elderly, Disabled, Low-Income and Infants.** This Mitigation Action is for Hays County and participating community Emergency Managers to launch a public notification effort during extreme heat periods urging elderly and low income persons to seek help if needed. Volunteer organizations such as Rotary International, Lions Club, Jaycees, Red Cross, United Way, and others should be urged to participate. Power Companies will be notified by the Wichita County Emergency Manager and requested to participate in the effort to distribute box fans and make minor repairs to air conditioners. The Hays County OEM will coordinate with participating community emergency managers and take the lead to initiate this Mitigation Action. The initial action will include newspaper and radio announcements and public information on both the Hays County and City of San Marcos websites. Public announcements will define the hazard, describe heat related health risks and provide tips on how to prevent illness. Health care officials can play an important role in this mitigation action by providing information to newspapers and radio stations. This action was labeled Heat-1 from the original Plan.	Local ESD	$ 2,000 to purchase and distribute 100 box fans $ 3,000 estimated cost for a/c repairs Funding Sources: United Way Rotary Clubs Lions Clubs Red Cross Churches and charitable organizations Power Companies	Periods of Extreme Heat May be annually	Extreme heat	Not independently cost-effective	Ongoing
8	**Promote Flood Insurance.** Promote the purchase of Flood insurance. Advertise the availability, cost, and coverage of Flood insurance through the National Flood Insurance Program (NFIP). Develop NFIP brochure and promote using City website and newsletter. Priority: High	Mountain City	$2,000	Ongoing	Flood	Not independently cost-effective, but the initial step in identifying appropriate mitigation actions	Ongoing

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
9	**Increase Public Awareness of Hazards.** Increase public awareness of hazards and hazardous areas. Distribute public awareness information regarding flood hazards, SFHAs, and potential mitigation measures using the local newspaper, utility bill inserts, inserts in the phone book, a City hazard awareness website, and an educational program for school age children or "how to" classes in retrofitting by local merchants. Integrate "Disaster Resistance Education" into the public school curriculum. Provide public education on the importance of maintaining the ditches. Priority: Medium	Mountain City	$2,000	ongoing	Floods, thunderstorms, high winds, tornadoes	Not independently cost-effective	Initiated in 2011 HMP
10	**Wildfire Hazard Areas.** Conduct study to determine and map potential wildfire hazard areas. Priority: Medium	Mountain City	$500	TBD; likely initiated in 2011	Wildfire	Not independently cost-effective, but essential in minimizing loss of life and injuries during significant storms.	Initiated in 2011 HMP
11	**Monitor Drought Conditions.** Continue to monitor drought conditions through contact with State Agencies. Priority: Medium	Mountain City	No additional cost – uses existing staff	Ongoing	Drought	Not independently cost effective.	Ongoing
12	**Public Information Campaigns.** Cooperate and coordinate with the County and State agencies in developing public information campaigns and/or water use restrictions to ensure sufficient water pressure for fire-fighting and provision of drinking water during periods of drought. Priority: Medium	Mountain City	No additional cost – uses existing staff resources	Ongoing	Drought	Very difficult to determine, but presumed very cost-effective because actions preserves essential function	Ongoing

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
13	**Evaluate Excess Heat Risks.** Evaluate the risks presented by excessive heat and humidity, especially in terms of high-risk populations such as the elderly/low income. Priority: Medium.	Mountain City	No additional cost – uses existing staff resources	TBD; probably initiated in 2011	Extreme heat	Not independently cost-effective, but needed to develop adequate risk reduction efforts	Initiated in 2011 HMP
14	**Review Plans and Resources to Address Risk Posed By Snow and Ice Hazards During Winter Storms**. Conduct a review of the City's current plans and resources to address the risks posed by ice and snow hazards during winter storms. Focus on City's ability to respond to snow and ice emergencies, and on potentially at-risk populations in the community. Priority: Low to medium.	Mountain City	No additional cost – uses existing staff resources	Ongoing	Winter storms, extreme cold, winter storm	Not independently cost-effective, but contributes to maintaining public services; protects at-risk populations	Initiated in 2011 HMP
15	**Various Mitigation Actions to Reduce Wildfire Risk.** On a case-by-case basis, develop and initiate mitigation actions to reduce the wildfire and brushfire risk. Actions may include informing property owners of appropriate actions, clearing vegetation, and monitoring antecedent conditions, among others. Priority: Low.	Mountain City	No additional cost – uses existing staff resources	TBD/as need is identified	Wildfire	Cost-effective, as measures tend to be in-expensive and prevent fires	Initiated in 2011 HMP
16	**Upgrades to At-Risk Structures.** Based on the results of the study above, initiate upgrades to at-risk structures and/or infrastructure. Mitigates specific risks to structures, people and operations. Priority: Low	Mountain City	Varies depending on measure. Funding from General Fund or FEMA grant program/s	TBD based on study	Floods, thunderstorms, high winds, tornadoes, seismic	Cost-effectiveness will vary with level of risk and project cost	TBD, but likely to be initiated no earlier than 2012

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
17	**Structural/Engineering Study.** Complete a detailed structural/engineering survey of Mountain City public facilities to ensure their soundness with respect to resisting the effects of high winds, extreme roof loading from snow or ice, and hail. Forms basis of decisions about any additional actions to mitigate risk. Priority: Low	Mountain City	To be determined, but if initiated probably from General Fund	Not yet established – to be commenced only if funding is available	Floods, thunderstorms, high winds, tornadoes, seismic	Not independently cost-effective, but the initial step in identifying appropriate mitigation actions	Initiated in 2011 HMP
18	**Understanding Dam Failure Risks.** Engage with County and State floodplain managers, engineers and emergency managers to ensure that local officials have a detailed understanding of potential risks to the community from dam and/or levee failures. Priority: Low to medium.	Mountain City	No additional cost – uses existing staff resources	Initiated in 2011, then ongoing	Dam Failure	Not independently cost-effective	Initiated in 2011 HMP
19	**Evacuation Plans.** Ensure that the jurisdiction and its citizens are aware of and understand notification and evacuation plans related to dam and/or levee failure. Priority: Low to medium.	Mountain City	No additional cost – uses existing staff resources	Initiated in 2011, then ongoing	Dam Failure	Not independently cost-effective	Initiated in 2011 HMP

1.6 Plan Adoption by the Mountain City

After the draft Plan is approved by the Texas Division of Emergency Management (TDEM) and FEMA Region VI, the 2011 Plan Update will be adopted by the Hays County Commissioners Court. The City Council for Mountain City will also adopt the updated HMP by resolution. The Mountain City adoption resolution is provided below. A copy of the County resolution is included in Appendix N.

Figure F-4
Adoption Resolution - Mountain City

Resolution to be inserted upon Plan adoption

Appendix G
City of Niederwald

Contents of this Section

1.1 Background
1.2 Public Facilities
1.3 Hazard Identification
1.4 Vulnerability Assessment and Loss Estimation
1.5 Mitigation Actions
1.6 Plan Adoption by the City of Niederwald

This appendix is part of the 2011 Hays County Hazard Mitigation Plan (HMP) update, and includes jurisdiction-specific information about the City of Niederwald, which is one of the 11 incorporated jurisdictions within the County that is participating in the Plan update. This appendix supplements the County HMP, so only jurisdiction-specific information is included here.

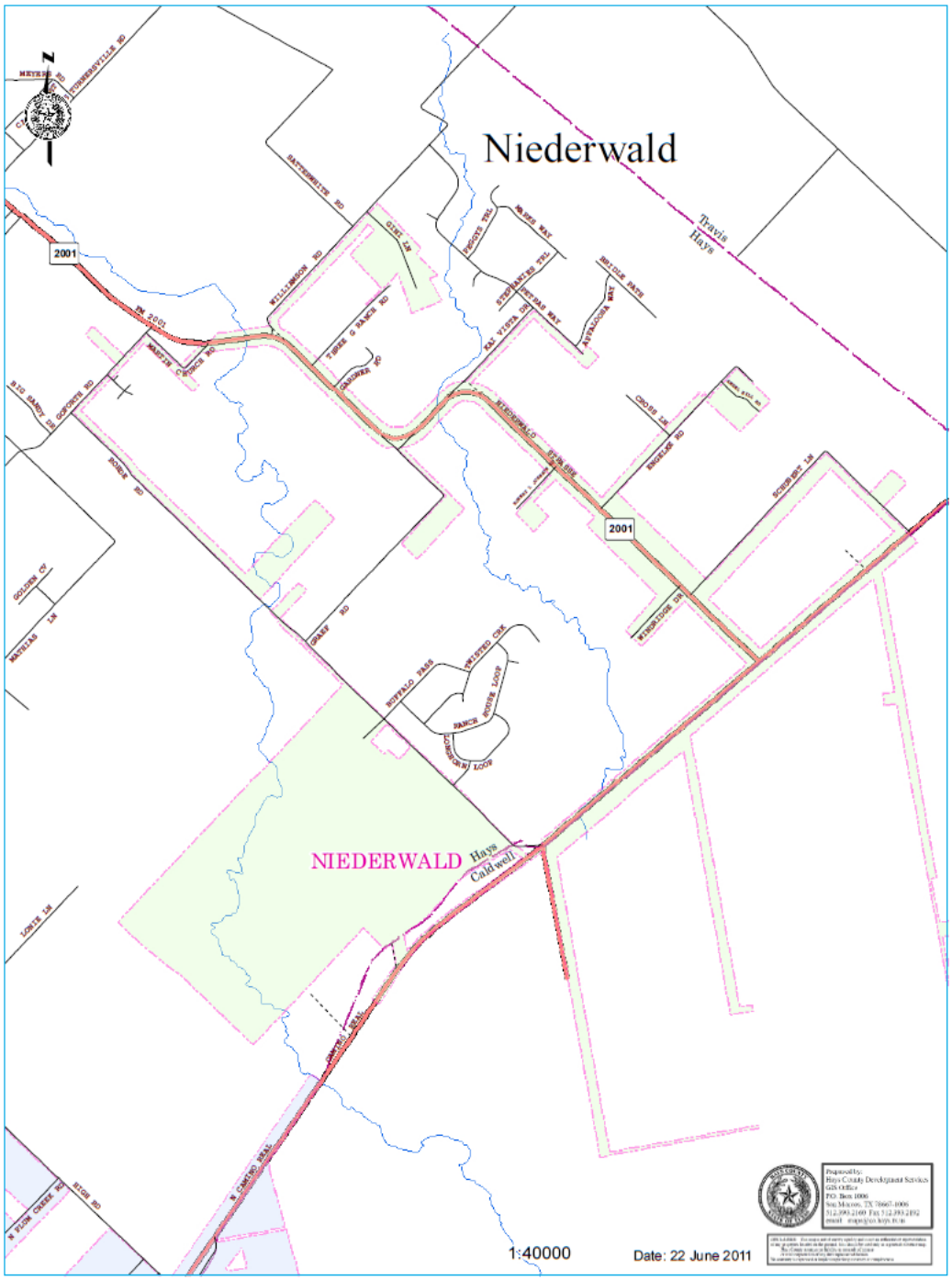
1.1 Background

The City of Niederwald is located fifteen miles northeast of San Marcos in eastern Hays County. The City was founded by German pioneers in the 1890's. The name Niederwald, which means "brushwood," referred to a growth of mesquite trees in the shallow valley where the Germans settled alongside the old Austin–San Antonio road. Niederwald incorporated in 1987. In 1990 Niederwald had a population of 233 residents. That same year the City expanded partially into Caldwell County.[1] By the year 2000 the population had grown to 584. The 2010 U.S. Census reported the Niederwald population at 565.[2] As of 2010 there were 216 housing units in the City.

FigureG-1 is a map of the City of Niederwald, which covers approximately 3.0 square miles. See Section 3.3.1 (Geography) of the 2011 Plan update for a jurisdictional map of Hays County.

[1] Texas State Historical Association. The Handbook of Texas Online – Niedwerald, Texas.
[2] US Census Bureau. 2010 US Census. Race, Hispanic or Latino, Age and Housing Occupancy - City of Niederwald.

Figure G-1
City of Niederwald, Texas Map
(Source: Hays County Development Services – GIS Office)



1.2 Public Facilities

As part of the Hays County Plan update, the City of Niederwald was contacted by email and requested to provide a list of city owned facilities. As of 2010, the City owns three public buildings. These facilities are listed below in Table G-1.

Table G-1
City of Niederwald Public Facilities
(Source: City of Niedwerald, Texas)

No.	Facility Name	Street Address	Year Built	Use	Square Footage	Occupancy	Structure Type	Replacement Value
1	City Hall	13851 Camino Real	1931	City Hall	1,200	4	Wood frame	$175,000
2	Community Center	8807 Niederwald Strasse	1992	Recreation	1,050	10	Metal building	$45,000
3	Park Playspace	Schubert Lane	2000	Recreation	n/a	n/a	n/a	$35,000

1.3 Hazard Identification

Hays County has received seven Presidential Disaster Declarations since 1965, several of which have affected the City of Niederwald.

Overview of Niederwald's Recent Natural Hazards History

The City of Niederwald was contacted and requested to provide descriptions of past hazard events. In addition to contacting the City, the National Oceanic and Atmospheric Administration's (NOAAs) National Climatic Data Center (NCDC) database was also reviewed to identify past hazard events for the City of Niederwald. Upon review and discussion with City officials, no past hazard events were identified for Niederwald over the past 20 years.

The 2011 Hays County HMP update includes discussions of the 11 natural hazards with potential to affect the County (see Section 5, *Hazard Identification, Profiling and Ranking*), including the jurisdictions within the County boundaries. The subsections below include only information that supplements the material in Section 5 of the County HMP.

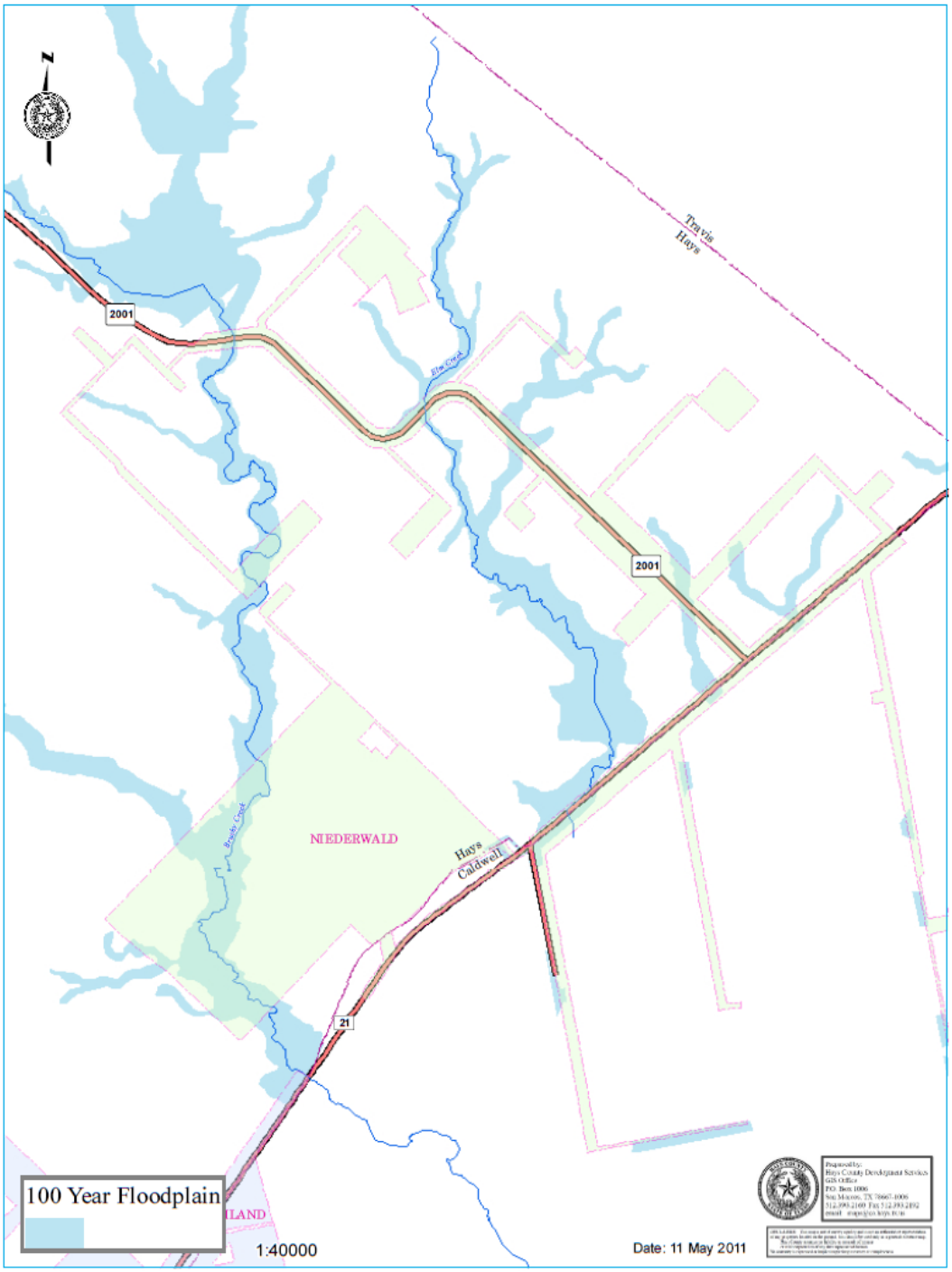
1.3.1 Floods

This subsection addresses the flood hazard. The flood subsection below includes the potential for floods caused by extreme rainfall associated with these hazards. Hazard Description. See Section 5.4.1 of the Hays County Plan update for a description of the flood hazard. Hazard Location. From a review of the FIRM for the flood hazard is primarily located along the floodplains of Brushy Creek and Elm Creek. According to the Hays County GIS, a total of 0.50 square miles of the City (3.0 square miles total) is located within the 100-year floodplain. Niederwald has a total of 10 parcels that have some exposure to the 100-year floodplain. Various floodplain maps for the City are presented within this subsection. Severity and extent of the hazard. Flood severity is measured in various ways, including frequency, depth, velocity, duration and contamination, among others. The frequency of flooding is often the most common for judging severity. In Niederwald there have been no significant flood events over the past 10 years. Hazard's impact on life and property. The impacts on life and property from flooding can be significant. Property owners that have experienced repetitive flooding in the past must cope with the disruptions and costly repairs associated with flooding. Occurrences of the hazard. Based on a review of open source documents Niedwerwald has experienced no floods over the past 10 years.

One of the best sources for determining flood risk for an area is review of the Flood Insurance Rate Maps (FIRMs) produced by FEMA. The FIRM is the official map of a community on which FEMA has delineated both the special flood hazard areas (1% annual chance of flooding) and the risk premium zones applicable to the community.[3] The City of Niederwald is located on six FIRM panels, all with effective dates of September 2, 2005. Figure G-2 identifies the 100-year floodplain for Niederwald. The map shows that two sections of floodplain pass through the City in a north-south direction. The floodplain generally follows Brushy Creek and Elm Creek.

[3] FEMA online - Floodplain Management. Flood Insurance Rate Map (FIRM) definition

Figure G-2
City of Niedwerald - Floodplain Map
(Source: FEMA, FIRM Effective September 2, 2005, Hays County GIS Office)



1.3.2 Tornadoes

This subsection addresses the tornado hazard. Hazard Description. The nature of the tornado hazard in this jurisdiction is considered substantially the same as for the County as a whole. Refer to HMP Section 5 for further information. Hazard Location. The hazard affects all parts of this jurisdiction approximately equally. Severity and extent of the hazard. The severity and extent of the hazard are equal across the jurisdiction. Hazard's impact on life and property. The potential impacts on life and property in this jurisdiction vary with the strength of the events. Vulnerability to the tornado hazard is directly correlated to structure type and occupancy; because of this variability, it is not possible to accurately characterize vulnerabilities across the entire jurisdiction. However, Subsection 1.4.2 below includes the results of a basic tornado risk assessment, which was conducted using best-available data at the time of the analysis. Occurrences of the hazard. Tornado occurrences are discussed in HMP Section 5. The statistical probability of these hazards impacting this jurisdiction are the same as for the County as a whole.

1.3.3 Winter Storm

This subsection addresses the winter storm hazard. Hazard Description. The nature of winter storm hazard in this jurisdiction is considered substantially the same as for the County as a whole. Refer to HMP Section 5 for further information. Hazard Location. The hazard affects all parts of this jurisdiction approximately equally. Severity and extent of the hazard. The severity and extent of the hazard are equal across the jurisdiction. Hazard's impact on life and property. The potential impacts on life and property in this jurisdiction vary with the strength of the events. Vulnerability to the winter storm hazard is directly correlated to structure type and occupancy; because of this variability, it is not possible to accurately characterize vulnerabilities across the entire jurisdiction. However, Subsection 1.4.3 below includes the results of a basic winter storm risk assessment, which was conducted using best-available data at the time of the analysis. Occurrences of the hazard. Winter storm occurrences are discussed in HMP Section 5. The statistical probability of these hazards impacting this jurisdiction are the same as for the County as a whole.

The remaining eight hazards profiled as part of the Hays County Plan update are not described within the jurisdictional appendices. The hazard descriptions in the main plan provide sufficient descriptions of these hazards, so they are not repeated in the jurisdictional appendices, although the appendices include actions to address the full range of hazards. See Section 5.4 of the Hays County Plan update for a complete profile of the other hazards.

1.4 Vulnerability Assessment and Loss Estimation

This subsection briefly summarizes the jurisdiction's vulnerabilities and estimated losses from three natural hazards: floods, tornadoes, and winter storms. Because the jurisdiction appendices in this 2011 HMP update have been standardized, in some cases there will be very little risk evident in certain communities, and therefore minimal information in these subsections. The methodologies for completing these analyses are described in Section 6 (and hazard-specific subsections) of the HMP, and are not repeated here.

1.4.1 Flood Loss Estimation

The City of Niederwald is not currently a member of the National Flood Insurance Program (NFIP). In some municipalities within Hays County, a flood risk assessment can be performed based on analysis of NFIP data on repetitive flood loss properties. The NFIP defines repetitive loss properties as those that have received at least two NFIP insurance payments of more than $1,000 each in any rolling ten-year period. As of May 2010, Hays County had 32 such properties (30 residential and two non-residential properties), based on a query of the FEMA BureauNet NFIP interface. Of this total, none were located within the City of Niederwald. With no NFIP repetitive loss properties in Niederwald an analysis of repetitive loss properties was not performed.

As Niederwald is not in the NFIP, there are no policies in force within the City

Table G-2
Comparison of NFIP Claims for the City of Niederwald with Hays County
(Source: FEMA – NFIP Statistics, March, 2011)

City/County Name	# of Polices In-Force	Insurance In-Force	# of Losses	Total Paid Claims
City of Niederwald	0	$0	0	$0
Hays County	521	$130,165,500	236	$3,514,972

1.4.2 Tornado Loss Estimation

Relative to other parts of the nation, the overall tornado risk is moderate in Hays County and the City of Niederwald. There is significant enough exposure to the hazard to perform a simple risk assessment to characterize the potential future losses. The tornado loss estimation for the City of Niederwald was calculated using FEMA's Benefit-Cost Analysis Tool (BCAR) software (version 4.5.5.0). The BCAR analysis methodology and tornado element of the software are based entirely on avoided injuries and fatalities. As a result, it is not necessary to separate public assets from private ones in order to estimate potential future losses (risk) – the calculation is based on the population at risk, rather than the square footage or value of buildings or functions. The table below summarizes data inputs and expected losses over a 50-year planning horizon.

Table G-3
Tornado Risk Assessment - Project Information
(Source: FEMA BCA Software, Version 4.5.5.0)

Data	Value
Loss estimation horizon (in years)	50
Population (2010 US Census)	565
Zip Code used as center of analysis	78676
Radius in miles for access to safe room	0.97
Assumed safe room structure design wind speed (mph)	200
Occupancy – Jurisdictional Facilities	14
Assumed structure type: residential properties	Wood-frame, one- or two-story
Assumed structure type: jurisdiction-owned facilities	Small professional building
Estimated annual losses (jurisdiction-owned facilities)	**$2,267**
Estimated losses – 50-year horizon (jurisdiction-owned facilities)	**$31,288**
Estimated Annual losses (residential property)	**34,548**
Estimated losses – 50-year horizon (residential property)	**$476,783**

It should be noted that this result is typical of tornado analyses (i.e. that the apparent risk is very high compared to other hazards). This occurs because the analysis is based entirely on life safety, and the probabilities of events of various magnitudes combined with the relatively high values assigned to deaths and injuries indicate significant losses over long time horizons. See Section 6.3.3, *Tornado Wind Risk in Hays County*, of the Plan update to see how the residential tornado risk in the City of Niederwald compares with the risk to the County other municipalities in Hays County.

1.4.3 Winter Storm Loss Estimation

This analysis is based on information provided by the County and community, and uses data from the National Climatic Data Center (NCDC) and estimates from the 2010 U.S. Census. The estimated annual and 100-year risk for each jurisdiction was calculated as a proportion of the total winter storm risk for Hays County. Additional information about the methodology is found in Section 6 of the HMP. Jurisdiction-specific information and analysis output are provided in the table below.

Table G-4
City of Niederwald Winter Storm Loss Estimates
Data Parameters and Summary of Results
(Source: FEMA BCA Software, Version 4.5.5.0)

Data	Value
Winter storm events	9
Reporting Years	14
Average annual number of winter storm events	0.64
Total reported damages (Hays County)	$7,500,000
Annual damages (Hays County)	$535,714
Hays County Population (2010 US Census)	157,101
Niederwald Population (2010 US Census)	565
Percent of County Population	0.35%
Estimated Annual losses	**$1,875**
Estimated losses – 100-year horizon	**$26,756**

1.5 Mitigation Actions

The table below lists prioritized mitigation projects and actions identified by the City of Niederwald. The list was prioritized by the community using the STAPLEE methodology – see Section 7 of the County HMP for a discussion of this methodology. All of the original actions for Niederwald (Action Items 1-7) remain in the table for reference purposes. Completed actions are noted in the status column, but also have the action number and action item description highlighted with ~~strikethrough~~ text to indicate completion. Action items 8 – 19 have been added as part of the 2011 Plan update.

Table G-5
City of Niederwald Mitigation Actions

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
Note: Action Items 1-7 were identified from the original Hays Co. HMP.							
~~1~~	~~**Increase the number of Hays County communities that participate in the NFIP.** Accomplishing this action makes flood insurance available throughout Hays County and requires that all communities enforce the minimum requirements of the NFIP. Future buildings cannot be constructed within designated floodways and cannot be constructed below the base flood elevation. This action establishes sound floodplain management programs throughout Hays County. This action was labeled F-1 from the original Plan.~~	City of Niederwald	Cost and Funding: Existing staff resources, no cost	2006-2007	Flood	Not independently cost-effective	Complete. The City of Niederwald joined the NFIP in 1978.

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
2	**Adopt 'Higher Standard" Flood Damage Prevention Ordinances.** By adopting "higher standard" requirements, new buildings, infrastructure and critical facilities have a reduced risk of loss of life and property damage during a flood event. Communities are encouraged to follow the guidance outlined in EO 11988 where critical facilities are protected to the 500-year (0.2% annual chance flood event) elevation. This action was labeled F-5 from the original Plan.	City of Niederwald	Cost and Funding: Existing staff resources, no cost	Ongoing	Flood	Not independently cost-effective	Ongoing
3	**Provide Training for Local Floodplain Managers and Certified Floodplain Managers (CFM's).** By increasing training for local floodplain managers and CFM‟s there should be improved local floodplain management programs, reduced risk of loss of life, and new buildings and infrastructure have a reduced risk of damage during a flood event. The City of San Marcos and/or Hays County would be the logical communities to provide floodplain management training such as hosting FEMA‟s FPM Training Course, "Managing Floodplain Development through the NFIP", hosting NFIP Workshops, and hosting Community Rating System (CRS) Workshops. These training opportunities would assist local communities and provide continuing education credits (CEC‟s) for local floodplain administrators, certified floodplain managers (CFM‟s), engineers, surveyors and the general public. This action was labeled F-8 from the original Plan.	City of Niederwald	Cost and Funding: Existing staff resources, no cost	Annually 2011 - 2015	Flood	Not independently cost-effective	ongoing

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
4	**Improve Emergency Communication Capabilities.** By improving emergency communications Hays County and participating communities can respond faster and coordinate better to save lives and reduce property damage during disaster events. This action was labeled E-2 from the original Plan.	City of Niederwald	$620,000 Funding: Capital Area Planning Council (CAPCO), Texas DEM	Ongoing	All hazards	Not independently cost-effective, but critical for saving lives	Ongoing
5	**Development of and maintenance of countywide and individual community HAZMAP Plans.** Develop and formally adopt HAZMAP plans prior to the November 2004 deadline established by the Disaster Mitigation Act of 2000. Develop procedures to conduct annual reviews and updates to maintain countywide and individual community HAZMAP plans. Provide annual training opportunities for community emergency managers to assist in the planning and plan maintenance efforts. Create and maintain multi-jurisdictional HAZMAP databases and GIS mapping to support countywide and individual community HAZMAP maintenance efforts. This action was labeled E-5 from the original Plan.	City of Niederwald	Existing staff resources	Original Plan adopted on April 20, 2004 - update in 2011	All hazards	Not independently cost-effective	Original HMP Complete. Plan update to be adopted once FEMA review is complete
6	**Storm Ready Designation for Hays County Communities** Storm Ready is a proven mitigation action. By Hays County and participating communities becoming Storm Ready Communities there can be mitigation actions in place to save lives and reduce property damage during disaster events. This action was labeled E-6 from the original Plan.	City of Niederwald	Cost and Funding: Existing staff resources, no cost	Ongoing	Floods, thunderstorms, high winds, tropical storms/cyclone tornadoes, hail	Not independently cost-effective, but critical for saving lives and minimizing injuries	ongoing

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
7	**Reduce Impacts of Extreme Heat on Elderly, Disabled, Low-Income and Infants.** This Mitigation Action is for Hays County and participating community Emergency Managers to launch a public notification effort during extreme heat periods urging elderly and low income persons to seek help if needed. Volunteer organizations such as Rotary International, Lions Club, Jaycees, Red Cross, United Way, and others should be urged to participate. Power Companies will be notified by the Hays County Emergency Manager and requested to participate in the effort to distribute box fans and make minor repairs to air conditioners. The Hays County OEM will coordinate with participating community emergency managers and take the lead to initiate this Mitigation Action. The initial action will include newspaper and radio announcements and public information on both the Hays County and City of San Marcos websites. Public announcements will define the hazard, describe heat related health risks and provide tips on how to prevent illness. Health care officials can play an important role in this mitigation action by providing information to newspapers and radio stations. This action was labeled "*Heat-1"* from the original Plan.	City of Niederwald	$ 2,000 to purchase and distribute 100 box fans $ 3,000 estimated cost for a/c repairs Funding Sources: United Way Rotary Clubs Lions Clubs Red Cross Churches and charitable organizations Power Companies	Periods of Extreme Heat May be annually	Extreme heat	Not independently cost-effective	Continued in planning
8	**Promote Flood Insurance.** Promote the purchase of Flood insurance. Advertise the availability, cost, and coverage of Flood insurance through the National Flood Insurance Program (NFIP). Develop NFIP brochure and promote using City website and newsletter. Priority: High	City of Niederwald	$2,000	Ongoing	Flood	Not independently cost-effective, but the initial step in identifying appropriate mitigation actions	Ongoing

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
9	**Increase Public Awareness of Hazards.** Increase public awareness of hazards and hazardous areas. Distribute public awareness information regarding flood hazards, SFHAs, and potential mitigation measures using the local newspaper, utility bill inserts, inserts in the phone book, a City hazard awareness website, and an educational program for school age children or "how to" classes in retrofitting by local merchants. Integrate "Disaster Resistance Education" into the public school curriculum. Provide public education on the importance of maintaining the ditches. Priority: Medium	City of Niederwald	$2,000	Ongoing	All hazards	Not independently cost-effective	Initiated in 2011 HMP
10	**Wildfire Hazard Areas.** Conduct study to determine and map potential wildfire hazard areas. Priority: Medium	City of Niederwald	$500	TBD; likely initiated in 2011	Wildfire	Not independently cost-effective, but essential in minimizing loss of life and injuries during significant storms.	ongoing
11	**Monitor Drought Conditions.** Continue to monitor drought conditions through contact with State Agencies. Priority: Medium	City of Niederwald	No additional cost – uses existing staff	Ongoing	Drought	Not independently cost effective.	Ongoing
12	**Public Information Campaigns.** Cooperate and coordinate with the County and State agencies in developing public information campaigns and/or water use restrictions to ensure sufficient water pressure for fire-fighting and provision of drinking water during periods of drought. Priority: Medium	City of Niederwald	No additional cost – uses existing staff resources	Ongoing	Drought	Very difficult to determine, but presumed very cost-effective because actions preserves essential function	Ongoing
13	**Evaluate Excess Heat Risks.** Evaluate the risks presented by excessive heat and humidity, especially in terms of high-risk populations such as the elderly/low income. Priority: Medium.	City of Niederwald	No additional cost – uses existing staff resources	TBD; probably initiated in 2011	Extreme heat	Not independently cost-effective, but needed to develop adequate risk reduction efforts	Initiated in 2011 HMP

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
14	**Review Plans and Resources to Address Risk Posed By Snow and Ice Hazards During Winter Storms**. Conduct a review of the City's current plans and resources to address the risks posed by ice and snow hazards during winter storms. Focus on City's ability to respond to snow and ice emergencies, and on potentially at-risk populations in the community. Priority: Low to medium.	City of Niederwald	No additional cost – uses existing staff resources	Ongoing	Winter storms, extreme cold, winter storm	Not independently cost-effective, but contributes to maintaining public services; protects at-risk populations	Initiated in 2011 HMP
15	**Various Mitigation Actions to Reduce Wildfire Risk.** On a case-by-case basis, develop and initiate mitigation actions to reduce the wildfire and brushfire risk. Actions may include informing property owners of appropriate actions, clearing vegetation, and monitoring antecedent conditions, among others. Priority: Low.	City of Niederwald	No additional cost – uses existing staff resources	TBD/as need is identified	Wildfire	Cost-effective, as measures tend to be in-expensive and prevent fires	Initiated in 2011 HMP
16	**Upgrades to At-Risk Structures.** Based on the results of the study above, initiate upgrades to at-risk structures and/or infrastructure. Mitigates specific risks to structures, people and operations. Priority: Low	City of Niederwald	Varies depending on measure. Funding from General Fund or FEMA grant program/s	TBD based on study	Floods, thunderstorms, high winds, tornadoes, seismic	Cost-effectiveness will vary with level of risk and project cost	TBD, but likely to be initiated no earlier than 2012
17	**Structural/Engineering Study.** Complete a detailed structural/engineering survey of Niederwald public facilities to ensure their soundness with respect to resisting the effects of high winds, extreme roof loading from snow or ice, and hail. Forms basis of decisions about any additional actions to mitigate risk. Priority: Low	City of Niederwald	To be determined, but if initiated probably from General Fund	Not yet established – to be commence d only if funding is available	Floods, thunderstorms, high winds, tornadoes, seismic	Not independently cost-effective, but the initial step in identifying appropriate mitigation actions	Initiated in 2011 HMP

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
18	**Understanding Dam Failure Risks.** Engage with County and State floodplain managers, engineers and emergency managers to ensure that local officials have a detailed understanding of potential risks to the community from dam and/or levee failures. Priority: Low to medium.	City of Niederwald	No additional cost – uses existing staff resources	Initiated in 2011, then ongoing	Dam Failure	Not independently cost-effective	Initiated in 2011 HMP
19	**Evacuation Plans.** Ensure that the jurisdiction and its citizens are aware of and understand notification and evacuation plans related to dam and/or levee failure. Priority: Low to medium.	City of Niederwald	No additional cost – uses existing staff resources	Initiated in 2011, then ongoing	Dam Failure	Not independently cost-effective	Initiated in 2011 HMP

1.6 Plan Adoption by the City of Niederwald

After the draft Plan is approved by the Governor's Texas Division of Emergency Management (TDEM) and FEMA Region VI, the 2011 Plan Update will be adopted by the Hays County Commissioners Court. The Niederwald City Council will also adopt the updated HMP by resolution. The City of Niederwald adoption resolution is provided below. A copy of the County resolutions is included in Appendix N.

Figure G-3
Adoption Resolution - City of Niederwald

Resolution to be inserted upon Plan adoption

Appendix H
City of San Marcos

Contents of this Section

1.1 Background
1.2 Public Facilities
1.3 Hazard Identification
1.4 Vulnerability Assessment and Loss Estimation
1.5 Mitigation Actions
1.6 Plan Adoption by the City of San Marcos

This appendix is part of the 2011 Hays County Hazard Mitigation Plan (HMP) update, and includes jurisdiction-specific information about the City of San Marcos, which is one of the 11 incorporated jurisdictions within the County that is participating in the Plan update. This appendix supplements the County HMP, so only jurisdiction-specific information is included here.

1.1 Background

The City of San Marcos, the county seat, is located in southern Hays County in Central Texas along Interstate Highway (IH-35) between San Antonio and Austin. A small portion of the City extends across the Hays County border into Caldwell and Guadalupe Counties. Between 1962 and 1972 the population of San Marcos increased by 48% mainly due to the expansion of Southwest Texas State University and the establishment of the Gary Job Corps Training Center. During this time period the population increased from 12,713 to 18,860. Growth continued through the 1970s and by 1980 there were 400 recorded businesses that mainly included manufacturers of furniture, sheet metal products, plastics, woolens, lighting fixtures, telecommunication devices, baked goods, construction materials, and tortillas. Contributing to the remarkable growth since the 1950s was the City of Austin's emergence as a regional metropolitan center.

According to the 2010 U.S. Census, the San Marcos population was 44,894.[1] This is a 29.25% increase from the population in 2000 which was estimated at 34,733. As of 2010 there were 18,179 housing units in the City. From the year 2006 to 2010, there were 2,508 residential and 149 non-residential building permits issued in San Marcos. The locations of the permits are depicted in Figures H-1 and H-2 below. Note that the information is for septic permits, which the city indicated are a direct proxy for building permits.

[1] US Census Bureau. 2010 US Census. Race, Hispanic or Latino, Age and Housing Occupancy - City of San Marcos.

Figure H-1
Residential (septic) Permits, 2006 to 2010

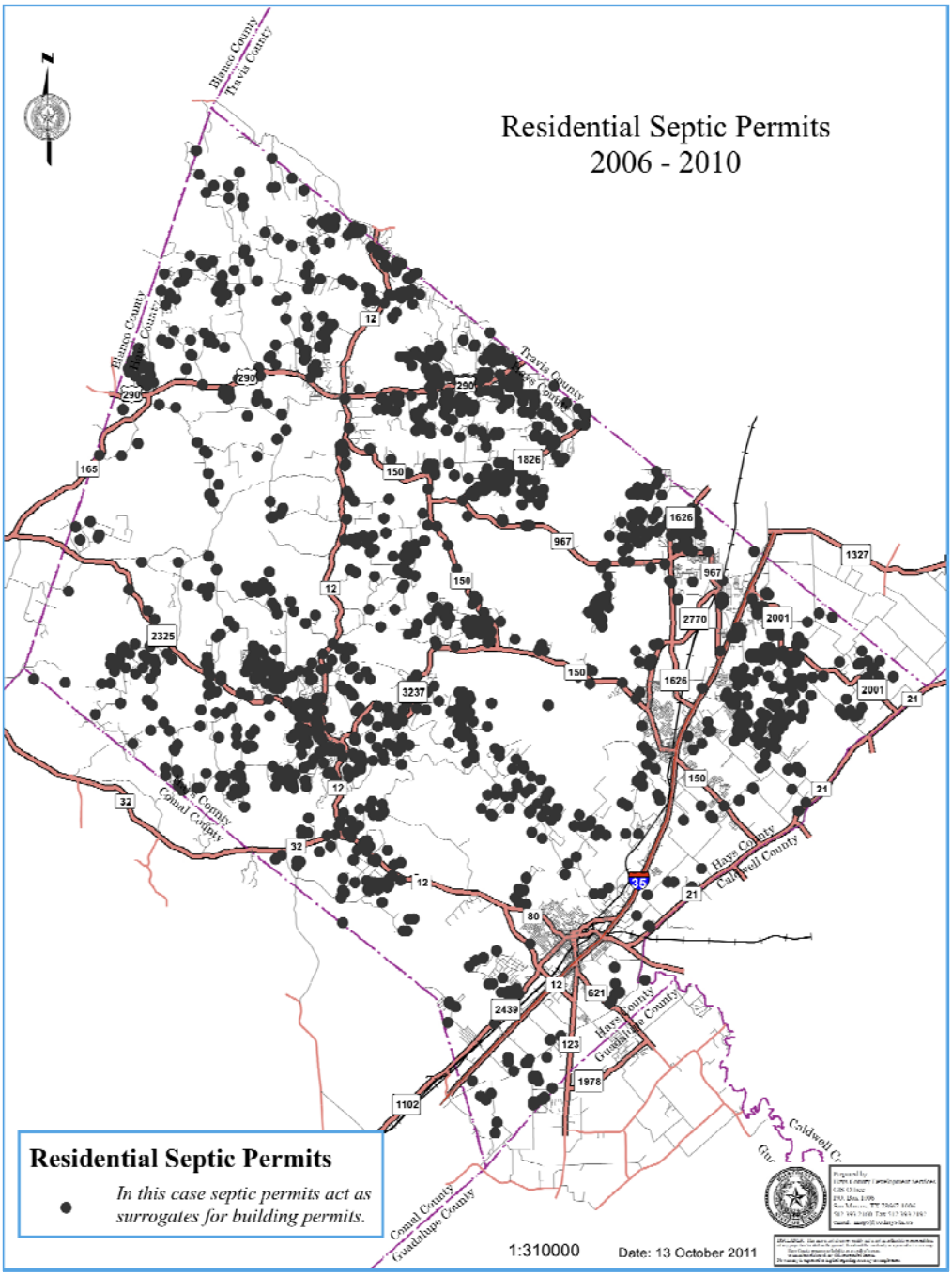


Figure H-2
Non-Residential (septic) Permits, 2006 to 2010

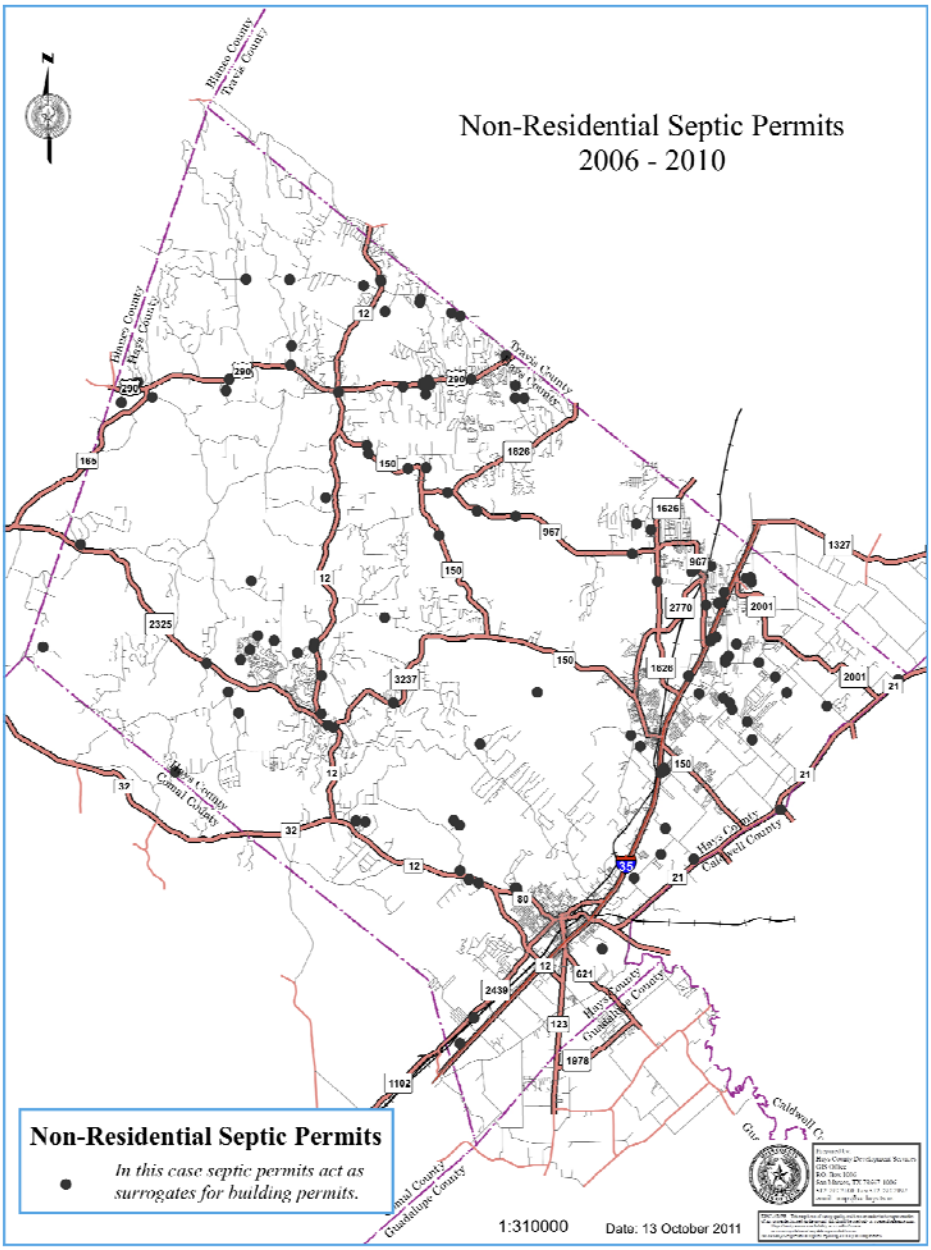
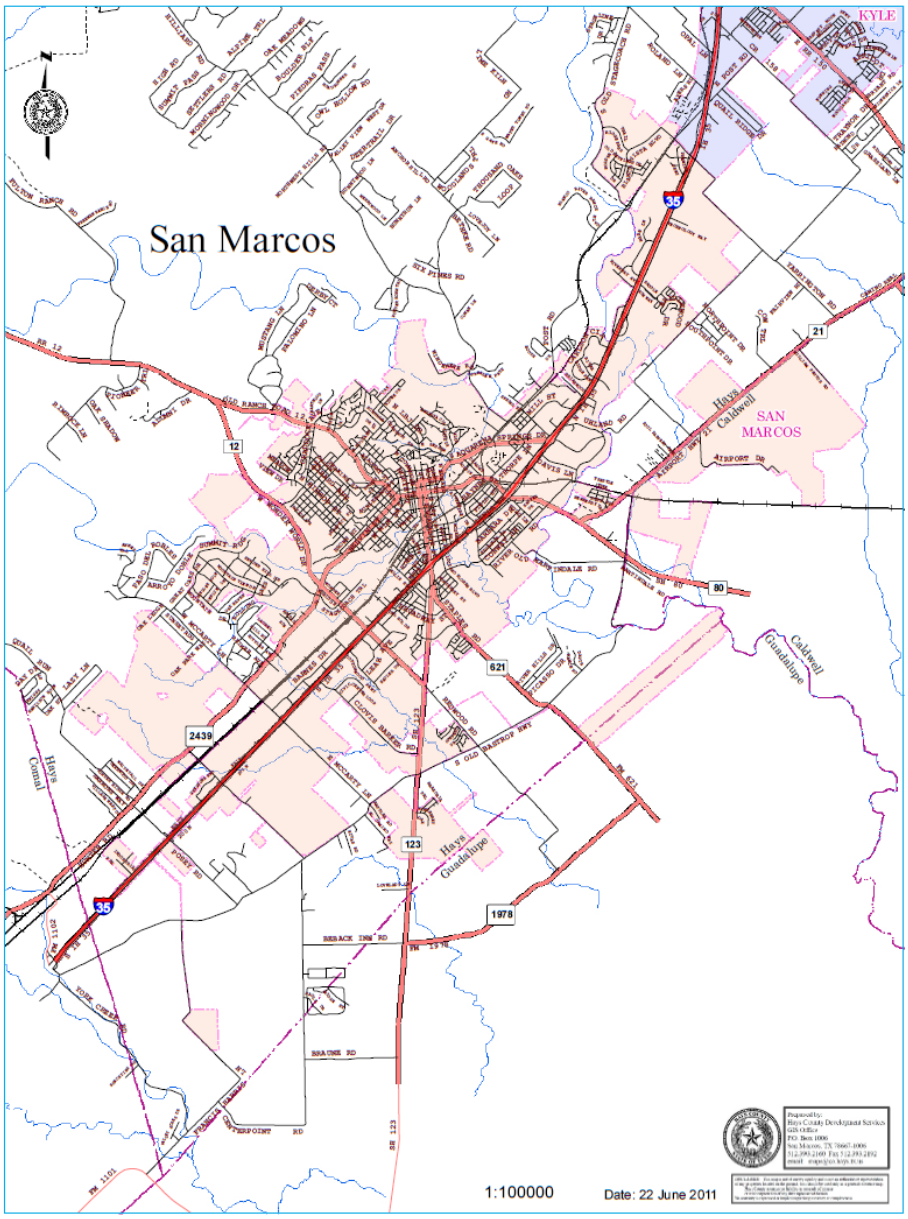


Figure H-3 is a map of the City of San Marcos, which covers 18.3 square miles. See Section 3.3.1 (Geography) of the 2011 Plan update for a jurisdictional map of Hays County.

Figure H-3
City of San Marcos, Texas Map
(Source: Hays County Development Services – GIS Office)



1.2 Public Facilities

As part of the Hays County Plan update, the City of San Marcos was contacted by email and requested to provide a list of city owned facilities. As of 2010, the City owns XX public buildings. These facilities are listed below in Table H-1.

Table H-1
City of San Marcos Public Facilities
(Source: City of San Marcos, Texas)

No.	Facility Name	Street Address	Year Built	Use	Square Footage	Occupancy	Replacement Value
1	Grant Harris Bldg	401 E Hopkins	1989	Office	6,510	13	$716,200
2	Dunbar Rec Center	801 MLK	1994	Meeting Rooms	6,508	13	$452,200
3	Old Fish Hatchery	206 N CM Allen	1989	Meeting Rooms	5,996	12	$267,000
4	Nature Center	430 Riverside	1998	Public Display	2,460	2	$210,400
5	Calaboose Building	200 MLK	1940	Museum	1,280	3	$72,100
6	Georgia St. Senior Ctr	720 Arizona	2003	Meeting Rooms	1,938	4	$167,000
7	SM Electric Utility	1040 Hwy 123	1965	Office, Warehouse	NA	0	NA
8	Animal Shelter	750 River Rd	2001	Office, Kennel	NA	0	$556,100
9	Activity Center	501 E Hopkins	1996	Meeting Rooms, Gym	57,775	40	$5,816,700
10	Code Enforcement	1402 W Hopkins	NA	Office, Warehouse	3,187	6	NA
11	Library	625 E Hopkins	1994	Library	26,560	13	$4,455,700
12	Airport Terminal	1807 Airport Dr	1990	Airport Terminal	3,420	13	$342,400
13	City Hall	630 E Hopkins	1994	Office	13,556	27	NA
14	Municipal Building	630 E Hopkins	1997	Office, Courtroom	10,120	20	$969,800
15	Public Works	630 E Hopkins	1997	Office, Repair Garage	20,528	7	$1,289,600
16	W/WW Warehouse	630 E Hopkins	NA	Warehouse	1,344	0	NA
17	Permit Center	630 E Hopkins	2009	Office	4,032	8	NA

No.	Facility Name	Street Address	Year Built	Use	Square Footage	Occupancy	Replacement Value
18	Sign Shop	630 E Hopkins		Office, Production	3,136	3	$71,800
19	Park Patrol	312 Reynolds	1994	Office	768	2	$57,900
20	WWTP Admin	720 River	1994	Office	6,008	12	$342,000
21	WWTP Process	720 River	1998	Industrial	5,850	2	$14,000,000
22	WWTP Quality	720 River	1992	Industrial	2,376	1	NA
23	Police Department	2300 S IH 35	1994	Office	46,168	92	$3,584,500
24	Fire Station 1	114 E Hutchison	1981	Fire Station	3,864	8	$745,400
25	Fire Station 2	1314 N Academy	1989	Fire Station	3,104	6	$264,000
26	Fire Station 3	2420 Hunter	2002	Fire Station	7,564	15	$825,200
27	Fire Station 4	404 Broadway	1994	Fire Station	3,184	6	$296,900
28	Fire Station 5	100 Carlson	2010	Fire Station	18,935	38	NA
29	ATCT		2010	Air Traffic Control Tower	NA	2	NA
30	Gary Sports Complex	2600 Hwy 21	1997	Concession, Restroom	1,132	13	$89,100
31	Tourist Information Ctr	617 N IH 35	1999	Office	1,944	4	$169,000
32	Cemetery Chapel	Old RR 12	1974	Chapel	1,152	2	$100,000
33	T Hangars	1949 Airport	1991	Hangar	15,236	5	$84,600
34	Storage Bldg	2285 Airport	1987	Storage	9,792	3	$198,500
35	Tower	1921 Airport	NA	Vacant	NA	0	$100,000
36	Airport Fire Station	1975 Airport	1987	Vacant	NA	0	$106,400
37	Price Senior Center	222 W San Antonio	1979	Meeting Rooms	7,736	15	$449,000
38	Cock House	400 E Hopkins	1989	Museum	1,264		$135,000
39	Recreation Hall	170 Charles Austin	2011	Office, Meeting Rooms	NA	0	$1,100,000
40	Hangar	1833 Airport	1989	Aircraft Hangar	10,200	2	$181,100
41	Hangar	1831 Airport	1989	Aircraft Hangar	10,350	3	$180,100

No.	Facility Name	Street Address	Year Built	Use	Square Footage	Occupancy	Replacement Value
42	Hangar	1829 Airport	1989	Aircraft Hangar	12,168	4	$209,500
43	Concessions	601S. CM Allen Pkwy	NA	Concession	1,820	2	NA
44	Cemetery Shop	Old RR 12	1991	Workshop	1,020	1	$40,000
45	PARD/WWW Storage	750 River Rd	NA	Warehouse	5,430	2	NA
46	Bathhouse	Reynolds	1993	Office, Storage, Restroom	2,236	2	$181,700

1.3 Hazard Identification

Hays County has received seven Presidential Disaster Declarations since 1965, several of which have affected the City of San Marcos. The bullets below summarize some of the more significant events since1980.

Overview of San Marcos's Recent Natural Hazards History

The bullets below highlight major events that have impacted the City of San Marcos. Events that include the Federal Emergency Management Agency (FEMA) disaster number in parenthesis after the date indicate events that received a Presidential Disaster Declaration. The source for the past events listed was a combination of information provided by the City and the National Oceanic and Atmospheric Administration's (NOAAs) National Climatic Data Center (NCDC).

- April 5, 1994. Severe thunderstorms produced widespread large hail, accompanied by damaging winds that knocked down tree limbs, stripped leaves from trees and knocked out power and telephone communications to San Marcos for several hours. The hailstones broke windows in homes and school as well as Southwest State University. The NCDC reported damages from the event totaled $5 million.
- May 13, 1994. High winds from a severe thunderstorm downed numerous trees and power lines throughout the San Marcos area. Property damage from the event was estimated at $500,000.
- August 14, 1996. High winds destroyed two buildings under construction in San Marcos. Property damage from the event was estimated at $20,000.
- March 16, 2000. Just north of San Marcos, severe thunderstorms produced large hailstones, up to 4.5 inches in diameter, causing widespread damage to roofs and windows of many residential homes. Numerous vehicles were also reported damaged. The storm caused an estimated $600,000 in damages.
- June 2, 2003. A line of thunderstorms formed along a cold front in central Texas and moved quickly southward. As the storms moved through Hays County, they produced a downburst that struck the town of San Marcos and spread southeastward into Caldwell County. In San Marcos Many business signs and awnings were damaged along with roof damage to several businesses. Metal or tin roof in some businesses was peeled off on the side of the incoming high winds. Based on the damage and its pattern, it appeared that damage was the result of straight line winds indicative of a strong downburst estimated at 60 knots or greater. In San Marcos, damages were estimated at $7 million.
- April 20, 2006. Severe thunderstorms produced extremely large hailstones that caused extensive damage to the San Marcos Tanger Outlet Mall and Prime Time Outlet Mall. Inspectors from the National Weather Service (NWS) surveying the damage after the event indicated the damages were caused by a combination of large hail and winds gusting 40 to 50 mph. Damages from this storm were estimated at $100 million with up to 10,000 vehicles damaged and another 7,000 vehicles in homes in the area. This event was considered one of the costliest hailstorms in U.S. history. See Section 5.4.10, Hail, of the Plan update for additional details about this event.
- January 13, 2007. A severe thunderstorm struck just south of the San Marcos Police Headquarters Building and produced winds estimated at 70 to 80 mph northward along Interstate Highway 35. The NCDC report indicated that tin metal roofs were torn off several buildings and tossed several hundred feet. Inspection teams also noted damage to roofs and eaves as well as walls of some buildings. Damages from the event were estimated at $100,000. The high winds were immediately followed by an F1 tornado that

damaged the Police Headquarters building and approximately 35 police cars. The tornado caused approximately $50,000 in damages.

- June 11, 2009. Severe thunderstorms downed numerous power lines in San Marcos causing approximately $50,000 in damages.

The 2011 Hays County HMP update includes discussions of the 11 natural hazards with potential to affect the County (see Section 5, *Hazard Identification, Profiling and Ranking*), including the jurisdictions within the County boundaries. The subsections below include only information that supplements the material in Section 5 of the County HMP.

1.3.1 Floods

This subsection addresses the flood hazard. The flood subsection below includes the potential for floods caused by extreme rainfall associated with these hazards. Hazard Description. The City of San Marcos is vulnerable to shallow and riverine flooding. As mentioned in Section 5.4.1 (Floods) of the Hays County Plan update, this area of central Texas is prone to intense rainfall events that have been known to deposit enormous volumes of water in relatively short timeframes. Coupled with steep-gradient topography and hard surface geology, runoff from intense storms frequently causes flash floods. These flooding problems are further exacerbated by urbanization.[2] See Section 5.4.1 of the Hays County Plan update for a general description of the flood hazard. Hazard Location. The existing flood hazard faced by the City of San Marcos is a combination of flooding and erosion issues in known special flood hazard areas (100-year floodplain), out-of-bank flooding and erosion in unstudied tributaries, and surcharge in secondary drainage systems. The potential for further flood hazard exists as currently undeveloped areas, both in and outside of the City of San Marcos' jurisdiction, become developed.[3] From a review of the FIRM for San Marcos, the flood hazard is primarily located along the floodplains of the Blanco and San Marcos Rivers and their tributaries. According to the Hays County GIS, a total of 5.07 square miles of the City (18.3 square miles total) is located within the 100-year floodplain. San Marcos has a total of 1,500 parcels that have some exposure to the 100-year floodplain. Various floodplain maps for the City are presented within this subsection. Severity and extent of the hazard. Flood severity is measured in various ways, including frequency, depth, velocity, duration and contamination, among others. The frequency of flooding is often the most common for judging severity. Since 1998, the San Marcos area has been hit with four major storm and flood events, resulting in loss of life and extensive damage to property and infrastructure. Hazard's impact on life and property. The impacts on life and property from flooding can be significant. Property owners that have experienced repetitive flooding in the past must cope with the disruptions and costly repairs associated with flooding. As mentioned above the four floods since 1998 caused significant loss of life and property damage. Occurrences of the hazard. The City of San Marcos has a long history of catastrophic floods. In San Marcos, the most disastrous flood in the past 40 years occurred on May 15, 1970. In Hays County, the storm produced rainfall totals that ranged from six inches in the northern part of the County with up to 13 inches recorded in San Marcos. The flood frequency was estimated between a 50 and 100-year flood event. It was estimated that 1,850 acres of floodplain were inundated and approximately half of this total was urban area.[4] Based on a review of open source documents San Marcos has more recently experienced flood events in 1997, 1998, 2001, 2002, 2004, and 2007. With six events over the past 14 years, the City is likely to be impacted by floods approximately every 2.3 years, an annual statistical probability of about .43 percent.

[2] San Marcos Flood Protection Plan, Engineering Report, Volume I of II. Prepared by Espey Consultants. May 10, 2007.
[3] San Marcos Flood Protection Plan, Engineering Report, Volume I of II.
[4] Flood Insurance Study (FIS), Hays County, Texas. Effective September 2, 2005. Page 9.

A portion of seven major watersheds are located within the City. The watersheds include the following

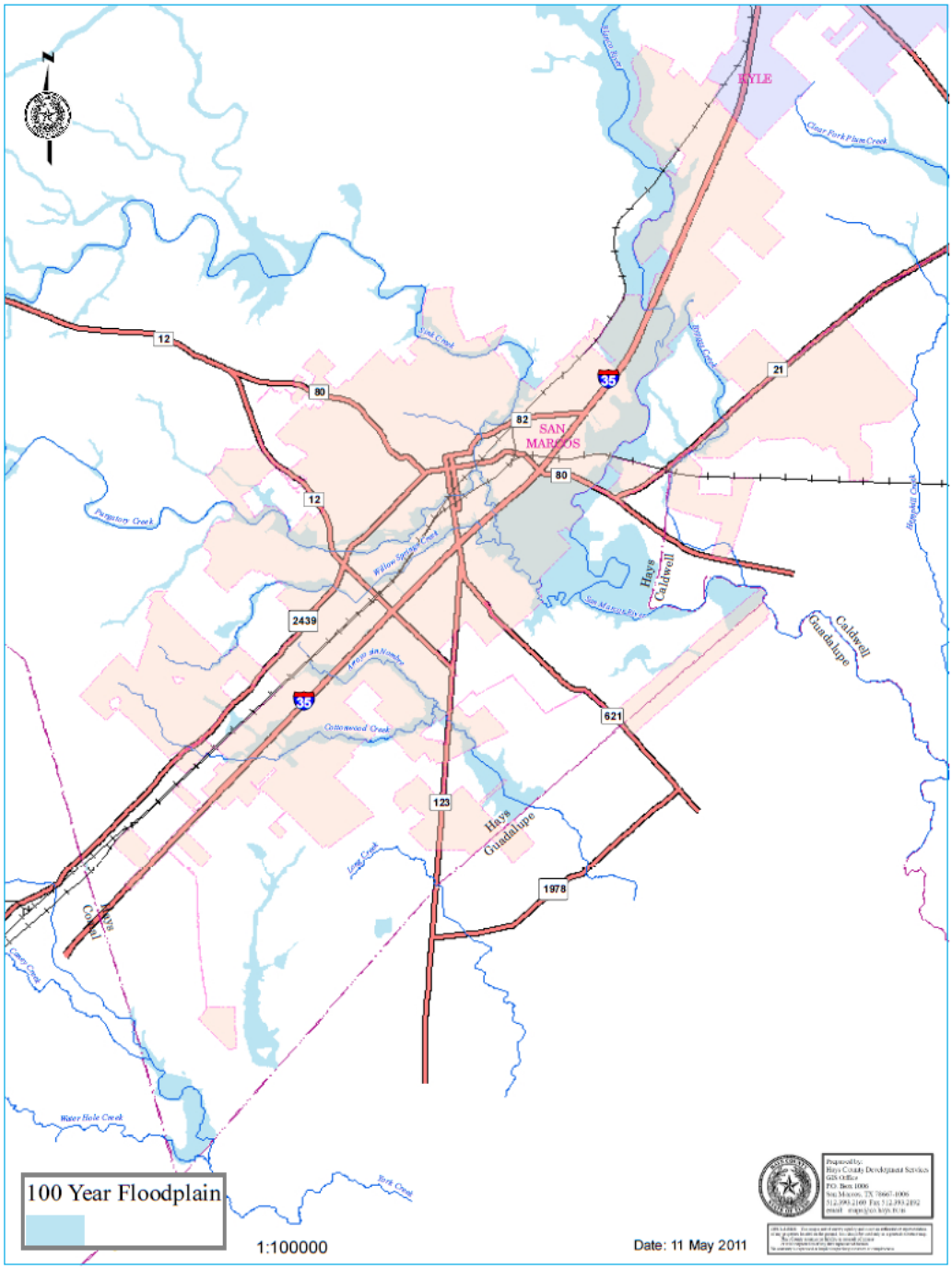
- Blanco River
- Bypass Creek
- Cottonwood Creek
- Purgatory Creek
- San Marcos River
- Sink Creek
- Willow Springs Creek

The watersheds that drain to and through the City of San Marcos are known for flash flooding. The 2007 San Marcos Flood Protection Plan describes these watersheds as being highly urbanized, steep watersheds flowing primarily from west to east through the City. The meteorological characteristics of central Texas, along with a geographic influence caused by the Balcones Escarpment, produce conditions conducive to large rainstorms in the area.[5]

One of the best sources for determining flood risk for an area is review of the Flood Insurance Rate Maps (FIRMs) produced by FEMA. The FIRM is the official map of a community on which FEMA has delineated both the special flood hazard areas (1% annual chance of flooding) and the risk premium zones applicable to the community.[6] The City of San Marcos is located on 17 FIRM panels, all with effective dates of September 2, 2005. Figure H-5 identifies the 100-year floodplain for San Marcos. The map shows that the largest areas of floodplain in San Marcos follow the Blanco and San Marcos Rivers. The Blanco River travels generally in a north-south direction through the northeastern and eastern part of the City. Additional areas of floodplain follow Cottonwood Creek, Arroyo Sin Nombre, Willow Springs Creek, Purgatory Creek, Sink Creek and Bypass Creek

[5] San Marcos Flood Protection Plan, Engineering Report, Volume I of II.
[6] FEMA online - Floodplain Management. Flood Insurance Rate Map (FIRM) definition

Figure H-4
City of San Marcos - Floodplain Map
(Source: FEMA, Effective FIRM September 2, 2005, Hays County GIS Office)



The City of San Marcos has been a member of the NFIP since August, 1971. In some cases the number of policies in force (i.e. the number of flood insurance policies currently valid and active in a community) may be a proxy for flood risk. The table below compares the number of policies and claim statistics for the City of San Marcos to those in the unincorporated areas of Hays County. The table indicates that between 1971 and 2010, there have been 338 NFIP insurance claims in San Marcos, with a total claims value of $3,514,972.[7]

Table H-2
Comparison of NFIP Claims for the City of San Marcos with Hays County
(Source: FEMA – NFIP Statistics, March, 2011)

City/County Name	# of Polices In-Force	Insurance In-Force	# of Losses	Total Paid Claims
City of San Marcos	517	84,514,600	338	$3,367,921
Hays County (unincorporated areas)	521	$130,165,500	236	$3,514,972

1.3.2 Tornadoes

This subsection addresses the tornado hazard. Hazard Description. The nature of the tornado hazard in this jurisdiction is considered substantially the same as for the County as a whole. Refer to HMP Section 5 for further information. Hazard Location. The hazard affects all parts of this jurisdiction approximately equally. Severity and extent of the hazard. The severity and extent of the hazard are equal across the jurisdiction. Hazard's impact on life and property. The potential impacts on life and property in this jurisdiction vary with the strength of the events. Vulnerability to the tornado hazard is directly correlated to structure type and occupancy; because of this variability, it is not possible to accurately characterize vulnerabilities across the entire jurisdiction. However, Subsection 1.4.2 below includes the results of a basic tornado risk assessment, which was conducted using best-available data at the time of the analysis. Occurrences of the hazard. Tornado occurrences are discussed in HMP Section 5. The statistical probability of these hazards impacting this jurisdiction are the same as for the County as a whole.

[7] FEMA – Policy and Claim Statistics for Flood Insurance

1.3.3 Winter Storm

This subsection addresses the winter storm hazard. Hazard Description. The nature of winter storm hazard in this jurisdiction is considered substantially the same as for the County as a whole. Refer to HMP Section 5 for further information. Hazard Location. The hazard affects all parts of this jurisdiction approximately equally. Severity and extent of the hazard. The severity and extent of the hazard are equal across the jurisdiction. Hazard's impact on life and property. The potential impacts on life and property in this jurisdiction vary with the strength of the events. Vulnerability to the winter storm hazard is directly correlated to structure type and occupancy; because of this variability, it is not possible to accurately characterize vulnerabilities across the entire jurisdiction. However, Subsection 1.4.3 below includes the results of a basic winter storm risk assessment, which was conducted using best-available data at the time of the analysis. Occurrences of the hazard. Winter storm occurrences are discussed in HMP Section 5. The statistical probability of these hazards impacting this jurisdiction are the same as for the County as a whole.

The remaining eight hazards profiled as part of the Hays County Plan update are not described within the jurisdictional appendices. The hazard descriptions in the main plan provide sufficient descriptions of these hazards, so they are not repeated in the jurisdictional appendices, although the appendices include actions to address the full range of hazards. See Section 5.4 of the Hays County Plan update for a complete profile of the other hazards.

1.4 Vulnerability Assessment and Loss Estimation

This subsection briefly summarizes the jurisdiction's vulnerabilities and estimated losses from three natural hazards: floods, tornadoes, and winter storms. Because the jurisdiction appendices in this 2011 HMP update have been standardized, in some cases there will be very little risk evident in certain communities, and therefore minimal information in these subsections. The methodologies for completing these analyses are described in Section 6 (and hazard-specific subsections) of the HMP, and are not repeated here.

1.4.1 Flood Loss Estimation

The flood risk assessment method is based on analysis of NFIP data on repetitive flood loss properties. The NFIP defines repetitive loss properties as those that have received at least two NFIP insurance payments of more than $1,000 each in any rolling ten-year period. As of May 2010, Hays County had 32 such properties (30 residential and two non-residential properties), based on a query of the FEMA BureauNet NFIP interface. Of this total, 13 repetitive loss properties (40.6 percent of the County total) were located within the City of San Marcos. Table H-3 provides a comparison of the residential repetitive loss claims for Hays County and the City of San Marcos. The table below includes the number of repetitive loss properties, building and contents damages, the total number of claims, and the average claim amounts.

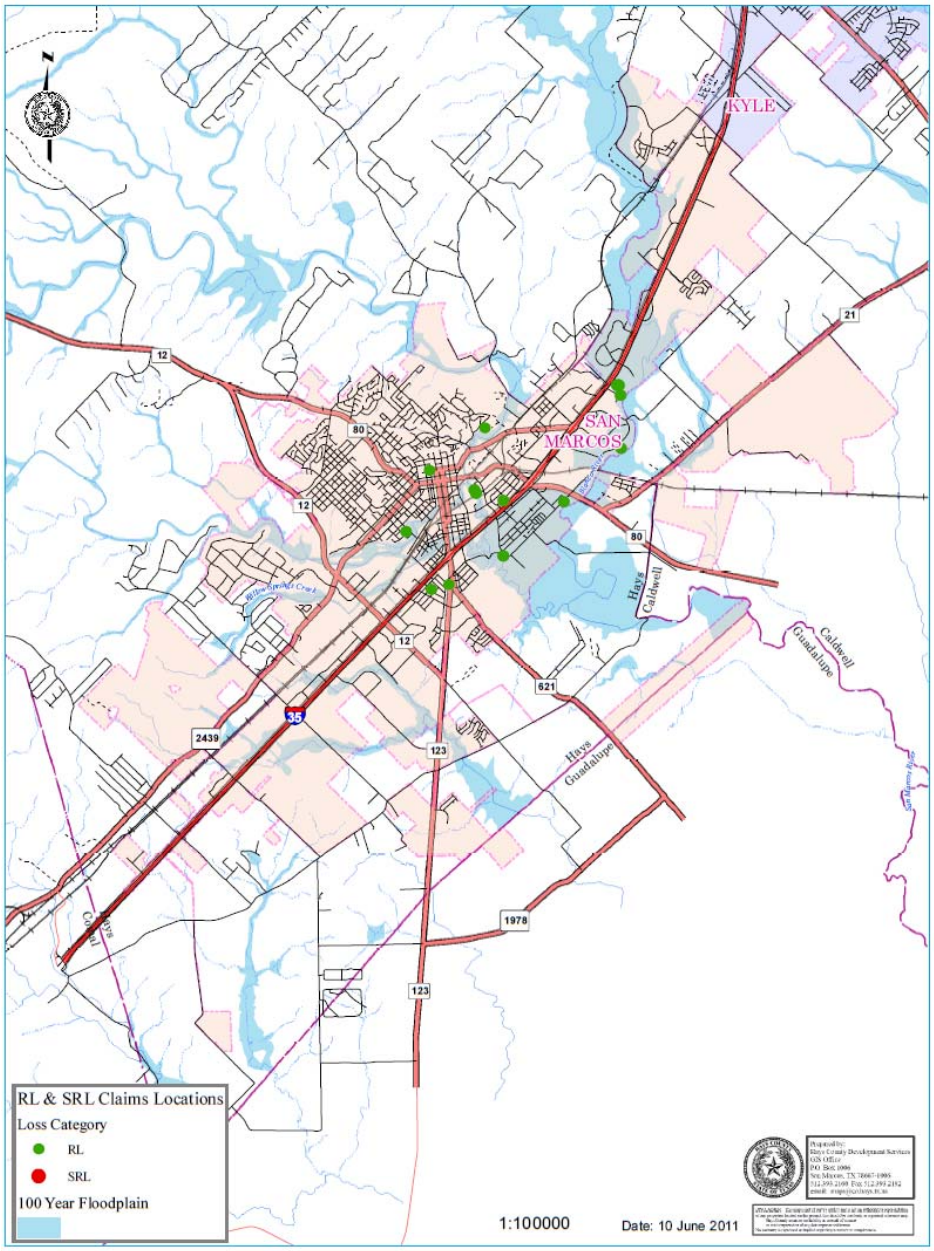
Table H-3
Summary of Residential NFIP Repetitive Loss Statistics, Hays County and the City of San Marcos
(Source: FEMA NFIP query May, 2010)

Unincorporated Area/City	Properties	Building	Contents	Total	# Claims	Average
Unincorporated Hays County	17	$664,810	$206,634	$871,444	36	$24,207
San Marcos, City of	13	$314,126	$119,342	$433,468	27	$16,054
Grand Total	**30**	**$978,936**	**$325,976**	**$1,304,912**	**63**	**$20,713**

*Note: This total includes the incorporated and unincorporated areas of Hays County.

The following map (Figure H-5) identifies the 13 NFIP RL properties in the City of San Marcos. The map includes major thoroughfares, but detailed street names have been omitted for confidentiality purposes to prevent the identification of exact address locations of RL properties. The map shows the RL properties in San Marcos are mainly located along the floodplain of the Blanco River and its tributaries.

Figure H-5
Map of Repetitive Loss Properties in the City of San Marcos
(Source: FEMA, Effective FIRM September 2, 2005, Hays County GIS Office)



The RL claims can be broken down by focusing on individual street level data. Table H-4 provides a summary of residential RL claims for the nine individual streets within San Marcos. The table includes the building, contents, and total claims data for repetitive loss properties in San Marcos. Address data about individual sites is omitted for reasons of confidentiality. The data shows that Hackberry Street and River Road have the most RL properties in the City of San Marcos. These two streets both have three RL properties and six prior NFIP claims. Although these two streets have the same number of properties and prior claims, Hackberry Street has almost twice the building claims value and average claim amount.

Table H-4
Summary of Residential NFIP Repetitive Loss Statistics, City of San Marcos, ordered by number of Claims per Street
(Source: FEMA NFIP query May, 2010)

Street Name	# of Properties	Building	Contents	Total	# Claims	Average
Hackberry Street	3	$114,109	$0	$114,109	6	$19,018
River Road	3	$61,741	$0	$61,741	6	$10,290
Farris Street	1	$10,207	$0	$10,207	2	$5,103
North Fredericksburg St.	1	$0	$8,070	$8,070	2	$4,035
North Riviera Street	1	$26,113	$0	$26,113	2	$13,056
Pecan Street	1	$51,257	$0	$51,257	2	$25,628
Riviera Street	1	$46,751	$43,900	$90,651	3	$30,217
SR 123 North	1	$0	$67,372	$67,372	2	$33,686
Sycamore Street	1	$3,950	$0	$3,950	2	$1,975
Grand Total	**13**	**$314,126**	**$119,342**	**$433,468**	**27**	**$16,054**

1.4.2 Tornado Loss Estimation

Relative to other parts of the nation, the overall tornado risk is moderate in Hays County and the City of San Marcos. There is significant enough exposure to the hazard to perform a simple risk assessment to characterize the potential future losses. The tornado loss estimation for the City of San Marcos was calculated using FEMA's Benefit-Cost Analysis Tool (BCAR) software (version 4.5.5.0). The BCAR analysis methodology and tornado element of the software are based entirely on avoided injuries and fatalities. The table below summarizes residential data inputs and expected losses over a 50-year planning horizon.

Table H-5
Residential Tornado Risk Assessment - Project Information
(Source: FEMA BCA Software, Version 4.5.5.0)

Data	Value
Loss estimation horizon (in years)	50
Population (2010 US Census)	44,894
Zip Code used as center of analysis	78676
Radius in miles for access to safe room	2.41
Assumed safe room structure design wind speed (m.p.h.)	200
Assumed structure type: residential properties	Wood-frame, one- or two-story
Occupancy Percentage	
Day	50%
Evening	80%
Night	100%
Estimated Annual losses (residential property)	**$2,745,101**
Estimated losses – 50-year horizon (residential property)	**$37,884,446**

It should be noted that this result is typical of tornado analyses (i.e. that the apparent risk is very high compared to other hazards). This occurs because the analysis is based entirely on life safety, and the probabilities of events of various magnitudes combined with the relatively high values assigned to deaths and injuries indicate significant losses over long time horizons. See *Tornado Wind Risk in Hays County section of the* Plan update to see how the residential tornado risk in the City of San Marcos compares with the risk to the County other municipalities in Hays County.

Tornado Risk – Public Assets

In addition to the residential tornado risk assessment an analysis was also completed for the City's XX public facilities. The analysis was completed based on data provided by the City of San Marcos and entered into the tornado module of the FEMA BCAR software. Within the tornado module, separate analyses were completed for each structure by entering data such as the building square footage and occupancy. As part of the analysis it was assumed that the safe room design wind speed was 200 m.p.h. This data input is related to the fact that the software is designed to evaluate safe rooms; this figure is not intended to represent the design wind speed of individual facilities. Table H-6 below summarizes the non-residential data inputs.

Table H-6
Non-Residential Tornado Risk Assessment - Project Information
(Source: FEMA BCA Software, Version 4.5.5.0)

Data	Value
Loss estimation horizon	50
Assumed safe room structure design wind speed (mph)	200
Assumed structure type	Small professional building (steel frame)
Occupancy Percentage	
Day	100%
Evening	25%
Night	5%

The software uses inputs related to building occupancy by time of day to calculate the expected loss of life and number of injuries for tornado classes F0 to F5. The results of the analysis are shown below in Table H-7. The table shows that the Police Department building has the highest annual and 50-year risk for public facilities in the City of San Marcos.

Table H-7
Tornado Risk Assessment – City of San Marcos Public Assets, Annual and 50-Year Tornado Risk
(Source: FEMA BCA Software, Version 4.5.5.0)

Facility Name	Square Footage	Occupancy	Replacement Value	Annual Risk	50-Year Risk
Grant Harris Bldg	6,510	13.0	$716,200	$2,109	$341,697
Dunbar Rec Center	6,508	13.0	$452,200	$2,109	$341,592
Old Fish Hatchery	5,996	12.0	$267,000	$1,943	$314,718
Nature Center	2,460	2.5	$210,400	$399	$64,560
Calaboose Building	1,280	2.6	$72,100	$415	$67,185
Georgia St. Senior Ctr	1,938	3.9	$167,000	$628	$101,722
SM Electric Utility	NA	1.7	NA	$270	$43,740
Animal Shelter	NA	2.0	$556,100	$324	$52,488
Activity Center	57,775	40.0	$5,816,700	$6,480	$1,049,760
Code Enforcement	3,187	6.4	NA	$1,033	$167,279
Library	26,560	13.0	$4,455,700	$2,109	$341,592
Airport Terminal	3,420	13.0	$342,400	$2,109	$341,592
City Hall	13,556	27.1	NA	$4,392	$711,527
Municipal Building	10,120	20.2	$969,800	$3,279	$531,179
Public Works	20,528	6.8	$1,289,600	$1,109	$179,579
W/WW Warehouse	1,344	0.4	NA	$73	$11,757
Permit Center	4,032	8.1	NA	$1,306	$211,632
Sign Shop	3,136	3.1	$71,800	$508	$82,301
Park Patrol	768	1.5	$57,900	$249	$40,311
WWTP Admin	6,008	12.0	$342,000	$1,947	$315,348
WWTP Process	5,850	2.0	$14,000,000	$316	$51,176
WWTP Quality	2,376	0.8	NA	$128	$20,785
Police Department	46,168	92.3	$3,584,500	$14,958	$2,423,266
Fire Station 1	3,864	7.7	$745,400	$1,252	$202,814
Fire Station 2	3,104	6.2	$264,000	$1,006	$162,923
Fire Station 3	7,564	15.1	$825,200	$2,451	$397,019
Fire Station 4	3,184	6.4	$296,900	$1,032	$167,122
Fire Station 5	18,935	37.9	NA	$6,135	$993,860
ATCT	NA	2.0	NA	$324	$52,488
Gary Sports Complex	1,132	13.0	$89,100	$2,109	$341,592
Tourist Information Ctr	1,944	3.9	$169,000	$630	$102,037
Cemetery Chapel	1,152	2.3	$100,000	$373	$60,466
T Hangars	15,236	5.1	$84,600	$823	$133,285
Storage Bldg	9,792	3.3	$198,500	$529	$85,660
Tower	NA	0.0	$100,000	$0	$0

Facility Name	Square Footage	Occupancy	Replacement Value	Annual Risk	50-Year Risk
Airport Fire Station	NA	0	$106,400	$0	$0
Price Senior Center	7,736	15.5	$449,000	$2,506	$406,047
Cock House	1,264	2.5	$135,000	$410	$66,345
Recreation Hall	NA	13.0	$1,100,000	$2,109	$341,592
Hangar	10,200	2.0	$181,100	$316	$51,176
Hangar	10,350	3.5	$180,100	$559	$90,542
Hangar	12,168	4.1	$209,500	$657	$106,446
Concessions	1,820	1.8	NA	$295	$47,764
Cemetery Shop	1,020	1.0	$40,000	$165	$26,769
PARD/WWW Storage	5,430	1.8	NA	$293	$47,502
Bathhouse	2,236	2.2	$181,700	$362	$58,682
Totals	**347,651**	**445.2**	**$38,826,900**	**$72,529**	**$11,748,917**

1.4.3 Winter Storm Loss Estimation

This analysis is based on information provided by the County and community, and uses data from the National Climatic Data Center (NCDC) and estimates from the 2010 U.S. Census. The estimated annual and 100-year risk for each jurisdiction was calculated as a proportion of the total winter storm risk for Hays County. Additional information about the methodology is found in Section 6 of the HMP. Jurisdiction-specific information and analysis output are provided in the table below.

Table H-8
City of San Marcos Winter Storm Loss Estimates
Data Parameters and Summary of Results
(Source: FEMA BCA Software, Version 4.5.5.0)

Data	Value
Winter storm events	9
Reporting Years	14
Average annual number of winter storm events	0.64
Total reported damages (Hays County)	$7,500,000
Annual damages (Hays County)	$535,714
Hays County Population (2010 US Census)	157,101
San Marcos Population (2010 US Census)	44,894
Percent of County Population	28.57%
Estimated Annual losses	**$153,054**
Estimated losses – 100-year horizon	**$2,184,074**

1.5 Mitigation Actions

The table below lists prioritized mitigation projects and actions identified by the City of San Marcos. The list was prioritized by the community using the STAPLEE methodology – see Section 7 of the County HMP for a discussion of this methodology. All of the original actions for Uhland (Action Items 1-18) remain in the table for reference purposes. Completed actions are noted in the status column, but also have the action number and action item description highlighted with ~~strikethrough~~ text to indicate completion. Action items 19 – 28 have been added as part of the 2011 Plan update.

Table H-9
City of San Marcos Mitigation Actions

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
Note: Action Items 1-7 were identified from the original Hays Co. HMP.							
1	**Reduce Flood Losses and Increase Flood Insurance Coverage in Hays County.** Increasing the flood insurance policy base in Hays County will provide financial relief to property owners and renters that are flooded in future disaster events. By relying on flood insurance property owners and renters have economic security and do not have to rely on a disaster event being declared as a Presidential Declared Disaster. This action was labeled F-2 from the original Plan.	City of San Marcos	Cost and Funding: Existing staff resources, no cost	2010 with improve-ments annually through 2015	Flood	Not independently cost-effective	On-going
2	**Minimize the risk of loss of life at low water crossings in Hays County.** Install warning signs or barricades at all high velocity low water crossings identified in the Hays County Flood Insurance Study (FIS). Phase 1 of this Action Item is to identify low water crossings located in high velocity areas and install signage or barricades to warn and restrict vehicular or pedestrian crossings during flood events. This action was labeled F-3 from the original Plan.	Hays County	Cost and Funding: $12,000 annually and $2,000 per year maintenance cost	Study initiation in 2006 and installation in 2007-2009	Flood	Not independently cost-effective, but critical for reducing loss of life and injuries at low water crossings	In progress

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
3	**Acquisition or elevation of Repetitive Loss Properties.** There is a 25% local share cost associated with HMGP and FMA funding. However there is the possibility that individuals will elevate or flood proof at their own expense once they see the benefits of this mitigation action. Since approval of the Hays County Mitigation Plan as both an all hazards plan and as a flood mitigation plan, funding from these two Federal programs will be available to all participating communities. This action was labeled F-4 from the original Plan.	City of San Marcos	Cost: The estimated acquisition cost is $100,000 per structure. The estimated cost to elevate a residential structure a total of three feet in a shallow flooding area is $30,000 per structure. Funding Sources: FEMA, Texas DEM, Texas Water Development Board (TWDB), Texas Office of Rural and Community Affairs, Hays County	2010-2015	Flood	Cost-effectiveness determined on a per structure or project basis.	On-going
4	**Adopt 'Higher Standard" Flood Damage Prevention Ordinances.** By adopting "higher standard" requirements, new buildings, infrastructure and critical facilities have a reduced risk of loss of life and property damage during a flood event. Communities are encouraged to follow the guidance outlined in EO 11988 where critical facilities are protected to the 500-year (0.2% annual chance flood event) elevation. This action was labeled F-5 from the original Plan.	City of San Marcos	Cost and Funding: Existing staff resources, no cost	2004-2005	Flood	Not independently cost-effective	Updated Ordinance 2010

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
5	**Improve Flood Warning in Hays County.** This Action Item is to identify sites where stream and rain gauges and flood warning for the fourteen (14) High Hazard dams is needed in Hays County and coordinate installation requests with the USGS, GBRA and NWS. The Hays County Mitigation Planning Committee recommends to relocate or raise the Blanco River gauge at Kyle because this gauge is inundated during high water events. This action was labeled F-6 from the original Plan.	Hays County OEM	Cost: Phase 1 – 2 gauges – $40,000 estimated installation cost. Maintenance cost $24,000 (estimated) Phase 2 – 2 gauges - $ 40,000 estimated installation cost. $48,000 (estimated) Phase 3- Flood Warning devices on selected High Hazard dams - $20,000 per dam ($280,000 for all 14 dams). Annual Maintenance cost $5,000 per dam ($70,000 per year for all 14 dams - estimated) Funding: FEMA – Hazard Mitigation Grant Program (HMGP), TWDB, Hays County	Phased 2010-2015	Flood	Not independently cost-effective	Completed – new sites are under review

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
6	**Provide Training for Local Floodplain Managers and Certified Floodplain Managers (CFM's).** By increasing training for local floodplain managers and CFM‟s there should be improved local floodplain management programs, reduced risk of loss of life, and new buildings and infrastructure have a reduced risk of damage during a flood event. The City of San Marcos and/or Hays County would be the logical communities to provide floodplain management training such as hosting FEMA‟s FPM Training Course, "Managing Floodplain Development through the NFIP", hosting NFIP Workshops, and hosting Community Rating System (CRS) Workshops. These training opportunities would assist local communities and provide continuing education credits (CEC‟s) for local floodplain administrators, certified floodplain managers (CFM‟s), engineers, surveyors and the general public. This action was labeled F-8 from the original Plan.	City of San Marcos	Cost and Funding: Existing staff resources, no cost	Annually 2010-2015	Flood	Not independently cost-effective	Trained 5 personnel to CFM level
7	**Increase Participation in the Community Rating System (CRS) Program.** Currently, the City of San Marcos is the only community within Hays County that participates in FEMA‟s CRS Program. Encourage additional Hays County communities to participate in FEMA's CRS program and assist communities in preparing the CRS Program Application, documenting CRS activities, preparing annual reports, hosting CRS workshops and training activities, and developing programs that will result in future CRS credits. This action was labeled F-9 from the original Plan.	Hays EMC	Cost and Funding: Existing staff resources, no cost	2010	Flood	Not independently cost-effective	On-going

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
8	**Improve Emergency Warning Capabilities.** By improving emergency warning Hays County and participating communities can respond faster to save lives and reduce property damage during disaster events. This action was labeled E-1 from the original Plan.	City of San Marcos	$60,000 – $95,000 Funding: Existing staff resources	Phased over 5 years (2010-2013)	All hazards	Not independently cost-effective, but critical for saving lives	New radio station KZOS - completed Reverse 911 system
9	**Improve Emergency Communication Capabilities.** By improving emergency communications Hays County and participating communities can respond faster and coordinate better to save lives and reduce property damage during disaster events. This action was labeled E-2 from the original Plan.	City of San Marcos	$620,000 Funding: Capital Area Planning Council (CAPCO), Texas DEM	Phased over 5 years (2010-2013)	All hazards	Not independently cost-effective, but critical for saving lives	Funded and in progress
10	**Development of and maintenance of countywide and individual community HAZMAP Plans.** Develop and formally adopt HAZMAP plans prior to the November 2004 deadline established by the Disaster Mitigation Act of 2000. Develop procedures to conduct annual reviews and updates to maintain countywide and individual community HAZMAP plans. Provide annual training opportunities for community emergency managers to assist in the planning and plan maintenance efforts. Create and maintain multi-jurisdictional HAZMAP databases and GIS mapping to support countywide and individual community HAZMAP maintenance efforts. This action was labeled E-5 from the original Plan.	City of San Marcos	Existing staff resources	Original Plan adopted on April 20, 2004	All hazards	Not independently cost-effective	Original HMP Complete. Plan update to be adopted in 2011.
11	**Storm Ready Designation for Hays County Communities** Storm Ready is a proven mitigation action. By Hays County and participating communities becoming Storm Ready Communities there can be mitigation actions in place to save lives and reduce property damage during disaster events. This action was labeled E-6 from the original Plan.	City of San Marcos	Cost and Funding: Existing staff resources, no cost	Phased over five years 2010-2015	Floods, thunderstorms, high winds, tropical storms/cyclone, tornadoes, hail	Not independently cost-effective, but critical for saving lives and minimizing injuries	In progress

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
12	**Reduce Impacts of Extreme Heat on Elderly, Disabled, Low-Income and Infants.** This Mitigation Action is for Hays County and participating community Emergency Managers to launch a public notification effort during extreme heat periods urging elderly and low income persons to seek help if needed. Volunteer organizations such as Rotary International, Lions Club, Jaycees, Red Cross, United Way, and others should be urged to participate. Power Companies will be notified by the Wichita County Emergency Manager and requested to participate in the effort to distribute box fans and make minor repairs to air conditioners. The Hays County OEM will coordinate with participating community emergency managers and take the lead to initiate this Mitigation Action. The initial action will include newspaper and radio announcements and public information on both the Hays County and City of San Marcos websites. Public announcements will define the hazard, describe heat related health risks and provide tips on how to prevent illness. Health care officials can play an important role in this mitigation action by providing information to newspapers and radio stations. This action was labeled Heat-1 from the original Plan.	City of San Marcos	$ 2,000 to purchase and distribute 100 box fans $ 3,000 estimated cost for a/c repairs Funding Sources: United Way Rotary Clubs Lions Clubs Red Cross Churches and charitable organizations Power Companies	Periods of Extreme Heat May be annually	Extreme Heat	Not independently cost-effective	Completed each year – ongoing program
13	**Install Emergency Generators at Fire Stations.** Install emergency generators for backup power at all fire stations in the City of San Marcos. There are numerous rural and volunteer fire stations in Hays County that do not have backup power available. A survey should be conducted to evaluate which stations, if not all, should have emergency backup power installed. This action was labeled Fire-1 from the original Plan.	City of San Marcos	$3,000 for Study Funding: Texas DEM, FEMA, Hays County	Study initiation in 2006	Floods, thunderstorms, high winds, tornadoes, seismic, winter storms	Not independently cost-effective, but critical for determining which fire stations need emergency generators	Completed

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
14	**Encourage Construction of Tornado "Safe Rooms."** Sponsor "Safe Room" workshops for communities, interested homeowners, design professionals and contractors. Invite recognized experts such as Texas Tech Wind Engineering, FEMA, TxDEM, and others to provide technical and funding information throughout Hays County. In the event of a disaster event, provide assistance to local communities and interested citizens regarding the "Safe Room" Program and other life saving systems. This action was labeled T-1 from the original Plan.	City of San Marcos - Building	Funding: Texas DEM, FEMA	Ongoing	Tornadoes	Not independently cost-effective	Code updates completed and public awareness campaigns in progress
15	**Building Code Improvements.** This action has zero cost for participating communities and the benefits for new construction are major. Building code improvements ensure that new construction (buildings and infrastructure) can be more resistant to damage from a wide range of hazards. This action was labeled T-2 from the original Plan.	City of San Marcos - Building	Funding: Texas DEM, CAPCO	Evaluation in 2006 Code updates phased 2011-2014	Tornadoes, thunderstorms, high winds, tropical storms/cyclone	Not independently cost-effective	Completed 2010
16	**Make San Marcos More Drought Resistant.** Coordinate with the Guadalupe Blanco River Authority (GBRA), The Lower Colorado River Authority (LCRA), the Edwards Aquifer Authority, the Texas Water Development Board and others to develop a Hays County Water Conservation or Drought Management Recommendations Plan and implement procedures to minimize the impacts of drought on Hays County. This action was labeled D-1 from the original Plan.	City of San Marcos – Water Dept	$20,000 Study Cost Funding: Texas Water Development Board	2011-2015	Drought	Not independently cost-effective	Hired water conservation manager and watershed protection manager Completed study In progress with EARIP plan

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
17	**Construct Needed Water System Improvements in Lower Colorado Region K and South Central Texas Region L.** Hays County is located in two regions as defined in the *Texas Water Plan - Water for Texas 2002*. Areas in Hays County north of Onion Creek are located in Lower Colorado Region K and areas south of Onion Creek are located in South Central Texas Region L. Historically the cities of New Braunfels, San Antonio and San Marcos have relied on groundwater from the Edwards-Balcones Aquifer, which affects the base flow of the Guadalupe River. The City of New Braunfels has converted from groundwater to surface water from Canyon Lake. The City of San Marcos and GBRA recently constructed a pipeline and water treatment plant to convert the City's primary water source to Canyon Lake water. This action supports the long range water goals for the region from the Texas Water Plan which include: protection of the San Marcos Springs from over- pumpage of groundwater; improved aquifer recharge; and construction of additional water supply projects to meet water needs until 2050. This action was labeled D-2 from the original Plan.	City of San Marcos - Engineering	$4,720 million (South Central Texas Region – 21 counties) $ 256 million (14 county Lower Colorado Region) Funding Sources: TWDB, GBRA, LCRA	2010-2015	Drought	Not independently cost-effective	Converted water supply to San Marcos to 80% surface water and 20% Aquifer - Implemented water protection programs
18	**Promote Flood Insurance.** Promote the purchase of Flood insurance. Advertise the availability, cost, and coverage of Flood insurance through the National Flood Insurance Program (NFIP). Develop NFIP brochure and promote using City website and newsletter. Priority: High	City of San Marcos	$2,000	Ongoing	Flood	Not independently cost-effective, but the initial step in identifying appropriate mitigation actions	Ongoing

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
19	**Increase Public Awareness of Hazards.** Increase public awareness of hazards and hazardous areas. Distribute public awareness information regarding flood hazards, SFHAs, and potential mitigation measures using the local newspaper, utility bill inserts, inserts in the phone book, a City hazard awareness website, and an educational program for school age children or "how to" classes in retrofitting by local merchants. Integrate "Disaster Resistance Education" into the public school curriculum. Provide public education on the importance of maintaining the ditches. Priority: Medium	City of San Marcos	$2,000	ongoing	All hazards	Not independently cost-effective	Initiated in 2011 HMP
20	**Wildfire Hazard Areas.** Conduct study to determine and map potential wildfire hazard areas. Priority: Medium	City of San Marcos	$500	TBD; likely initiated in 2011	Wildfire	Not independently cost-effective, but essential in minimizing loss of life and injuries during significant storms.	Initiated in 2011 HMP
21	**Evaluate Excess Heat Risks.** Evaluate the risks presented by excessive heat and humidity, especially in terms of high-risk populations such as the elderly/low income. Priority: Medium.	City of San Marcos	No additional cost – uses existing staff resources	TBD; probably initiated in 2011	Extreme heat	Not independently cost-effective, but needed to develop adequate risk reduction efforts	Initiated in 2011 HMP
22	**Review Plans and Resources to Address Risk Posed By Snow and Ice Hazards During Winter Storms**. Conduct a review of the City's current plans and resources to address the risks posed by ice and snow hazards during winter storms. Focus on City's ability to respond to snow and ice emergencies, and on potentially at-risk populations in the community. Priority: Low to medium.	City of San Marcos	No additional cost – uses existing staff resources	Ongoing	Winter storms	Not independently cost-effective, but contributes to maintaining public services; protects at-risk populations	Initiated in 2011 HMP

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
23	**Various Mitigation Actions to Reduce Wildfire Risk.** On a case-by-case basis, develop and initiate mitigation actions to reduce the wildfire and brushfire risk. Actions may include informing property owners of appropriate actions, clearing vegetation, and monitoring antecedent conditions, among others. Priority: Low.	City of San Marcos	No additional cost – uses existing staff resources	TBD/as need is identified	Wildfire	Cost-effective, as measures tend to be in-expensive and prevent fires	Initiated in 2011 HMP
24	**Upgrades to At-Risk Structures.** Based on the results of the study above, initiate upgrades to at-risk structures and/or infrastructure. Mitigates specific risks to structures, people and operations. Priority: Low	City of San Marcos	Varies depending on measure. Funding from General Fund or FEMA grant program/s	TBD based on study	Thunderstorms, high winds, tropical storms/ cyclones, tornadoes, winter storms, seismic	Cost-effectiveness will vary with level of risk and project cost	TBD, but likely to be initiated no earlier than 2012
25	**Structural/Engineering Study.** Complete a detailed structural/engineering survey of San Marcos public facilities to ensure their soundness with respect to resisting the effects of high winds, extreme roof loading from snow or ice, and hail. Forms basis of decisions about any additional actions to mitigate risk. Priority: Low	City of San Marcos	To be determined, but if initiated probably from General Fund	Not yet established – to be commence d only if funding is available	Thunderstorms, high winds, tropical storms/cyclones tornadoes, winter storms, seismic	Not independently cost-effective, but the initial step in identifying appropriate mitigation actions	Initiated in 2011 HMP
26	**Understanding Dam Failure Risks.** Engage with County and State floodplain managers, engineers and emergency managers to ensure that local officials have a detailed understanding of potential risks to the community from dam and/or levee failures. Priority: Low to medium.	City of San Marcos	No additional cost – uses existing staff resources	Initiated in 2011, then ongoing	Dam failure	Not independently cost-effective	Initiated in 2011 HMP
27	**Evacuation Plans.** Ensure that the jurisdiction and its citizens are aware of and understand notification and evacuation plans related to dam and/or levee failure. Priority: Low to medium.	City of San Marcos	No additional cost – uses existing staff resources	Initiated in 2011, then ongoing	Dam failure	Not independently cost-effective	Initiated in 2011 HMP

1.6 Plan Adoption by the City of San Marcos

After the draft Plan is approved by the Texas Division of Emergency Management (TDEM) and FEMA Region VI, the 2011 Plan Update will be adopted by the Hays County Commissioners Court. The San Marcos City Council will also adopt the updated HMP by resolution. The City of San Marcos adoption resolution is provided below.

Figure H-6
Adoption Resolution - City of San Marcos

Resolution to be inserted upon Plan adoption

Appendix I
City of Uhland

Contents of this Section

1.1 Background
1.2 Public Facilities
1.3 Hazard Identification
1.4 Vulnerability Assessment and Loss Estimation
1.5 Mitigation Actions
1.6 Plan Adoption by the City of Uhland

This appendix is part of the 2011 Hays County Hazard Mitigation Plan (HMP) update, and includes jurisdiction-specific information about the City of Uhland, which is one of the 11 incorporated jurisdictions within the County that is participating in the Plan update. This appendix supplements the County HMP, so only jurisdiction-specific information is included here.

1.1 Background

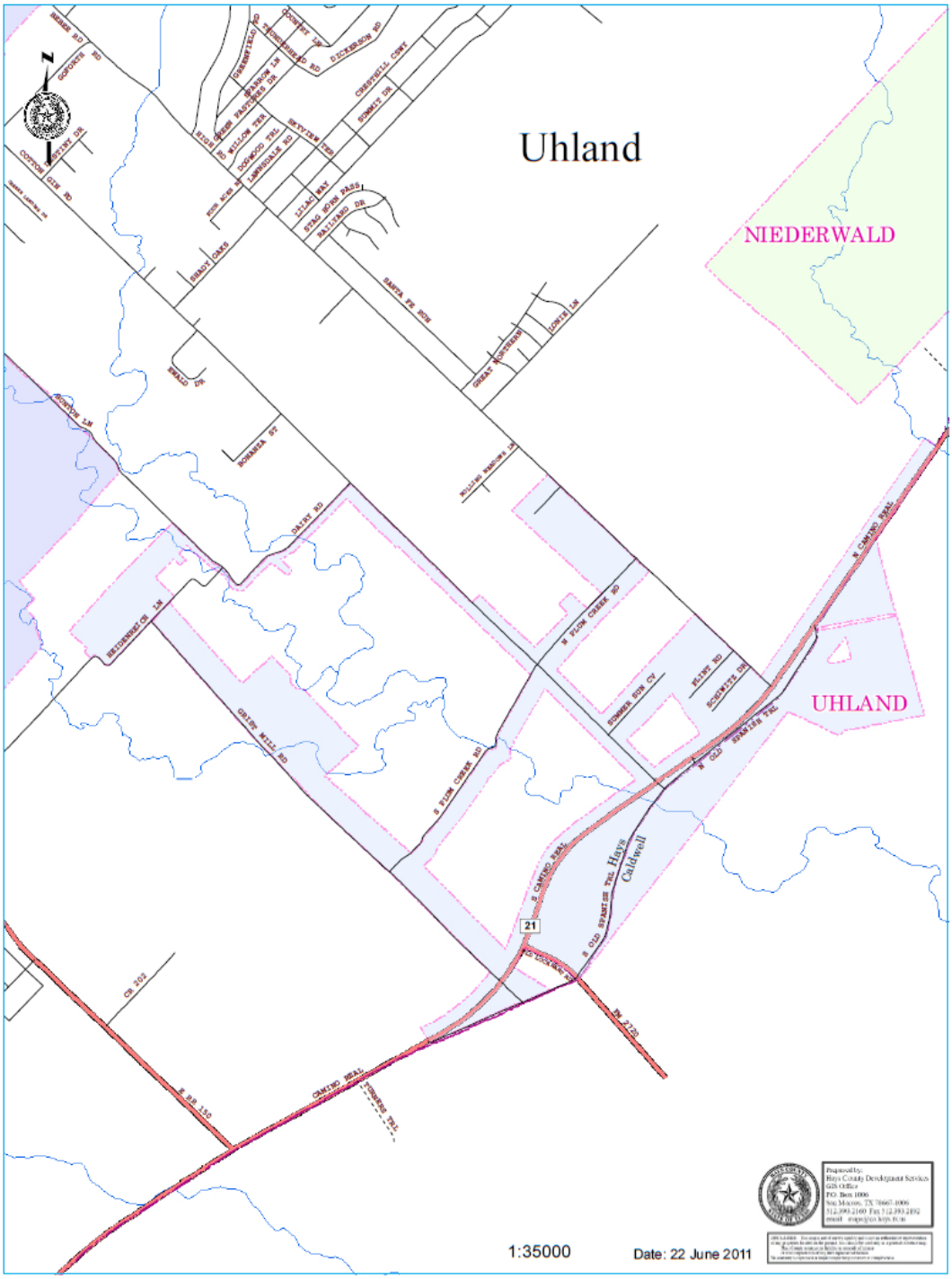
The City of Uhland is located on State Highway 21 eleven miles northeast of San Marcos on the Caldwell and Hays county line. The majority of the City is located in Hays County, with a small portion of the City located in Caldwell County. Originally called Live Oak at its founding in 1860, the community was renamed Uhland in 1900 when the first post office was established. Historians credit Louis Scheh, a German native who moved to the area in 1880 with naming the community for a German poet he admired, Ludwig Uhland.[1]

The population in the City of Uhland has increased significantly over the past 10 years. In 2000 the population was 386. The 2010 U.S. Census estimated the Uhland population at 1,014.[2] Between 2000 and 2010, the population has increased 163 percent. As of 2010 there were 332 housing units in the City.

Figure I-1 is a map of the City of Uhland, which covers approximately 1.8 square miles. See Section 3.3.1 (Geography) of the 2011 Plan update for a jurisdictional map of Hays County.

[1] Official website for the City of Uhland, *about Uhland*
[2] US Census Bureau. 2010 US Census. Race, Hispanic or Latino, Age and Housing Occupancy - City of Uhland.

Figure I-1
City of Uhland, Texas Map
(Source: Hays County Development Services – GIS Office)



1.2 Public Facilities

As part of the Hays County Plan update, the City of Uhland was contacted by email and requested to provide a list of city owned facilities. As of 2010, the City owns one public building. These facilities are listed below in Table I-1

Table I-1
City of Uhland Public Facilities
(Source: City of Uhland, Texas)

No.	Facility Name	Street Address	Year Built	Use	Square Footage	Occupancy	Structure Type	Replacement Value
1	Uhland Community Center/Office	15 North Old Spanish Trail	Unknown	City Office and Community Center	7200	5	Pier @ beam Wood	$360,000

Figure I-2 is the City of Uhland Community Center. The left side of the building functions as the City meeting rooms and City secretary office.

Figure I-2
City of Uhland Community Center
(Source: City of Uhland)

1.3 Hazard Identification

Hays County has received seven Presidential Disaster Declarations since 1965, several of which have affected the City of Uhland.

Overview of Uhland's Recent Natural Hazards History

The City of Uhland was contacted and requested to provide descriptions of past hazard events. In addition to contacting the City, the National Oceanic and Atmospheric Administration's (NOAAs) National Climatic Data Center (NCDC) database was also reviewed to identify past hazard events for the City of Uhland. Upon review and discussion with City officials, no past hazard events were identified for Uhland over the past 20 years.

The 2011 Hays County HMP update includes discussions of the 11 natural hazards with potential to affect the County (see Section 5, *Hazard Identification, Profiling and Ranking*), including the jurisdictions within the County boundaries. The subsections below include only information that supplements the material in Section 5 of the County HMP.

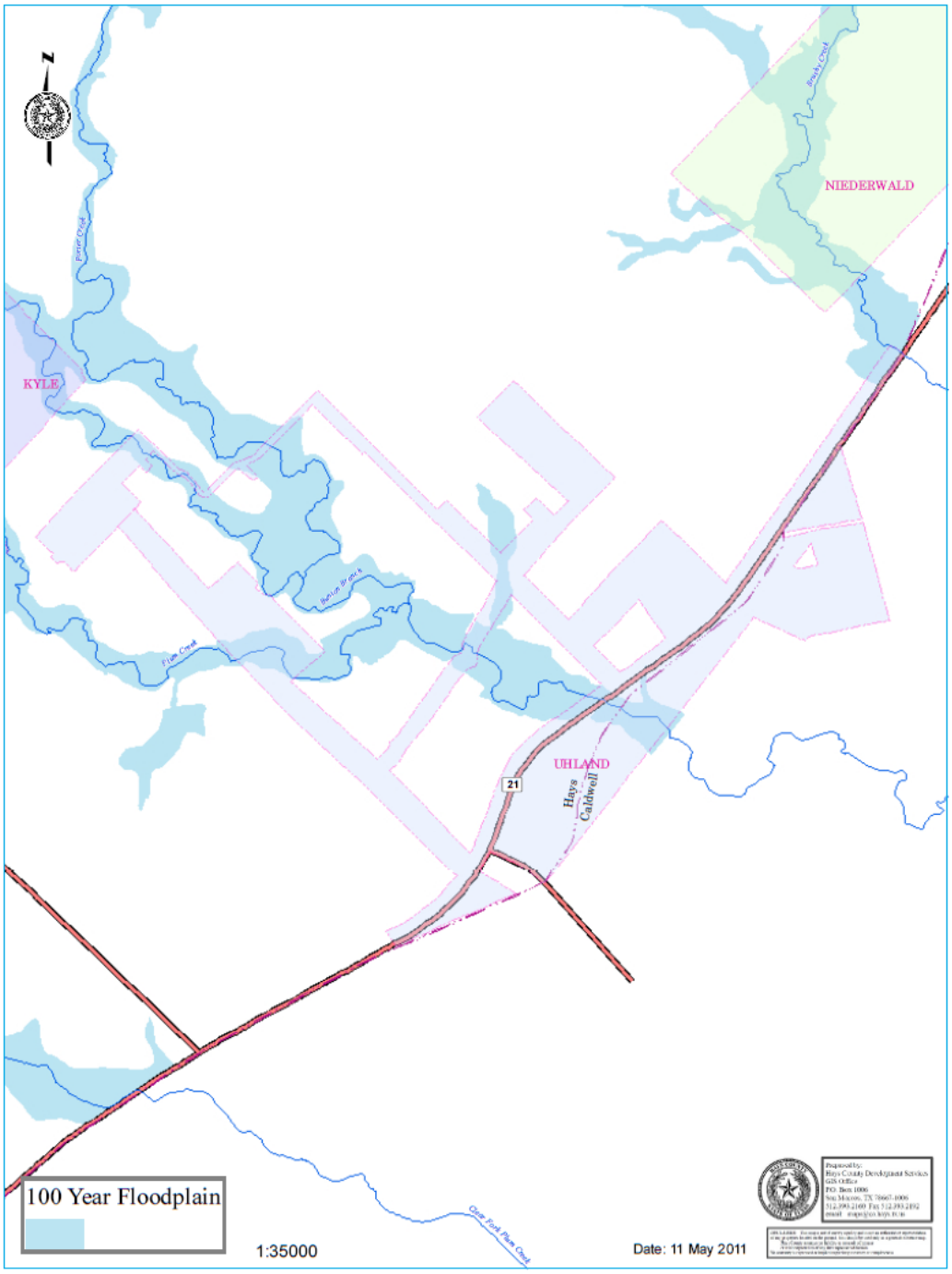
1.3.1 Floods

This subsection addresses the flood hazard. The flood subsection below includes the potential for floods caused by extreme rainfall associated with these hazards. Hazard Description. The City of Uhland is vulnerable to shallow and riverine flooding. See Section 5.4.1 of the Hays County Plan update for a description of the flood hazard. Hazard Location. From a review of the FIRM for Uhland, the flood hazard is primarily located along the floodplain of Plum Creek. According to the Hays County GIS, a total of 0.20 square miles of the City (1.8 square miles total) is located within the 100-year floodplain. Uhland has a total of 20 parcels that have some exposure to the 100-year floodplain. Various floodplain maps for the City are presented within this subsection. Severity and extent of the hazard. Flood severity is measured in various ways, including frequency, depth, velocity, duration and contamination, among others. The frequency of flooding is often the most common for judging severity. In Uhland there have been no significant flood events over the past 10 years. Hazard's impact on life and property. The impacts on life and property from flooding can be significant. Property owners that have experienced repetitive flooding in the past must cope with the disruptions and costly repairs associated with flooding. Occurrences of the hazard. Based on a review of open source documents Uhland has experienced no floods over the past 10 years.

One of the best sources for determining flood risk for an area is review of the Flood Insurance Rate Maps (FIRMs) produced by FEMA. The FIRM is the official map of a community on which FEMA has delineated both the special flood hazard areas (1% annual chance of flooding) and the risk premium zones applicable to the community.[3] The City of Uhland is located on two FIRM panels, both with effective dates of September 2, 2005. Figure I-3 identifies the FEMA flood zones for Uhland. The map shows that a section of 100-year floodplain follows Plum Creek, which generally flows in a southeasterly direction through the central and southeastern part of the City.

[3] FEMA online - Floodplain Management. Flood Insurance Rate Map (FIRM) definition

Figure I-3
City of Uhland - Floodplain Map
(Source: FEMA, Effective FIRM September 2, 2005, Hays County GIS Office)



1.3.2 Tornadoes

This subsection addresses the tornado hazard. Hazard Description. The nature of the tornado hazard in this jurisdiction is considered substantially the same as for the County as a whole. Refer to HMP Section 5 for further information. Hazard Location. The hazard affects all parts of this jurisdiction approximately equally. Severity and extent of the hazard. The severity and extent of the hazard are equal across the jurisdiction. Hazard's impact on life and property. The potential impacts on life and property in this jurisdiction vary with the strength of the events. Vulnerability to the tornado hazard is directly correlated to structure type and occupancy; because of this variability, it is not possible to accurately characterize vulnerabilities across the entire jurisdiction. However, Subsection 1.4.2 below includes the results of a basic tornado risk assessment, which was conducted using best-available data at the time of the analysis. Occurrences of the hazard. Tornado occurrences are discussed in HMP Section 5. The statistical probability of these hazards impacting this jurisdiction are the same as for the County as a whole.

1.3.3 Winter Storm

This subsection addresses the winter storm hazard. Hazard Description. The nature of winter storm hazard in this jurisdiction is considered substantially the same as for the County as a whole. Refer to HMP Section 5 for further information. Hazard Location. The hazard affects all parts of this jurisdiction approximately equally. Severity and extent of the hazard. The severity and extent of the hazard are equal across the jurisdiction. Hazard's impact on life and property. The potential impacts on life and property in this jurisdiction vary with the strength of the events. Vulnerability to the winter storm hazard is directly correlated to structure type and occupancy; because of this variability, it is not possible to accurately characterize vulnerabilities across the entire jurisdiction. However, Subsection 1.4.3 below includes the results of a basic winter storm risk assessment, which was conducted using best-available data at the time of the analysis. Occurrences of the hazard. Winter storm occurrences are discussed in HMP Section 5. The statistical probability of these hazards impacting this jurisdiction are the same as for the County as a whole.

The remaining eight hazards profiled as part of the Hays County Plan update are not described within the jurisdictional appendices. The hazard descriptions in the main plan provide sufficient descriptions of these hazards, so they are not repeated in the jurisdictional appendices, although the appendices include actions to address the full range of hazards. See Section 5.4 of the Hays County Plan update for a complete profile of the other hazards.

1.4 Vulnerability Assessment and Loss Estimation

This subsection briefly summarizes the jurisdiction's vulnerabilities and estimated losses from three natural hazards: floods, tornadoes, and winter storms. Because the jurisdiction appendices in this 2011 HMP update have been standardized, in some cases there will be very little risk evident in certain communities, and therefore minimal information in these subsections. The methodologies for completing these analyses are described in Section 6 (and hazard-specific subsections) of the HMP, and are not repeated here.

1.4.1 Flood Loss Estimation

The City of Uhland has been a member of the National Flood Insurance Program (NFIP) since March, 1978. In some municipalities within Hays County, a flood risk assessment can be performed based on analysis of NFIP data on repetitive flood loss properties. The NFIP defines repetitive loss properties as those that have received at least two NFIP insurance payments of more than $1,000 each in any rolling ten-year period. As of May 2010, Hays County had 32 such properties (30 residential and two non-residential properties), based on a query of the FEMA BureauNet NFIP interface. Of this total, none were located within the City of Uhland. With no NFIP repetitive loss properties in Uhland an analysis of repetitive loss properties was not performed.

In some cases the number of policies in force (i.e. the number of flood insurance policies currently valid and active in a community) may be a proxy for flood risk. The table below compares the number of policies and claim statistics for the City of Uhland with Hays County. The Table indicates that as of March, 2011, the City of Uhland had no NFIP policies in force. The table also shows that between 1978 and 2010, there have been no NFIP insurance claims in Uhland.[4]

Table I-2
Comparison of NFIP Claims for the City of Uhland with Hays County
(Source: FEMA – NFIP Statistics, March, 2011)

City/County Name	# of Polices In-Force	Insurance In-Force	# of Losses	Total Paid Claims
City of Uhland	0	$0	0	$0
Hays County	521	$130,165,500	236	$3,514,972

[4] FEMA – Policy and Claim Statistics for Flood Insurance

1.4.2 Tornado Loss Estimation

Relative to other parts of the nation, the overall tornado risk is moderate in Hays County and the City of Uhland. There is significant enough exposure to the hazard to perform a simple risk assessment to characterize the potential future losses. The tornado loss estimation for the City of Uhland was calculated using FEMA's Benefit-Cost Analysis Tool (BCAR) software (version 4.5.5.0). The BCAR analysis methodology and tornado element of the software are based entirely on avoided injuries and fatalities. As a result, it is not necessary to separate public assets from private ones in order to estimate potential future losses (risk) – the calculation is based on the population at risk, rather than the square footage or value of buildings or functions. The table below summarizes data inputs and expected losses over a 50-year planning horizon.

Table I-3
Tornado Risk Assessment - Project Information
(Source: FEMA BCA Software, Version 4.5.5.0)

Data	Value
Loss estimation horizon (in years)	50
Population (2010 US Census)	1,014
Zip Code used as center of analysis (Wimberley, Texas)	78676
Radius in miles for access to safe room	0.66
Assumed safe room structure design wind speed (mph)	200
Occupancy – Community Center	5 (estimated)
Assumed structure type: residential properties	Wood-frame, one- or two-story
Assumed structure type: jurisdiction-owned facilities	Wood-frame, one- or two-story
Estimated annual losses (jurisdiction-owned facilities)	**$810**
Estimated losses – 50-year horizon (jurisdiction-owned facilities)	**$11,174**
Estimated Annual losses (residential property)	**$62,002**
Estimated losses – 50-year horizon (residential property)	**$855,679**

It should be noted that this result is typical of tornado analyses (i.e. that the apparent risk is very high compared to other hazards). This occurs because the analysis is based entirely on life safety, and the probabilities of events of various magnitudes combined with the relatively high values assigned to deaths and injuries indicate significant losses over long time horizons. See Section 6.3.3, *Tornado Wind Risk in Hays County*, of the Plan update to see how the residential tornado risk in the City of Uhland compares with the risk to the County other municipalities in Hays County.

1.4.3 Winter Storm Loss Estimation

This analysis is based on information provided by the County and community, and uses data from the National Climatic Data Center (NCDC) and estimates from the 2010 U.S. Census. The estimated annual and 100-year risk for each jurisdiction was calculated as a proportion of the total winter storm risk for Hays County. Additional information about the methodology is found in Section 6 of the HMP. Jurisdiction-specific information and analysis output are provided in the table below.

Table I-4
City of Uhland Winter Storm Loss Estimates
Data Parameters and Summary of Results
(Source: FEMA BCA Software, Version 4.5.5.0)

Data	Value
Winter storm events	9
Reporting Years	14
Average annual number of winter storm events	0.64
Total reported damages (Hays County)	$7,500,000
Annual damages (Hays County)	$535,714
Hays County Population (2010 US Census)	157,101
Uhland Population (2010 US Census)	1,014
Percent of County Population	0.64%
Estimated Annual losses	**$3,429**
Estimated losses – 100-year horizon	**$48,926**

1.5 Mitigation Actions

The table below lists prioritized mitigation projects and actions identified by the City of Uhland. The list was prioritized by the community using the STAPLEE methodology – see Section 7 of the County HMP for a discussion of this methodology. All of the original actions for Uhland (Action Items 1-7) remain in the table for reference purposes. Completed actions are noted in the status column, but also have the action number and action item description highlighted with ~~strikethrough~~ text to indicate completion. Action items 8 – 19 have been added as part of the 2011 Plan update.

Table I-5
City of Uhland Mitigation Actions

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
Note: Action Items 1-7 were identified from the original Hays Co. HMP.							
~~1~~	~~**Increase the number of Hays County communities that participate in the NFIP.** Accomplishing this action makes flood insurance available throughout Hays County and requires that all communities enforce the minimum requirements of the NFIP. Future buildings cannot be constructed within designated floodways and cannot be constructed below the base flood elevation. This action establishes sound floodplain management programs throughout Hays County. This action was labeled F-1 from the original Plan.~~	City of Uhland	Cost and Funding: Existing staff resources, no cost	2006-2007	Flood	Not independently cost-effective	Complete. The City of Uhland joined the NFIP in 1978.
~~2~~	~~**Adopt 'Higher Standard" Flood Damage Prevention Ordinances.** By adopting "higher standard" requirements, new buildings, infrastructure and critical facilities have a reduced risk of loss of life and property damage during a flood event. Communities are encouraged to follow the guidance outlined in EO 11988 where critical facilities are protected to the 500-year (0.2% annual chance flood event) elevation. This action was labeled F-5 from the original Plan.~~	City of Uhland	Cost and Funding: Existing staff resources, no cost	2008	Flood	Not independently cost-effective	Complete

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
3	**Provide Training for Local Floodplain Managers and Certified Floodplain Managers (CFM's).** By increasing training for local floodplain managers and CFM"s there should be improved local floodplain management programs, reduced risk of loss of life, and new buildings and infrastructure have a reduced risk of damage during a flood event. The City of San Marcos and/or Hays County would be the logical communities to provide floodplain management training such as hosting FEMA"s FPM Training Course, "Managing Floodplain Development through the NFIP", hosting NFIP Workshops, and hosting Community Rating System (CRS) Workshops. These training opportunities would assist local communities and provide continuing education credits (CEC"s) for local floodplain administrators, certified floodplain managers (CFM"s), engineers, surveyors and the general public. This action was labeled F-8 from the original Plan.	City of Uhland	Cost and Funding: Existing staff resources, no cost	Annually 2011– 2015	Flood	Not independently cost-effective	Ongoing
4	**Improve Emergency Communication Capabilities.** By improving emergency communications Hays County and participating communities can respond faster and coordinate better to save lives and reduce property damage during disaster events. This action was labeled E-2 from the original Plan.	City of Uhland	$620,000 Funding: Capital Area Planning Council (CAPCO), Texas DEM	Phased over 5 years (2011-2015	All hazards	Not independently cost-effective, but critical for saving lives	Ongoing

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
5	**Development of and maintenance of countywide and individual community HAZMAP Plans.** Develop and formally adopt HAZMAP plans prior to the November 2004 deadline established by the Disaster Mitigation Act of 2000. Develop procedures to conduct annual reviews and updates to maintain countywide and individual community HAZMAP plans. Provide annual training opportunities for community emergency managers to assist in the planning and plan maintenance efforts. Create and maintain multi-jurisdictional HAZMAP databases and GIS mapping to support countywide and individual community HAZMAP maintenance efforts. This action was labeled E-5 from the original Plan.	City of Uhland	Existing staff resources	Original Plan adopted 2006 – update underway	All hazards	Not independently cost-effective	Original HMP Complete. Plan update to be adopted in 2011.
6	**Storm Ready Designation for Hays County Communities** Storm Ready is a proven mitigation action. By Hays County and participating communities becoming Storm Ready Communities there can be mitigation actions in place to save lives and reduce property damage during disaster events. This action was labeled E-6 from the original Plan.	City of Uhland	Cost and Funding: Existing staff resources, no cost	Phased over five years 2011-2015	Thunderstorms, high winds, tropical storms and cyclones, tornadoes, floods	Not independently cost-effective, but critical for saving lives and minimizing injuries	Ongoing

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
7	**Reduce Impacts of Extreme Heat on Elderly, Disabled, Low-Income and Infants.** This Mitigation Action is for Hays County and participating community Emergency Managers to launch a public notification effort during extreme heat periods urging elderly and low income persons to seek help if needed. Volunteer organizations such as Rotary International, Lions Club, Jaycees, Red Cross, United Way, and others should be urged to participate. Power Companies will be notified by the Hays County Emergency Manager and requested to participate in the effort to distribute box fans and make minor repairs to air conditioners. The Hays County OEM will coordinate with participating community emergency managers and take the lead to initiate this Mitigation Action. The initial action will include newspaper and radio announcements and public information on both the Hays County and City of San Marcos websites. Public announcements will define the hazard, describe heat related health risks and provide tips on how to prevent illness. Health care officials can play an important role in this mitigation action by providing information to newspapers and radio stations. This action was labeled Heat-1 from the original Plan.	Hays County OEM and Local ESDs	$ 2,000 to purchase and distribute 100 box fans $ 3,000 estimated cost for a/c repairs Funding Sources: United Way Rotary Clubs Lions Clubs Red Cross Churches and charitable organizations Power Companies	Periods of Extreme Heat May be annually	Extreme heat	Not independently cost-effective	Ongoing
8	**Promote Flood Insurance.** Promote the purchase of Flood insurance. Advertise the availability, cost, and coverage of Flood insurance through the National Flood Insurance Program (NFIP). Develop NFIP brochure and promote using City website and newsletter. Priority: High	City of Uhland	$2,000	Ongoing	Flood	Not independently cost-effective, but the initial step in identifying appropriate mitigation actions	Ongoing

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
9	**Increase Public Awareness of Hazards.** Increase public awareness of hazards and hazardous areas. Distribute public awareness information regarding flood hazards, SFHAs, and potential mitigation measures using the local newspaper, utility bill inserts, inserts in the phone book, a City hazard awareness website, and an educational program for school age children or "how to" classes in retrofitting by local merchants. Integrate "Disaster Resistance Education" into the public school curriculum. Provide public education on the importance of maintaining the ditches. Priority: Medium	City of Uhland	$2,000	ongoing	Floods, thunderstorms, high winds, tornadoes	Not independently cost-effective	Initiated in 2011 HMP
10	**Wildfire Hazard Areas.** Conduct study to determine and map potential wildfire hazard areas. Priority: Medium	City of Uhland	$500	TBD; likely initiated in 2011	Wildfire	Not independently cost-effective, but essential in minimizing loss of life and injuries during significant storms.	Initiated in 2011 HMP
11	**Vegetation maintenance**. Regularly cut back and maintain potentially flammable vegetation around and near structures.	City of Uhland	$5,000	TBD; likely initiated in 2011	Wildfire	Not independently cost-effective	The City is currently working to establish mowing contract to maintain vegetation.
12	**Monitor Drought Conditions.** Continue to monitor drought conditions through contact with State Agencies. Priority: Medium	City of Uhland	No additional cost – uses existing staff	Ongoing	Drought	Not independently cost effective.	Ongoing
13	**Public Information Campaigns.** Cooperate and coordinate with the County and State agencies in developing public information campaigns and/or water use restrictions to ensure sufficient water pressure for fire-fighting and provision of drinking water during periods of drought. Priority: Medium	City of Uhland	No additional cost – uses existing staff resources	Ongoing	Drought	Very difficult to determine, but presumed very cost-effective because actions preserves essential function	Ongoing

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
14	**Evaluate Excess Heat Risks.** Evaluate the risks presented by excessive heat and humidity, especially in terms of high-risk populations such as the elderly/low income. Priority: Medium.	City of Uhland	No additional cost – uses existing staff resources	TBD; probably initiated in 2011	Extreme heat	Not independently cost-effective, but needed to develop adequate risk reduction efforts	Initiated in 2011 HMP
15	**Review Plans and Resources to Address Risk Posed By Snow and Ice Hazards During Winter Storms**. Conduct a review of the City's current plans and resources to address the risks posed by ice and snow hazards during winter storms. Focus on City's ability to respond to snow and ice emergencies, and on potentially at-risk populations in the community. Priority: Low to medium.	City of Uhland	No additional cost – uses existing staff resources	Ongoing	Winter storms, extreme cold, winter storm	Not independently cost-effective, but contributes to maintaining public services; protects at-risk populations	Initiated in 2011 HMP
16	**Various Mitigation Actions to Reduce Wildfire Risk.** On a case-by-case basis, develop and initiate mitigation actions to reduce the wildfire and brushfire risk. Actions may include informing property owners of appropriate actions, clearing vegetation, and monitoring antecedent conditions, among others. Priority: Low.	City of Uhland	No additional cost – uses existing staff resources	TBD/as need is identified	Wildfire	Cost-effective, as measures tend to be in-expensive and prevent fires	Initiated in 2011 HMP
17	**Upgrades to At-Risk Structures.** Based on the results of the study above, initiate upgrades to at-risk structures and/or infrastructure. Mitigates specific risks to structures, people and operations. Priority: Low	City of Uhland	Varies depending on measure. Funding from General Fund or FEMA grant program/s	TBD based on study	Floods, thunderstorms, high winds, tornadoes, seismic	Cost-effectiveness will vary with level of risk and project cost	TBD, but likely to be initiated no earlier than 2012
18	**Structural/Engineering Study.** Complete a detailed structural/engineering survey of Uhland public facilities to ensure their soundness with respect to resisting the effects of high winds, extreme roof loading from snow or ice, and hail. Forms basis of decisions about any additional actions to mitigate risk. Priority: Low	City of Uhland	To be determined, but if initiated probably from General Fund	Not yet established – to be commenced only if funding is available	Floods, thunderstorms, high winds, tornadoes, seismic	Not independently cost-effective, but the initial step in identifying appropriate mitigation actions	Initiated in 2011 HMP

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
19	**Understanding Dam Failure Risks.** Engage with County and State floodplain managers, engineers and emergency managers to ensure that local officials have a detailed understanding of potential risks to the community from dam and/or levee failures. Priority: Low to medium.	City of Uhland	No additional cost – uses existing staff resources	Initiated in 2011, then ongoing	Dam Failure	Not independently cost-effective	Initiated in 2011 HMP
20	**Evacuation Plans.** Ensure that the jurisdiction and its citizens are aware of and understand notification and evacuation plans related to dam and/or levee failure. Priority: Low to medium.	City of Uhland	No additional cost – uses existing staff resources	Initiated in 2011, then ongoing	Dam Failure	Not independently cost-effective	Initiated in 2011 HMP

1.6 Plan Adoption by the City of Uhland

After the draft Plan is approved by the Texas Division of Emergency Management (TDEM) and FEMA Region VI, the 2011 Plan Update will be adopted by the Hays County Commissioners Court. The Uhland City Council will also adopt the updated HMP by resolution. The City of Uhland adoption resolution is provided below. A copy of the County resolution is included in Appendix N.

Figure I-4
Adoption Resolution - City of Uhland

Resolution to be inserted upon Plan adoption

Appendix J
Wimberley

Contents of this Section

1.1 Background
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1.4 Vulnerability Assessment and Loss Estimation
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1.6 Plan Adoption by the Wimberley

This appendix is part of the 2011 Hays County Hazard Mitigation Plan (HMP) update, and includes jurisdiction-specific information about Wimberley, which is one of the 11 incorporated jurisdictions within the County that is participating in the Plan update. This appendix supplements the County HMP, so only jurisdiction-specific information is included here.

1.1 Background

The Wimberley is located along Farm Road 12 in south-central Hays County, approximately 16 miles northwest of San Marcos, Texas and about 30 miles southwest of Austin. The center of Wimberley is situated at the confluence of Cypress Creek and the Blanco River. The Blanco River flows through the city from west to east. Cypress Creek flows from its origin at Jacob's Well into the city area from the northwest, turns south, and meanders to join the Blanco River. Other smaller creeks or streams flow to the Blanco throughout the city. Elevations within the city range from about 780 to 1,260 feet above sea level. The City was incorporated in May 2000.

The 2010 U.S. Census estimated the Wimberley population at 2,626.[1] This is a 31 percent decrease from the population in 2000 which was estimated at 3,797. As of 2010 there were 1,482 housing units in the City. Permit information for the years 2006 to 2011 is listed below.

[1] US Census Bureau. 2010 US Census. Race, Hispanic or Latino, Age and Housing Occupancy - City of Wimberley.

Table J-1
Wimberley Residential and Commercial Permit Data
(Source: Wimberley, Texas)

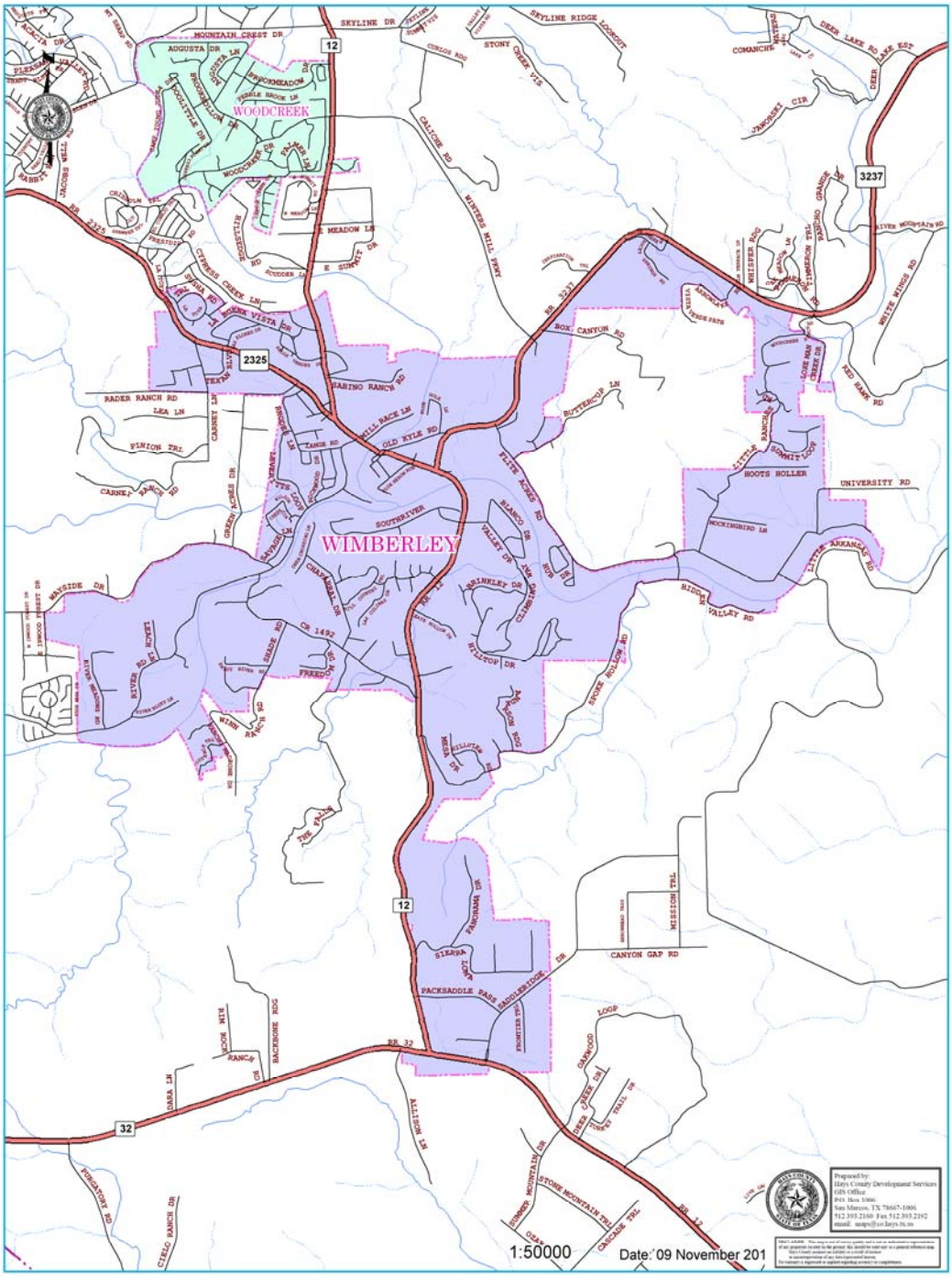
Residential		
Year	Value of Projects	Number of Permits Issued
2006	$ 9,199,681.00	67
2007	$ 6,642,025.00	68
2008	$ 6,453,314.12	67
2009	$ 3,119,990.00	58
2010	$ 5,246,931.77	85
2011	$ 4,237,987.75	57
	$ 34,899,929.64	402

Commercial		
Year	Value of Projects	Number of Permits Issued
2006	$ 924,904.00	26
2007	$ 970,028.00	37
2008	$ 1,815,557.00	25
2009	$ 14,022,685.75	40
2010	$ 930,241.00	52
2011	$ 169,540.00	26
	$ 18,832,955.75	206

The land area encompassed by the Wimberley and its extraterritorial jurisdiction (ETJ) totals 33.5 square miles (21,400 acres). Nine square miles (5,720 acres) are in the incorporated area, and 24.5 square miles (15,680 acres) are in the ETJ, which extends one mile outside the incorporated area (except where the City abuts the City of Woodcreek to north).[2] Figure J-1 is a map of the Wimberley. See Section 3.3.1 (Geography) of the 2011 Plan update for a jurisdictional map of Hays County.

[2] City of Wimberley Comprehensive Plan. Second Revision. Adopted July 17, 2008.

Figure J-1
Wimberley, Texas Map
(Source: Hays County Development Services – GIS Office)



1.2 Public Facilities

As part of the Hays County Plan update, the Wimberley was contacted by email and requested to provide a list of city owned facilities. As of 2010, the City owns six public buildings. These facilities are listed below in Table J-2

Table J-2
Wimberley Public Facilities
(Source: Wimberley, Texas)

No.	Facility Name	Street Address	Year Built	Use	Square Footage	Occupancy	Structure Type	Replacement Value
1	City Hall	221 Stillwater	2002	Government Admin	3,928	5	Stone/Wood	$200,000
2	Wimberley Community Center	14068 Ranch Road 12	2006	Public Recreation	8,000	20	Stone/Wood/ Steel	$1,500,000
3	Nature Trail Pavilion	Old Kyle Road	2006	Public Recreation	1,500	1	Stone/Wood/ Steel	$50,000
4.	Nature Trail Restroom	Old Kyle Road	2008	Public Restroom	500	0	Stone/Wood	$55,000
5	Blue Hole Regional Pk. Office/Bathhouse	100 Blue Hole Lane	2011	Public Recreation	2,000	2	Stone/Wood/ Steel	$160,000

Figure J-2 is the Wimberley City Hall.

Figure J-2
Wimberley City Hall
(Source: Wimberley)

1.3 Hazard Identification

Hays County has received seven Presidential Disaster Declarations since 1965, several of which have affected the Wimberley. The bullets below summarize some of the more significant events since1980.

Overview of Wimberley's Recent Natural Hazards History

The bullets below highlight major events that have impacted the Wimberley. Events that include the Federal Emergency Management Agency (FEMA) disaster number in parenthesis after the date indicate events that received a Presidential Disaster Declaration. The source for the past events listed was a combination of information provided by the City and the National Oceanic and Atmospheric Administration's (NOAAs) National Climatic Data Center (NCDC).

- November 15, 2001. A magnitude F0 tornado touched down near Wimberley, knocking down trees and causing scattered area of minor damage to buildings in Wimberley. Most damage was confined to roofs and fences. The tornado caused approximately $50,000 in damages.
- July 5, 2002. Flash flood event in Wimberley occurred along the Blanco River. A United States Gaging Station (USGS) gaging station indicated the river crested at 25.71 feet along the Blanco River at River Road.
- March 12, 2007. Severe thunderstorms resulted in three to five inches of rain which caused significant flooding along the Blanco River. On March 12th, the Blanco River at Wimberley crested at 20.79 feet where flood stage is 13 feet. According to the NCDC, this was the 5th highest crest on record. No property damage was reported.
- July 4, 2007. Heavy rains produced two to four inches of rain in the Wimberley area. The event caused widespread flash flooding that closed FM 32, FM 3424, and FM 2325. No property damage was reported.
- September 10, 2009. As an area of low pressure slowly moved eastward across south central Texas, heavy rains caused water to flow over County Road 1492 at River Road.

The 2011 Hays County HMP update includes discussions of the 11 natural hazards with potential to affect the County (see Section 5, *Hazard Identification, Profiling and Ranking*), including the jurisdictions within the county boundaries. The subsections below include only information that supplements the material in Section 5 of the County HMP.

1.3.1 Floods

This subsection addresses the flood hazard. The flood subsection below includes the potential for floods caused by extreme rainfall associated with these hazards. Hazard Description. The Wimberley is vulnerable to shallow and riverine flooding. The 2008 *Wimberley Comprehensive Plan* indicates that the city experiences periodic heavy rains that produce very rapid run-off. When this occurs, normally dry creek beds can suddenly turn into raging torrents, over-feeding rivers and causing them to overflow their normal banks. Typically the highest flow rates occur during spring rainfall events. Flows in the creeks and streams in the Wimberley region generally are erratic in response to rainfall events. The normal flow in the Blanco River and Cypress Creek is characterized by shallow, fast moving reaches with some rapids and some relatively deep, sluggish pool areas. Other smaller creeks and streams that do not experience spring flows typically are dry, except during heavy rainfall events.[3] See Section 5.4.1 of the Hays County Plan update for a general description of the flood hazard. Hazard Location. From a review of the FIRM for Wimberley, the flood hazard is primarily located along the floodplains of the Blanco River and Cypress Creek. According to the Hays County GIS, a total of 1.05 square miles of the City (9.0 square miles total) is located within the 100-year floodplain. Wimberley has a total of 760 parcels that have some exposure to the 100-year floodplain. Various floodplain maps for the city are presented within this subsection. Severity and extent of the hazard. Flood severity is measured in various ways, including frequency, depth, velocity, duration and contamination, among others. The frequency of flooding is often the most common for judging severity. A USGS gaging station along the Blanco River at Wimberley indicates the greatest flood on record occurred in May of 1929. The peak flow from this event was 113,000 cubic feet per second (cfs). To provide some perspective as to the velocity, the mean daily stream flow at this gage is roughly only 130 cfs. More recently, the December 1991 flood along the Blanco River reached a peak flow of 32,900 cfs at the Wimberley gaging station. Hazard's impact on life and property. The impacts on life and property from flooding can be significant. Property owners that have experienced repetitive flooding in the past must cope with the disruptions and costly repairs associated with flooding. Occurrences of the hazard. Based on a review of open source documents Wimberley has recently experienced flood events in 1991, 1997, 1998, 2001, 2002, 2007, and 2009. With seven events over the past 19 years, the City is likely to be impacted by floods slightly less than every three years, an annual statistical probability of about 33 percent. Table J-3 shows the top five historical crests at the Wimberley gaging station along the Blanco River.

[3] Texas Water Development Board. Wimberley Regional Wastewater Planning Study. Prepared by Guadalupe-Blanco River Authority and R.J. Brandes Company. April 19, 1996

Table J-3
Blanco River at Wimberley – Top Five Historical Crests, Ordered by Crest Height
(Source: Visit Wimberley.com – Wimberley Rivers and Streams)

River Crest (feet)	Date	Feet Above Flood State
33.30	5/28/1929	20.30
28.89	11/16/2001	15.89
28.50	10/17/1998	15.50
25.71	07/05/2002	12.71
20.46	6/09/1997	7.46

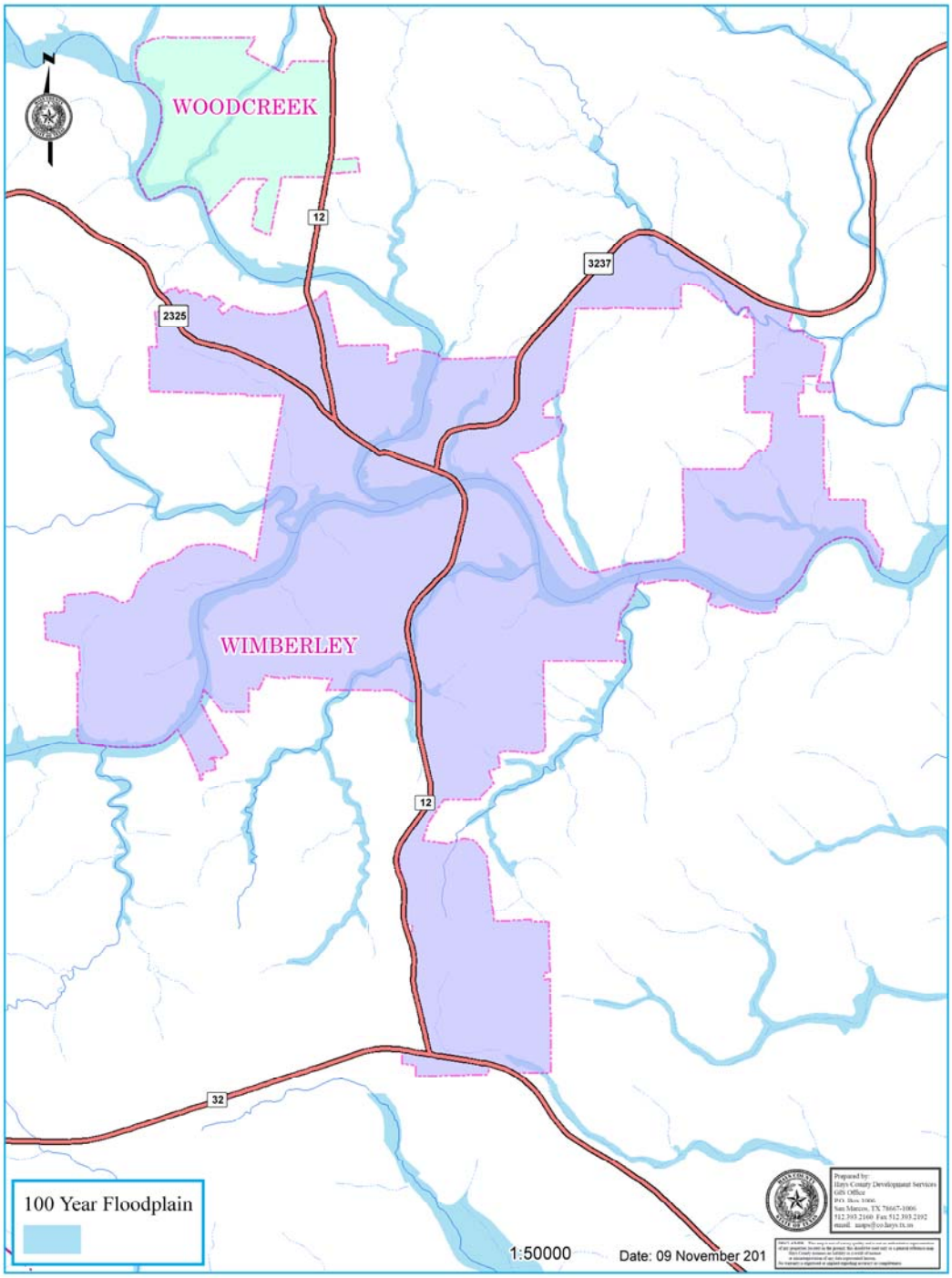
Figure J-3 is a photograph of the Blanco River at the intersection of County Road 1492 and River Road on July 5, 2002. At this location the river crested at 25.71 feet, 12.71 feet above flood stage.

Figure J-3
Blanco River on July 5, 2002 at Intersection 1492 and River Road
(Source: Visit Wimberley.com – Wimberley Rivers and Streams)

One of the best sources for determining flood risk for an area is review of the Flood Insurance Rate Maps (FIRMs) produced by FEMA. The FIRM is the official map of a community on which FEMA has delineated both the special flood hazard areas (1% annual chance of flooding) and the risk premium zones applicable to the community.[4] The Wimberley is located on nine FIRM panels, all with effective dates of September 2, 2005. Figure J-4 identifies the 100-year floodplain for Wimberley. The map shows that a section of 100-year floodplain follows the Blanco River, which generally flows through the city from west to east. Additional areas of floodplain in the City follow Cypress Creek, Wilson Creek, Pierce Creek, Spoke-Pile Creek and Smith Creek which are all tributaries of the Blanco River.

[4] FEMA online - Floodplain Management. Flood Insurance Rate Map (FIRM) definition

Figure J-4
Wimberley - Floodplain Map
(Source: FEMA, Effective FIRM September 2, 2005, Hays County GIS Office)



Several goals and objectives within the 2008 *Wimberley Comprehensive Plan* address stormwater management and flood control. Specific goals and objectives are included to minimize the risks to lives and property due to flood hazards. The Wimberley Comprehensive Plan recommends the City require new construction in areas adjacent to waterways and flood zones be sited in accordance with rules that are no less stringent than those required for compliance with FEMA mandates. The Comprehensive Plan also recommends addressing the effects of rainwater runoff on property development. One objective recommends development of a watershed protection plan and a master drainage plan to define appropriate storm and flood drainage systems.

1.3.2 Tornadoes

This subsection addresses the tornado hazard. Hazard Description. The nature of the tornado hazard in this jurisdiction is considered substantially the same as for the county as a whole. Refer to HMP Section 5 for further information. Hazard Location. The hazard affects all parts of this jurisdiction approximately equally. Severity and extent of the hazard. The severity and extent of the hazard are equal across the jurisdiction. Hazard's impact on life and property. The potential impacts on life and property in this jurisdiction vary with the strength of the events. Vulnerability to the tornado hazard is directly correlated to structure type and occupancy; because of this variability, it is not possible to accurately characterize vulnerabilities across the entire jurisdiction. However, Subsection 1.4.2 below includes the results of a basic tornado risk assessment, which was conducted using best-available data at the time of the analysis. Occurrences of the hazard. Tornado occurrences are discussed in HMP Section 5. The statistical probability of these hazards impacting this jurisdiction are the same as for the county as a whole.

1.3.3 Winter Storm

This subsection addresses the winter storm hazard. **Hazard Description.** The nature of winter storm hazard in this jurisdiction is considered substantially the same as for the County as a whole. Refer to HMP Section 5 for further information. **Hazard Location.** The hazard affects all parts of this jurisdiction approximately equally. **Severity and extent of the hazard.** The severity and extent of the hazard are equal across the jurisdiction. **Hazard's impact on life and property.** The potential impacts on life and property in this jurisdiction vary with the strength of the events. Vulnerability to the winter storm hazard is directly correlated to structure type and occupancy; because of this variability, it is not possible to accurately characterize vulnerabilities across the entire jurisdiction. However, Subsection 1.4.3 below includes the results of a basic winter storm risk assessment, which was conducted using best-available data at the time of the analysis. **Occurrences of the hazard.** Winter storm occurrences are discussed in HMP Section 5. The statistical probability of these hazards impacting this jurisdiction are the same as for the County as a whole.

The remaining eight hazards profiled as part of the Hays County Plan update are not described within the jurisdictional appendices. The hazard descriptions in the main plan provide sufficient descriptions of these hazards, so they are not repeated in the jurisdictional appendices, although the appendices include actions to address the full range of hazards. See Section 5.4 of the Hays County Plan update for a complete profile of the other hazards.

1.4 Vulnerability Assessment and Loss Estimation

This subsection briefly summarizes the jurisdiction's vulnerabilities and estimated losses from three natural hazards: floods, tornadoes, and winter storms. Because the jurisdiction appendices in this 2011 HMP update have been standardized, in some cases there will be very little risk evident in certain communities, and therefore minimal information in these subsections. The methodologies for completing these analyses are described in Section 6 (and hazard-specific subsections) of the HMP, and are not repeated here.

1.4.1 Flood Loss Estimation

The Wimberley has been a member of the National Flood Insurance Program (NFIP) since February, 1998. In some municipalities within Hays County, a flood risk assessment can be performed based on analysis of NFIP data on repetitive flood loss properties. The NFIP defines repetitive loss properties as those that have received at least two NFIP insurance payments of more than $1,000 each in any rolling ten-year period. As of May 2010, Hays County had 32 such properties (30 residential and two non-residential properties), based on a query of the FEMA BureauNet NFIP interface. Of this total, none were located within the Wimberley. With no NFIP repetitive loss properties in Wimberley an analysis of repetitive loss properties was not performed.

In some cases the number of policies in force (i.e. the number of flood insurance policies currently valid and active in a community) may be a proxy for flood risk. The table below compares the number of policies and claim statistics for the Wimberley to those in Hays County. The table indicates that between 1998 and 2010, there have been three NFIP insurance claims in Wimberley, with a total claims value of $54,157.[5]

[5] FEMA – Policy and Claim Statistics for Flood Insurance

Table J-4
Comparison of NFIP Claims for the Wimberley with Hays County
(Source: FEMA – NFIP Statistics, March, 2011)

City/County Name	# of Polices In-Force	Insurance In-Force	# of Losses	Total Paid Claims
Wimberley	104	$23,439,000	3	$54,157
Hays County	521	$130,165,500	236	$3,514,972

1.4.2 Tornado Loss Estimation

Relative to other parts of the nation, the overall tornado risk is moderate in Hays County and the Wimberley. There is significant enough exposure to the hazard to perform a simple risk assessment to characterize the potential future losses. The tornado loss estimation for the Wimberley was calculated using FEMA's Benefit-Cost Analysis Tool (BCAR) software (version 4.5.5.0). The BCAR analysis methodology and tornado element of the software are based entirely on avoided injuries and fatalities. The table below summarizes residential data inputs and expected losses over a 50-year planning horizon.

Table J-4
Residential Tornado Risk Assessment - Project Information
(Source: FEMA BCA Software, Version 4.5.5.0)

Data	Value
Loss estimation horizon (in years)	50
Population (2010 US Census)	2,626
Zip Code used as center of analysis	78676
Radius in miles for access to safe room	1.69
Assumed safe room structure design wind speed (m.p.h.)	200
Assumed structure type: residential properties	Wood-frame, one- or two-story
Occupancy Percentage	
Day	50%
Evening	80%
Night	100%
Estimated Annual losses (residential property)	**$160,754**
Estimated losses – 50-year horizon (residential property)	**$2,218,519**

It should be noted that this result is typical of tornado analyses (i.e. that the apparent risk is very high compared to other hazards). This occurs because the analysis is based entirely on life safety, and the probabilities of events of various magnitudes combined with the relatively high values assigned to deaths and injuries indicate significant losses over long time horizons. See Section 6.3.3, *Tornado Wind Risk in Hays County*, of the Plan update to see how the residential tornado risk in the Wimberley compares with the risk to the County other municipalities in Hays County.

Tornado Risk – Public Assets

In addition to the residential tornado risk assessment an analysis was also completed for the City's six public facilities. The analysis was completed based on data provided by the Wimberley and entered into the tornado module of the FEMA BCAR software. Within the tornado module, separate analyses were completed for each structure by entering data such as the building square footage and occupancy. As part of the analysis it was assumed that the safe room design wind speed was 200 m.p.h. This data input is related to the fact that the software is designed to evaluate safe rooms; this figure is not intended to represent the design wind speed of individual facilities. Table J-6 below summarizes the non-residential data inputs.

Table J-6
Non-Residential Tornado Risk Assessment - Project Information
(Source: FEMA BCA Software, Version 4.5.5.0)

Data	Value
Loss estimation horizon	50
Assumed safe room structure design wind speed (mph)	200
Assumed structure type	Small professional building (steel frame)
Occupancy Percentage	
Day	100%
Evening	25%
Night	5%

The software uses inputs related to building occupancy by time of day to calculate the expected loss of life and number of injuries for tornado classes F0 to F5. The results of the analysis are shown below in Table J-7. The table shows that the community center has the highest annual and 50-year risk for public facilities in the Wimberley. Note that all occupancies are estimated based on the square footages of the facilities.

Table J-7
Tornado Risk Assessment – Wimberley Public Assets, Annual and 50-Year Tornado Risk
(Source: FEMA BCA Software, Version 4.5.5.0)

Facility Name	Square Footage	Occupancy	Replacement Value	Annual Risk	50-Year Risk
City Hall	3,928	5	$200,000	$810	$11,178
Wimberley Community Center	8,000	20	$1,500,000	$3,240	$44,712
Nature Trail Pavilion	1,500	1	$50,000	$162	$2,235
Nature Trail Restroom	500	0	$55,000	$0	$0
Blue Hole Regional Pk. Office/Bathhouse	2,000	2	$160,000	$324	$4,471
Total	**15,928**	**29**	$1,965,000	**$4,536**	**$62,596**

1.4.3 Winter Storm Loss Estimation

This analysis is based on information provided by the County and community, and uses data from the National Climatic Data Center (NCDC) and estimates from the 2010 U.S. Census. The estimated annual and 100-year risk for each jurisdiction was calculated as a proportion of the total winter storm risk for Hays County. Additional information about the methodology is found in Section 6 of the HMP. Jurisdiction-specific information and analysis output are provided in the table below.

Table J-8
Wimberley Winter Storm Loss Estimates
Data Parameters and Summary of Results
(Source: FEMA BCA Software, Version 4.5.5.0)

Data	Value
Winter storm events	9
Reporting Years	14
Average annual number of winter storm events	0.64
Total reported damages (Hays County)	$7,500,000
Annual damages (Hays County)	$535,714
Hays County Population (2010 US Census)	157,101
Wimberley Population (2010 US Census)	2,626
Percent of County Population	1.67%
Estimated Annual losses	**$8,946**
Estimated losses – 100-year horizon	**$127,666**

1.5 Mitigation Actions

The table below lists prioritized mitigation projects and actions identified by the Wimberley. The list was prioritized by the community using the STAPLEE methodology – see Section 7 of the County HMP for a discussion of this methodology. All of the original actions for Wimberley (Action Items 18-25) remain in the table for reference purposes. Completed actions are noted in the status column, but also have the action number and action item description highlighted with ~~strikethrough~~ text to indicate completion. Action items 1 – 17 and 26 - 37 have been added as part of the 2011 Plan update.

Table J-9
Wimberley Mitigation Actions

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
Note: Action Items 1-17 were added for the 2011 Plan update by the Wimberley							
1	**FM 1492 @ Blanco River.** Replace Low Water Crossing.	Wimberley	$1,000,000	2011 to 2015	Flood	Cost-effective	Initiated in 2011 update
2	**Hidden Valley @ Blanco River.** Replace Low Water Crossing.	Wimberley	$800,000	2011 to 2015	Flood	Cost-effective	Initiated in 2011 update
3	**Little Arkansas @ Blanco River.** Replace Low Water Crossing.	Wimberley	$1,000,000	2011 to 2015	Flood	Cost-effective	Initiated in 2011 update
4	**Valley Drive @ Pierce Creek.** Replace Low Water Crossing.	Wimberley	$500,000	2011 to 2015	Flood	Cost-effective	Initiated in 2011 update
5	**Flite Acres Road.** Replace Low Water Crossing..	Wimberley	$500,000	2011 to 2015	Flood	Cost-effective	Initiated in 2011 update
6	**FM 1492 @ Pierce Creek.** Replace Low Water Crossing.	Wimberley	$250,000	2011 to 2015	Flood	Cost-effective	Initiated in 2011 update
7	**Wilson Creek @ River Road.** Replace Low Water Crossing.	Wimberley	$200,000	2011 to 2015	Flood	Cost-effective	Initiated in 2011 update
8	**Green Acres Dr. @ Fire Station.** Replace Low Water Crossing.	Wimberley	$250,000	2011 to 2015	Flood	Cost-effective	Initiated in 2011 update
9	**Leveritts Loop.** Replace Low Water Crossing.	Wimberley	$150,000	2011 to 2015	Flood	Cost-effective	Initiated in 2011 update
10	**Spoke Hollow Dr. @ Spoke Pile Creek.** Replace Low Water Crossing.	Wimberley	$150,000	2011 to 2015	Flood	Cost-effective	Initiated in 2011 update
11	**River Road @ Western City Limits.** Replace Low Water Crossing.	Wimberley	$200,000	2011 to 2015	Flood	Cost-effective	Initiated in 2011 update
12	**Paradise Hills.** Replace Low Water Crossing.	Wimberley	$90,000	2011 to 2015	Flood	Cost-effective	Initiated in 2011 update

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
13	**River Road.** Reconstruct Roadway Along Blanco River.	Wimberley	$850,000	2011 to 2015	Flood	Cost-effective	Initiated in 2011 update
14	**Little Ranches @ Panther Creek.** Reconstruct Low Water Crossing & Roadway.	Wimberley	$1,000,000	2011 to 2015	Flood	Cost-effective	Initiated in 2011 update
15	**Hoots Holler.** Reconstruct Low Water Crossing & Roadway.	Wimberley	$1,000,000	2011 to 2015	Flood	Cost-effective	Initiated in 2011 update
16	**Emergency Siren System.** Installation of Three (3) Emergency Siren System	Wimberley	$105,000	2011 to 2015	Flood	Cost-effective	Initiated in 2011 update
17	**Stream Flow Monitor Station** Install stream flow monitor station at the confluence of the Blanco River & Little Blanco.	Wimberley	$150,000	Insert	Flood	Cost-effective	Initiated in 2011 update
Note: Action Items 18-25 were identified from the original Hays Co. HMP.							
18	**Reduce Flood Losses and Increase Flood Insurance Coverage in Hays County.** Increasing the flood insurance policy base in Hays County will provide financial relief to property owners and renters that are flooded in future disaster events. By relying on flood insurance property owners and renters have economic security and do not have to rely on a disaster event being declared as a Presidential Declared Disaster. This action was labeled F-2 from the original Plan.	Wimberley	Cost and Funding: Existing staff resources, no cost	2006 with improvements annually through 2010 Update schedule	Flood	Not independently cost-effective	Insert Status

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
19	**Acquisition or elevation of Repetitive Loss Properties.** There is a 25% local share cost associated with HMGP and FMA funding. However there is the possibility that individuals will elevate or flood proof at their own expense once they see the benefits of this mitigation action. Since approval of the Hays County Mitigation Plan as both an all hazards plan and as a flood mitigation plan, funding from these two Federal programs will be available to all participating communities. This action was labeled F-4 from the original Plan.	Wimberley	The estimated acquisition cost is $100,000 per structure. The estimated cost to elevate a residential structure a total of three feet in a shallow flooding area is $30,000 per structure. Funding Sources: FEMA, Texas DEM, Texas Water Development Board (TWDB), Texas Office of Rural and Community Affairs, Hays County	2011 to 1015	Flood	Cost-effectiveness determined on a per structure or project basis.	Ongoing
20	**Adopt 'Higher Standard" Flood Damage Prevention Ordinances.** By adopting "higher standard" requirements, new buildings, infrastructure and critical facilities have a reduced risk of loss of life and property damage during a flood event. Communities are encouraged to follow the guidance outlined in EO 11988 where critical facilities are protected to the 500-year (0.2% annual chance flood event) elevation. This action was labeled F-5 from the original Plan.	Wimberley	Cost and Funding: Existing staff resources, no cost	2011 and 2012	Flood	Not independently cost-effective, but part of an effective overall mitigation strategy	Ongoing

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
21	**Provide Training for Local Floodplain Managers and Certified Floodplain Managers (CFM's).** By increasing training for local floodplain managers and CFM"s there should be improved local floodplain management programs, reduced risk of loss of life, and new buildings and infrastructure have a reduced risk of damage during a flood event. The City of San Marcos and/or Hays County would be the logical communities to provide floodplain management training such as hosting FEMAs FPM Training Course, "Managing Floodplain Development through the NFIP", hosting NFIP Workshops, and hosting Community Rating System (CRS) Workshops. These training opportunities would assist local communities and provide continuing education credits (CECs) for local floodplain administrators, certified floodplain managers (CFMs), engineers, surveyors and the general public. This action was labeled F-8 from the original Plan.	Wimberley	Cost and Funding: Existing staff resources, no cost	Annually 2011 – 2015	All hazards	Not independently cost-effective	Ongoing
22	**Improve Emergency Communication Capabilities.** By improving emergency communications Hays County and participating communities can respond faster and coordinate better to save lives and reduce property damage during disaster events. This action was labeled E-2 from the original Plan.	Wimberley	$620,000 Funding: Capital Area Planning Council (CAPCO), Texas DEM	Phased over 5 years (2011-2015)	All hazards	Not independently cost-effective, but critical for saving lives	Ongoing

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
23	**Development of and maintenance of countywide and individual community HAZMAP Plans.** Develop and formally adopt HAZMAP plans prior to the November 2004 deadline established by the Disaster Mitigation Act of 2000. Develop procedures to conduct annual reviews and updates to maintain countywide and individual community HAZMAP plans. Provide annual training opportunities for community emergency managers to assist in the planning and plan maintenance efforts. Create and maintain multi-jurisdictional HAZMAP databases and GIS mapping to support countywide and individual community HAZMAP maintenance efforts. This action was labeled E-5 from the original Plan.	Wimberley and Hays County MPC	Existing staff resources	Original Plan adopted in 2006	All hazards	Not independently cost-effective	Original HMP Complete. Plan update to be adopted in 2012.
24	**Storm Ready Designation for Hays County Communities** Storm Ready is a proven mitigation action. By Hays County and participating communities becoming Storm Ready Communities there can be mitigation actions in place to save lives and reduce property damage during disaster events. This action was labeled E-6 from the original Plan.	Wimberley	Cost and Funding: Existing staff resources, no cost	Phased over five years 2011-2015	Thunderstorms, high winds, tropical storms and cyclones, tornadoes, floods	Not independently cost-effective, but critical for saving lives and minimizing injuries	Ongoing

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
25	**Reduce Impacts of Extreme Heat on Elderly, Disabled, Low-Income and Infants.** This Mitigation Action is for Hays County and participating community Emergency Managers to launch a public notification effort during extreme heat periods urging elderly and low income persons to seek help if needed. Volunteer organizations such as Rotary International, Lions Club, Jaycees, Red Cross, United Way, and others should be urged to participate. Power Companies will be notified by the Wichita County Emergency Manager and requested to participate in the effort to distribute box fans and make minor repairs to air conditioners. The Hays County OEM will coordinate with participating community emergency managers and take the lead to initiate this Mitigation Action. The initial action will include newspaper and radio announcements and public information on both the Hays County and City of San Marcos websites. Public announcements will define the hazard, describe heat related health risks and provide tips on how to prevent illness. Health care officials can play an important role in this mitigation action by providing information to newspapers and radio stations. This action was labeled Heat-1 from the original Plan.	Wimberley and Local ESD	$ 2,000 to purchase and distribute 100 box fans $3,000 estimated cost for a/c repairs Funding Sources: United Way Rotary Clubs Lions Clubs Red Cross Churches and charitable organizations Power Companies	Periods of Extreme Heat May be annually	Extreme Heat	Not independently cost-effective	Ongoing
26	**Promote Flood Insurance.** Promote the purchase of Flood insurance. Advertise the availability, cost, and coverage of Flood insurance through the National Flood Insurance Program (NFIP). Develop NFIP brochure and promote using City website and newsletter. Priority: High	Wimberley	$2,000	Ongoing	Flood	Not independently cost-effective, but the initial step in identifying appropriate mitigation actions	Ongoing

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
27	**Increase Public Awareness of Hazards.** Increase public awareness of hazards and hazardous areas. Distribute public awareness information regarding flood hazards, SFHAs, and potential mitigation measures using the local newspaper, utility bill inserts, inserts in the phone book, a City hazard awareness website, and an educational program for school age children or "how to" classes in retrofitting by local merchants. Integrate "Disaster Resistance Education" into the public school curriculum. Provide public education on the importance of maintaining the ditches. Priority: Medium	Wimberley	$2,000	ongoing	Floods, thunderstorms, high winds, tornadoes	Not independently cost-effective	Initiated in 2011 HMP
28	**Wildfire Hazard Areas.** Conduct study to determine and map potential wildfire hazard areas. Priority: Medium	Wimberley	$500	TBD; likely initiated in 2011	Wildfire	Not independently cost-effective, but essential in minimizing loss of life and injuries during significant storms.	Initiated in 2011 HMP
29	**Monitor Drought Conditions.** Continue to monitor drought conditions through contact with State Agencies. Priority: Medium	Wimberley	No additional cost – uses existing staff	Ongoing	Drought	Not independently cost effective.	Ongoing
30	**Public Information Campaigns.** Cooperate and coordinate with the County and State agencies in developing public information campaigns and/or water use restrictions to ensure sufficient water pressure for fire-fighting and provision of drinking water during periods of drought. Priority: Medium	Wimberley	No additional cost – uses existing staff resources	Ongoing	Drought	Very difficult to determine, but presumed very cost-effective because actions preserves essential function	Ongoing
31	**Evaluate Excess Heat Risks.** Evaluate the risks presented by excessive heat and humidity, especially in terms of high-risk populations such as the elderly/low income. Priority: Medium.	Wimberley	No additional cost – uses existing staff resources	TBD; probably initiated in 2011	Extreme heat	Not independently cost-effective, but needed to develop adequate risk reduction efforts	Initiated in 2011 HMP

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
32	**Review Plans and Resources to Address Risk Posed By Snow and Ice Hazards During Winter Storms**. Conduct a review of the City's current plans and resources to address the risks posed by ice and snow hazards during winter storms. Focus on City's ability to respond to snow and ice emergencies, and on potentially at-risk populations in the community. Priority: Low to medium.	Wimberley	No additional cost – uses existing staff resources	Ongoing	Winter storms, extreme cold, winter storm	Not independently cost-effective, but contributes to maintaining public services; protects at-risk populations	Initiated in 2011 HMP
33	**Various Mitigation Actions to Reduce Wildfire Risk.** On a case-by-case basis, develop and initiate mitigation actions to reduce the wildfire and brushfire risk. Actions may include informing property owners of appropriate actions, clearing vegetation, and monitoring antecedent conditions, among others. Priority: Low.	Wimberley	No additional cost – uses existing staff resources	TBD/as need is identified	Wildfire	Cost-effective, as measures tend to be in-expensive and prevent fires	Initiated in 2011 HMP
34	**Upgrades to At-Risk Structures.** Based on the results of the study above, initiate upgrades to at-risk structures and/or infrastructure. Mitigates specific risks to structures, people and operations. Priority: Low	Wimberley	Varies depending on measure. Funding from General Fund or FEMA grant program/s	TBD based on study	Floods, thunderstorms, high winds, tornadoes, seismic	Cost-effectiveness will vary with level of risk and project cost	TBD, but likely to be initiated no earlier than 2012
35	**Structural/Engineering Study.** Complete a detailed structural/engineering survey of Wimberley public facilities to ensure their soundness with respect to resisting the effects of high winds, extreme roof loading from snow or ice, and hail. Forms basis of decisions about any additional actions to mitigate risk. Priority: Low	Wimberley	To be determined, but if initiated probably from General Fund	Not yet established – to be commence d only if funding is available	Floods, thunderstorms, high winds, tornadoes, seismic	Not independently cost-effective, but the initial step in identifying appropriate mitigation actions	Initiated in 2011 HMP
36	**Understanding Dam Failure Risks.** Engage with County and State floodplain managers, engineers and emergency managers to ensure that local officials have a detailed understanding of potential risks to the community from dam and/or levee failures. Priority: Low to medium.	Wimberley	No additional cost – uses existing staff resources	Initiated in 2011, then ongoing	Dam Failure	Not independently cost-effective	Initiated in 2011 HMP

No.	Action Item Description/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
37	**Evacuation Plans.** Ensure that the jurisdiction and its citizens are aware of and understand notification and evacuation plans related to dam and/or levee failure. Priority: Low to medium.	Wimberley	No additional cost – uses existing staff resources	Initiated in 2011, then ongoing	Dam Failure	Not independently cost-effective	Initiated in 2011 HMP

1.6 Plan Adoption by the Wimberley

After the draft Plan is approved by the Governor's Texas Division of Emergency Management (TDEM) and FEMA Region VI, the 2011 Plan Update will be adopted by the Hays County Commissioners Court. The Wimberley City Council will also adopt the updated HMP by resolution. The Wimberley adoption resolution is provided below. A copy of the County resolutions is included in Appendix N.

Figure J-6
Adoption Resolution - Wimberley

Resolution to be inserted upon Plan adoption

Appendix K
City of Woodcreek

Contents of this Section

1.1 Background
1.2 Public Facilities
1.3 Hazard Identification
1.4 Vulnerability Assessment and Loss Estimation
1.5 Mitigation Actions
1.6 Plan Adoption by the City of Woodcreek

This appendix is part of the 2011 Hays County Hazard Mitigation Plan (HMP) update, and includes jurisdiction-specific information about the City of Woodcreek, which is one of the 11 incorporated jurisdictions within the County that is participating in the Plan update. This appendix supplements the County HMP, so only jurisdiction-specific information is included here.

1.1 Background

The City of Woodcreek is located just northwest of Wimberley, 28 miles southwest of Austin. The City was incorporated in 1984 and currently includes Brookmeadow, the original 18-hole Woodcreek golf course, the homes in what was originally called Woodcreek Resort Subdivision, and Camp Young Judaea.[1] There are currently 715 dwellings and a total of 1,079 lots. The 2010 U.S. Census estimated the Woodcreek population at 1,457.[2]

The number of building permits issued by the City for new construction can be an indication of recent development trends. TableK-1 identifies the number of building permits issued per year between 2005 and 2010. During this time period, a total of 56 building permits were issued for new construction in Woodcreek. The table shows that over the past six years the number of building permits issued peaked at 16 in 2006. Over the past four years, the number of permits issued has been rather steady at six to seven per year.

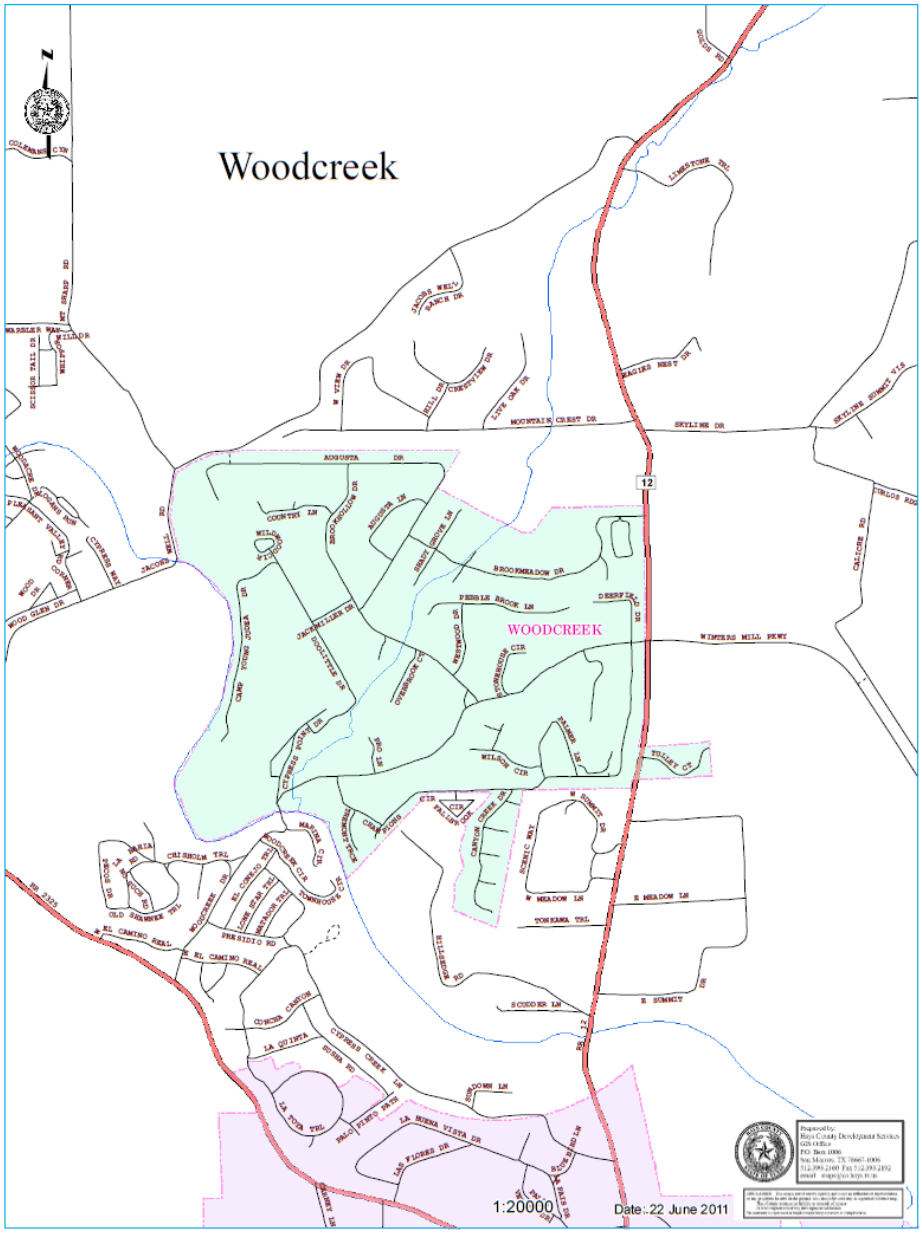
[1] Official website for the City of Woodcreek.Woodcreek Profile – History.
[2] US Census Bureau. 2010 US Census Population - City of Woodcreek.

Table K-1
City of Wood Creek - Building Permits Issued From 2005 - 2010
(Source: City of Wood Creek, Texas)

Year	Building Permits
2005	13
2006	16
2007	7
2008	6
2009	7
2010	7
Total	**56**

Figure K-1is a map of the City of Woodcreek, which covers approximately 686 acres (1.07 square miles). See Section 3.3.1 (Geography) of the 2011 Plan update for a jurisdictional map of Hays County.

Figure K-1
City of Woodcreek, Texas Map
(Source: Hays County Development Services – GIS Office)



1.2 Public Facilities

As part of the Hays County Plan update, the City of Woodcreek was contacted by email and requested to provide a list of city owned facilities. As of 2010, the City owns one public building, the Woodcreek City Hall, which was constructed in 2004. The facility is located at 41 Champions Circle. The City Hall is 1,384 square feet (s.f.) and constructed of wood with conventional wood framing on the interior. Figure K-2 is a photograph of Woodcreek City Hall.

Figure K-2
City of Woodcreek City Hall
(Source: City of Woodcreek)

1.3 Hazard Identification

Hays County has received seven Presidential Disaster Declarations since 1965, several of which have affected the City of Woodcreek. The bullets below summarize some of the more significant events since1980.

Overview of Woodcreek's Recent Natural Hazards History

The bullets below highlight major events that have impacted the City of Woodcreek. Events that include the Federal Emergency Management Agency (FEMA) disaster number in parenthesis after the date indicate events that received a Presidential Disaster Declaration. The source for the past events listed was a combination of information provided by the City and the National Oceanic and Atmospheric Administration's (NOAAs) National Climatic Data

Center (NCDC).

The 2011 Hays County HMP update includes discussions of the 11 natural hazards with potential to affect the County (see Section 5, *Hazard Identification, Profiling and Ranking*), including the jurisdictions within the County boundaries. The subsections below include only information that supplements the material in Section 5 of the County HMP.

1.3.1 Floods

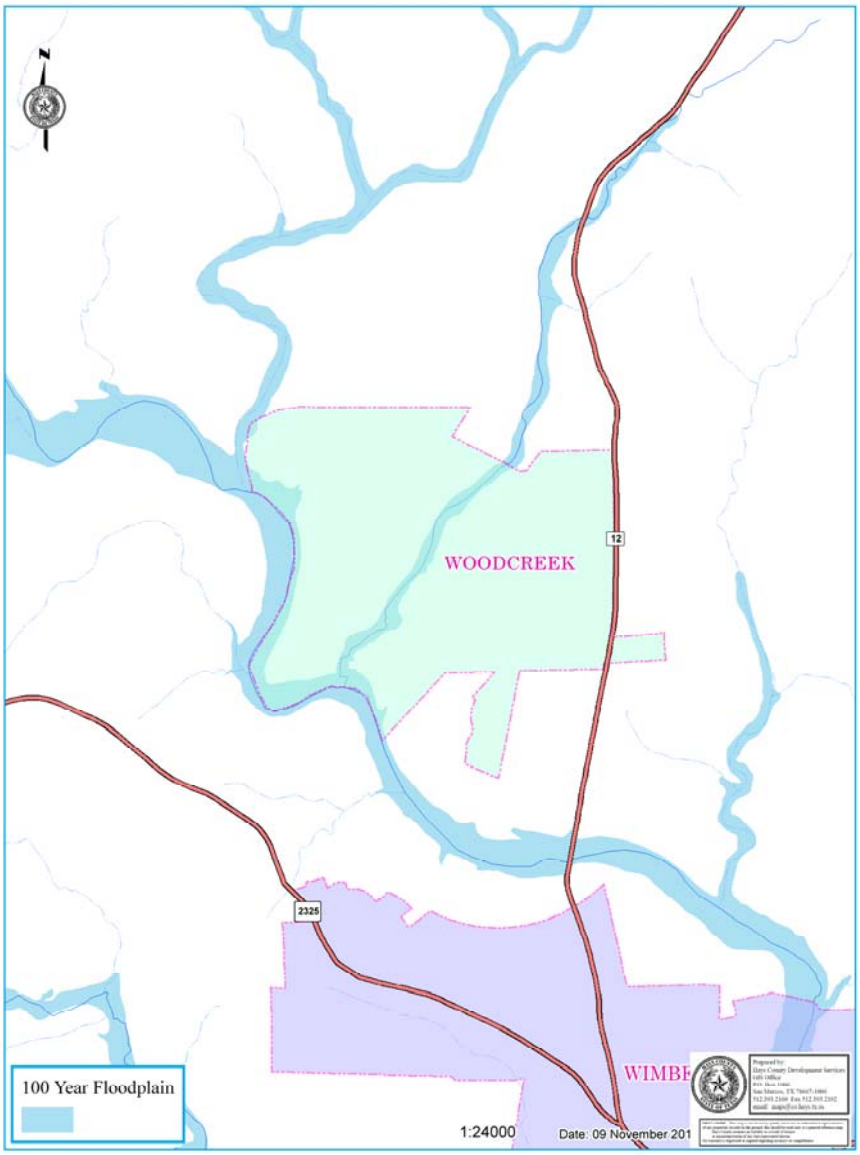
This subsection addresses the flood hazard. The flood subsection below includes the potential for floods caused by extreme rainfall associated with these hazards. Hazard Description. The City of Woodcreek is vulnerable to shallow flooding. See Section 5.4.1 of the Hays County Plan update for a description of the flood hazard. Hazard Location. From a review of the FIRM for Woodcreek, the flood hazard is located along the floodplain of Cypress Creek and its tributaries. According to the Hays County GIS, a total of 0.10 square miles of the City (1.07 square miles total) is located within the 100-year floodplain. Woodcreek has a total of 80 parcels that have some exposure to the 100-year floodplain. Various floodplain maps for the city are presented within this subsection. Severity and extent of the hazard. Flood severity is measured in various ways, including frequency, depth, velocity, duration and contamination, among others. The frequency of flooding is often the most common for judging severity. In Woodcreek there have been no flood events over the past 10 years. Hazard's impact on life and property. The impacts on life and property from flooding can be significant. Property owners that have experienced repetitive flooding in the past must cope with the disruptions and costly repairs associated with flooding. Occurrences of the hazard. Based on a review of open source documents Woodcreek has experienced no floods over the past 10 years.

One of the best sources for determining flood risk for an area is review of the Flood Insurance Rate Maps (FIRMs) produced by FEMA. The FIRM is the official map of a community on which FEMA has delineated both the special flood hazard areas (1% annual chance of flooding) and the risk premium zones applicable to the community.[3] The City of Woodcreek is located on two FIRM panels, both with effective dates of September 2, 2005. FigureK-3 identifies the FEMA flood zones for Woodcreek. The map shows that a section of 100-year floodplain follows Cypress Creek, which creates the western boundary of the City. Another section of 100-year floodplain flows north to south along Hog Creek, a tributary of Cypress Creek, through the central part of the city.

To reduce the risk from flooding the City has recently re-built two culverts to minimize road flooding. The city also purchased a flood-prone home located adjacent to Hog Creek.

[3] FEMA online - Floodplain Management. Flood Insurance Rate Map (FIRM) definition

Figure K-3
City of Woodcreek - Floodplain Map
(Source: FEMA, Effective FIRM September 2, 2005, Hays County GIS Office)



The City of Woodcreek has been a member of the NFIP since June, 1993. In some cases the number of policies in force (i.e. the number of flood insurance policies currently valid and active in a community) may be a proxy for flood risk. The table below compares the number of policies and claim statistics for the City of Woodcreek with Hays County. The Table indicates that as of March, 2011, the City of Woodcreek had 25 NFIP policies in force valued at approximately $6,259,700. The table also shows that between 1993 and 2010, there have been four NFIP insurance claims in Woodcreek for a total claims value of $61,438.[4]

Table K-2
Comparison of NFIP Claims for the City of Woodcreek with Hays County
(Source: FEMA – NFIP Statistics, March, 2011)

City/County Name	# of Polices In-Force	Insurance In-Force	# of Losses	Total Paid Claims
City of Woodcreek	25	$6,259,700	4	$61,438
Unincorporated Hays County	521	$130,165,500	236	$3,514,972

1.3.2 Tornadoes

This subsection addresses the tornado hazard. Hazard Description. The nature of the tornado hazard in this jurisdiction is considered substantially the same as for the County as a whole. Refer to HMP Section 5 for further information. Hazard Location. The hazard affects all parts of this jurisdiction approximately equally. Severity and extent of the hazard. The severity and extent of the hazard are equal across the jurisdiction. Hazard's impact on life and property. The potential impacts on life and property in this jurisdiction vary with the strength of the events. Vulnerability to the tornado hazard is directly correlated to structure type and occupancy; because of this variability, it is not possible to accurately characterize vulnerabilities across the entire jurisdiction. However, Subsection 1.4.2 below includes the results of a basic tornado risk assessment, which was conducted using best-available data at the time of the analysis. Occurrences of the hazard. Tornado occurrences are discussed in HMP Section 5. The statistical probability of these hazards impacting this jurisdiction are the same as for the County as a whole.

1.3.3 Winter Storm

This subsection addresses the winter storm hazard. Hazard Description. The nature of winter storm hazard in this jurisdiction is considered substantially the same as for the County as a whole. Refer to HMP Section 5 for further information. Hazard Location. The hazard affects all parts of this jurisdiction approximately equally. Severity and extent of the hazard. The severity and extent of the hazard are equal across the jurisdiction. Hazard's impact on life and property. The potential impacts on life and property in this jurisdiction vary with the strength of the events. Vulnerability to the winter storm hazard is directly correlated to structure type and occupancy; because of this variability, it is not possible to accurately characterize vulnerabilities across the entire jurisdiction. However,

[4] FEMA – Policy and Claim Statistics for Flood Insurance

Subsection 1.4.3 below includes the results of a basic winter storm risk assessment, which was conducted using best-available data at the time of the analysis. Occurrences of the hazard. Winter storm occurrences are discussed in HMP Section 5. The statistical probability of these hazards impacting this jurisdiction are the same as for the County as a whole.

The remaining eight hazards profiled as part of the Hays County Plan update are not described within the jurisdictional appendices. The hazard descriptions in the main plan provide sufficient descriptions of these hazards, so they are not repeated in the jurisdictional appendices, although the appendices include actions to address the full range of hazards. See Section 5.4 of the Hays County Plan update for a complete profile of the other hazards.

1.4 Vulnerability Assessment and Loss Estimation

This subsection briefly summarizes the jurisdiction's vulnerabilities and estimated losses from three natural hazards: floods, tornadoes, and winter storms. Because the jurisdiction appendices in this 2011 HMP update have been standardized, in some cases there will be very little risk evident in certain communities, and therefore minimal information in these subsections. The methodologies for completing these analyses are described in Section 6 (and hazard-specific subsections) of the HMP, and are not repeated here.

1.4.1 Flood Loss Estimation

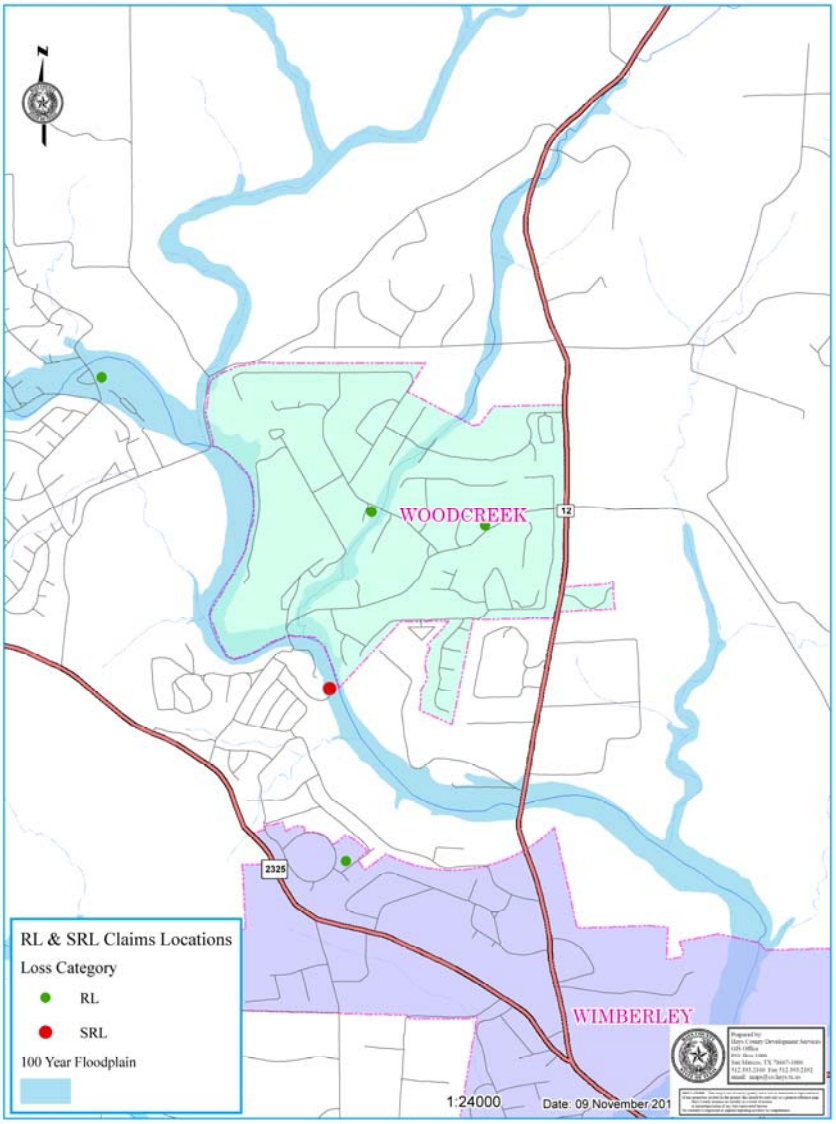
The flood risk assessment method is based on analysis of NFIP data on repetitive flood (RL) loss properties. The NFIP defines repetitive loss properties as those that have received at least two NFIP insurance payments of more than $1,000 each in any rolling ten-year period. As of May 2010, Hays County had 32 such properties (all residential and no non-residential properties), based on a query of the FEMA BureauNet NFIP interface. Of this total, two repetitive loss properties were located within the City of Woodcreek. Table K-3 provides a comparison of the residential repetitive loss claims for Hays County and Woodcreek. The table below includes the number of repetitive loss properties, building and contents damages, the total number of claims, and the average claim amounts.

Table K-3
Summary of Residential NFIP Repetitive Loss Statistics, Hays County and the City of Woodcreek
(Source: FEMA NFIP query May, 2010)

Unincorporated Area/City	Properties	Building	Contents	Total	# Claims	Average
City of Woodcreek	2	$114,945	$68,400	$183,345	4	$45,836
Unincorporated Hays County	15	$549,865	$138,234	$688,099	32	$21,503

The following map (Figure K-4) identifies the two NFIP RL properties in the City of Woodcreek. The map includes major County thoroughfares, but detailed street names have been omitted for confidentiality purposes, to prevent the identification of exact address locations of RL properties. The map shows one RL property is located near the central part of the City within the floodplain of Hog Creek (which has been acquired and demolished) and another located in the eastern part of the City.

Figure K-4
Map of Repetitive Loss Properties in the City of Woodcreek
(Source: FEMA, Effective FIRM September 2, 2005, Hays County GIS Office)



In 2004 FEMA began to develop the Severe Repetitive Loss (SRL) Grant Program in an effort to reduce or eliminate flood damages to residential properties that met certain minimum requirements. The Agency initiated the program early in 2008. As of 2010, there were no SRL properties located within the City of Woodcreek. See the Flood Risk section (Section 6.3.1) of the Plan update for a detailed discussion of SRL properties in Hays County.

1.4.2 Tornado Loss Estimation

Relative to other parts of the nation, the overall tornado risk is moderate in Hays County and the City of Woodcreek. There is significant enough exposure to the hazard to perform a simple risk assessment to characterize the potential future losses. The tornado loss estimation for the City of Woodcreek was calculated using FEMA's Benefit-Cost Analysis Tool (BCAR) software (version 4.5.5.0). The BCAR analysis methodology and tornado element of the software are based entirely on avoided injuries and fatalities. As a result, it is not necessary to separate public assets from private ones in order to estimate potential future losses (risk) – the calculation is based on the population at risk, rather than the square footage or value of buildings or functions. The table below summarizes data inputs and expected losses over a 50-year planning horizon.

Table K-4
Tornado Risk Assessment - Project Information
(Source: FEMA BCA Software, Version 4.5.5.0)

Data	Value
Loss estimation horizon (in years)	50
Population (2010 US Census)	1,457
Zip Code used as center of analysis	78676
Radius in miles for access to safe room	0.58
Assumed safe room structure design wind speed (mph)	200
Occupancy – City Hall	5 (estimated)
Assumed structure type: residential properties	Wood-frame, one- or two-story
Assumed structure type: jurisdiction-owned facilities	Wood-frame, one- or two-story
Estimated annual losses (jurisdiction-owned facilities)	**$810**
Estimated losses – 50-year horizon (jurisdiction-owned facilities)	**$11,174**
Estimated Annual losses (residential property)	**$89,090**
Estimated losses – 50-year horizon (residential property)	**$1,229,510**

It should be noted that this result is typical of tornado analyses (i.e. that the apparent risk is very high compared to other hazards). This occurs because the analysis is based entirely on life safety, and the probabilities of events of various magnitudes combined with the relatively high values assigned to deaths and injuries indicate significant losses over long time horizons. See Section 6.3.3, *Tornado Wind Risk in Hays County*, of the Plan update to see how the residential tornado risk in the City of Woodcreek compares with the risk to the County other municipalities in Hays County.

1.4.3 Winter Storm Loss Estimation

This analysis is based on information provided by the County and community, and uses data from the National Climatic Data Center (NCDC) and estimates from the 2010 U.S. Census. The estimated annual and 100-year risk for each jurisdiction was calculated as a proportion of the total winter storm risk for Hays County. Additional information about the methodology is found in Section 6 of the HMP. Jurisdiction-specific information and analysis output are provided in the table below.

TableK-5
City of Woodcreek Winter Storm Loss Estimates
Data Parameters and Summary of Results
(Source: FEMA BCA Software, Version 4.5.5.0)

Data	Value
Winter storm events	9
Reporting Years	14
Average annual number of winter storm events	0.64
Total reported damages (Hays County)	$7,500,000
Annual damages (Hays County)	$535,714
Hays County Population (2010 US Census)	157,101
Woodcreek Population (2010 US Census)	1,457
Percent of County Population	0.92%
Estimated Annual losses	**$4,929**
Estimated losses – 100-year horizon	**$70,331**

1.5 Mitigation Actions

The table below lists prioritized mitigation projects and actions identified by the City of Woodcreek. The list was prioritized by the community using the STAPLEE methodology – see Section 7 of the County HMP for a discussion of this methodology. All of the original actions for Woodcreek (Action Items 1-7) remain in the table for reference purposes. Completed actions are noted in the status column, but also have the action number and action item description highlighted with ~~strikethrough~~ text to indicate completion. Action items 8 – 19 have been added as part of the 2011 Plan update.

Table K-6
City of Woodcreek Mitigation Actions

No.	Action Item Description/Benefits/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
Note: Action Items 1-7 were identified from the original Hays Co. HMP.							
1	~~**Reduce flood losses and increase flood insurance coverage in Hays County.** This Action Item includes hosting a Flood Insurance Workshop by the NFIP Regional Coordinator. Local community floodplain managers, insurance agents, developers, homeowners and the general public can be invited. The purpose of the workshop is to inform attendees that flood insurance is available for all structures located in communities that participate in the NFIP and that flood insurance policies protect against losses both for structures and contents. This action was labeled F-2 from the original Plan.~~	City of Woodcreek	Existing staff resources	Annually 2006 - 2010	Flood	Not independently cost-effective	Not completed – little floodplain, little flood risk. Removed from plan

No.	Action Item Description/Benefits/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
2	**Adopt "Higher Standard" Flood Damage Prevention Ordinances.** Adopt a "Higher Standard" Flood Damage Prevention Ordinance similar to the City of San Marcos ordinance that requires all new construction and substantial improvement structures to be elevated a minimum of one foot above the established base flood (100-year) elevation. A "Higher Standard" Flood Damage Prevention Ordinance can assist a community's efforts to reduce future flood losses and provide additional Community Rating System (CRS) credits for communities desiring to participate in FEMA"s CRS Program. This action was labeled F-5 from the original Plan.	City of Woodcreek	Existing staff resources	2011 - 2013	Flood	Not independently cost-effective, but critical for reducing property damage and minimizing loss of life and injuries during flood events.	Ordinance under consideration
3	**Provide Training for Local Floodplain Managers and CFM's.** Provide floodplain management training such as hosting FEMA"s FPM Training Course, "Managing Floodplain Development through the NFIP", hosting NFIP Workshops, and hosting Community Rating System (CRS) Workshops. These training opportunities would assist local communities and provide continuing education credits (CEC"s) for local floodplain administrators, certified floodplain managers (CFM"s), engineers, surveyors and the general public. This action was labeled F-8 from the original Plan.	City of Woodcreek	Existing staff resources	Annually	Flood	Not independently cost-effective	Hays County Floodplain Manager will inform City FPM of future training opportunities

No.	Action Item Description/Benefits/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
4	**Improve Emergency Communication Systems.** This Action Item is to conduct a survey of emergency communication systems in Hays County, the City of San Marcos and other communities, purchase needed equipment and train personnel to create an effective system to improve emergency communications throughout Hays County. The ultimate goal is to develop a county-owned or leased emergency communications system. This action was labeled E-2 from the original Plan.	City of Woodcreek	$5,000 – Survey $15,000 Equipment $600,000 Emergency Communication System Funding: Capital Area Planning Council	Phased over 5 years: 2006 - 2010	All hazards	Not independently cost-effective, but critical for minimizing loss of life and injuries during emergencies.	City purchased two communication radios in 2009 - complete
5	**Development of and maintenance of countywide and individual community HAZMAP Plans.** Develop and formally adopt HAZMAP plans prior to the November 2004 deadline established by the Disaster Mitigation Act of 2000. Develop procedures to conduct annual reviews and updates to maintain countywide and individual community HAZMAP plans. Provide annual training opportunities for community emergency managers to assist in the planning and plan maintenance efforts. Create and maintain multi-jurisdictional HAZMAP databases and GIS mapping to support countywide and individual community HAZMAP maintenance efforts. This action was labeled E-5 from the original Plan.	City of Woodcreek	Existing staff resources	Plan to be updated every 5 years	All hazards	Not independently cost-effective	Original HMP Complete. Plan update to be adopted in 2011.

No.	Action Item Description/Benefits/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
6	**Storm Ready Designation for Hays County Communities.** There are no communities within Hays County that have been designated as a "Storm Ready" community by the National Weather Service (NWS). The NWS Office in New Braunfels is available to assist Hays County communities to become "Storm Ready". The Mitigation Plan Goal is to classify every community within Hays County as "Storm Ready". This action was labeled E-6 from the original Plan.	City of Woodcreek	Existing staff resources	Phased over 5 years: 2011 – 2015	Thunderstorms, high winds, tropical storms and cyclones, tornadoes, floods	Not independently cost-effective	Ongoing

No.	Action Item Description/Benefits/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
7	**Reduce Impacts of Extreme Heat on Elderly, Disabled, Low-Income and Infants.** This Mitigation Action is for Hays County and participating community Emergency Managers to launch a public notification effort during extreme heat periods urging elderly and low income persons to seek help if needed. Volunteer organizations such as Rotary International, Lions Club, Jaycees, Red Cross, United Way, and others should be urged to participate. Power Companies will be notified by the Hays County Emergency Manager and requested to participate in the effort to distribute box fans and make minor repairs to air conditioners. The Hays County Office of Emergency Management will coordinate with participating community emergency managers and take the lead to initiate this Mitigation Action. The initial action will include newspaper and radio announcements and public information on both the Hays County and City of San Marcos websites. Public announcements will define the hazard, describe heat related health risks and provide tips on how to prevent illness. Health care officials can play an important role in this mitigation action by providing information to newspapers and radio stations. This action was labeled Heat-1 from the original Plan.	Local ESD	$ 2,000 to purchase and distribute 100 box fans $ 3,000 estimated cost for a/c repairs Funding Sources: United Way Rotary Clubs Lions Clubs Red Cross Churches and charitable organizations Power Companies	Periods of Extreme Heat May be annually	Extreme Heat	Not independently cost-effective	Ongoing

No.	Action Item Description/Benefits/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
8	**Promote Flood Insurance.** Promote the purchase of Flood insurance. Advertise the availability, cost, and coverage of Flood insurance through the National Flood Insurance Program (NFIP). Develop NFIP brochure and promote using City website and newsletter. Priority: High	City of Woodcreek	$2,000	Ongoing	Flood	Not independently cost-effective, but the initial step in identifying appropriate mitigation actions	Ongoing
9	**Increase Public Awareness of Hazards.** Increase public awareness of hazards and hazardous areas. Distribute public awareness information regarding flood hazards, SFHAs, and potential mitigation measures using email and City website. Priority: Medium	City of Woodcreek	$2,000	ongoing	All hazards	Not independently cost-effective	Initiated in 2011 HMP
10	**Wildfire Hazard Areas.** Conduct study to determine and map potential wildfire hazard areas. Priority: Medium	Local ESD	$500	TBD; likely initiated in 2011	Wildfire	Not independently cost-effective, but essential in minimizing loss of life and injuries during significant storms.	Initiated in 2011 HMP
11	**Monitor Drought Conditions.** Continue to monitor drought conditions through contact with State Agencies. Priority: Medium	City of Woodcreek	No additional cost – uses existing staff	Ongoing	Drought	Not independently cost effective.	Ongoing
12	**Public Information Campaigns.** Cooperate and coordinate with the County and State agencies in developing public information campaigns and/or water use restrictions to ensure sufficient water pressure for fire-fighting and provision of drinking water during periods of drought. Priority: Medium	City of Woodcreek	No additional cost – uses existing staff resources	Ongoing	Drought	Very difficult to determine, but presumed very cost-effective because actions preserves essential function	Ongoing
13	**Evaluate Excess Heat Risks.** Evaluate the risks presented by excessive heat and humidity, especially in terms of high-risk populations such as the elderly/low income. Priority: Medium.	Local ESD	No additional cost – uses existing staff resources	TBD; probably initiated in 2011	Extreme heat	Not independently cost-effective, but needed to develop adequate risk reduction efforts	Initiated in 2011 HMP

No.	Action Item Description/Benefits/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
14	**Review Plans and Resources to Address Risk Posed By Snow and Ice Hazards During Winter Storms**. Conduct a review of the City's current plans and resources to address the risks posed by ice and snow hazards during winter storms. Focus on City's ability to respond to snow and ice emergencies, and on potentially at-risk populations in the community. Priority: Low to medium.	City of Woodcreek	No additional cost – uses existing staff resources	Ongoing	Winter storms, extreme cold, winter storm	Not independently cost-effective, but contributes to maintaining public services; protects at-risk populations	Initiated in 2011 HMP
15	**Various Mitigation Actions to Reduce Wildfire Risk.** On a case-by-case basis, develop and initiate mitigation actions to reduce the wildfire and brushfire risk. Actions may include informing property owners of appropriate actions, clearing vegetation, and monitoring antecedent conditions, among others. Priority: Low.	City of Woodcreek	No additional cost – uses existing staff resources	TBD/as need is identified	Wildfire	Cost-effective, as measures tend to be in-expensive and prevent fires	Initiated in 2011 HMP
16	**Upgrades to At-Risk Structures.** Based on the results of the study above, initiate upgrades to at-risk structures and/or infrastructure. Mitigates specific risks to structures, people and operations. Priority: Low	City of Woodcreek	Varies depending on measure. Funding from General Fund or FEMA grant program/s	TBD based on study	Floods, thunderstorms, high winds, tornadoes, seismic	Cost-effectiveness will vary with level of risk and project cost	TBD, but likely to be initiated no earlier than 2012
17	**Structural/Engineering Study.** Complete a detailed structural/engineering survey of Woodcreek public facilities to ensure their soundness with respect to resisting the effects of high winds, extreme roof loading from snow or ice, and hail. Forms basis of decisions about any additional actions to mitigate risk. Priority: Low	City of Woodcreek	To be determined, but if initiated probably from General Fund	Not yet established – to be commence d only if funding is available	Floods, thunderstorms, high winds, tornadoes, seismic	Not independently cost-effective, but the initial step in identifying appropriate mitigation actions	Initiated in 2011 HMP

No.	Action Item Description/Benefits/Priority	Lead Department	Cost Estimate /Funding	Schedule	Hazard	Cost-Effectiveness	Status as of 2011
18	**Understanding Dam Failure Risks.** Engage with County and State floodplain managers, engineers and emergency managers to ensure that local officials have a detailed understanding of potential risks to the community from dam and/or levee failures. Priority: Low to medium.	City of Woodcreek	No additional cost – uses existing staff resources	Initiated in 2011, then ongoing	Dam Failure	Not independently cost-effective	Initiated in 2011 HMP
19	**Evacuation Plans.** Ensure that the jurisdiction and its citizens are aware of and understand notification and evacuation plans related to dam and/or levee failure. Priority: Low to medium.	City of Woodcreek	No additional cost – uses existing staff resources	Initiated in 2011, then ongoing	Dam Failure	Not independently cost-effective	Initiated in 2011 HMP

1.6 Plan Adoption by the City of Woodcreek

After the draft Plan is approved by the Governor's Texas Division of Emergency Management (TDEM) and FEMA Region VI, the 2011 Plan Update will be adopted by the Hays County Commissioners Court. The Woodcreek City Council will also adopt the updated HMP by resolution. The City of Woodcreek adoption resolution is provided below. A copy of the County resolutions is included in Appendix N.

Figure K-5
Adoption Resolution - City of Woodcreek

Resolution to be inserted upon Plan adoption

Mitigation Planning Committee Meeting Minutes

Meeting #1
February 2, 2011

These minutes document the proceedings of the first meeting of the Hays County Mitigation Planning Committee (MPC). The MPC held its first meeting on Wednesday, February 2nd beginning at 1:30 p.m., at the San Marcos Activity Center, 501 E. Hopkins, San Marcos. These minutes were prepared by Jeff Ward.

Participants

Jeff Ward	Jeffrey S. Ward & Associates (consultant) (JW)
County and City Reps	See attached sign in sheet

There was good representation at this first meeting from the County and many of the participating incorporated areas. There were a couple of incorporated areas that were unable to attend this first meeting and the County is following up with these jurisdictions regarding the items reviewed, discussed, and requested during this meeting.

Minutes

General

Jeff Turner, Hays County Emergency Management Coordinator, opened the meeting with a discussion of the importance of mitigation, mitigation planning, and the plan update requirement.

1. Introductions (Sign-in)

A sign-in sheet was distributed to all meeting members (see attached). Each MPC participant introduced themselves. Jeff Hauff introduced the Consultant Team that has been hired to assist with the plan update process.

2. Presentation

JW presented an overview of the mitigation plan update process. This presentation included:

- Background and purpose of mitigation planning
- Establishing the process
- Communications
- The Request for Information (RFI) document
- Mitigation Planning Committee (MPC) and Stakeholders
- Structure of the plan/update
- Discussion of municipalities
- Documenting the planning process
- Hazard identification and profiling
- Vulnerability assessment and loss estimation (facilities)

- Mitigation actions
- Plan monitoring and maintenance
- Plan adoption
- Schedule
- Other discussion
- Man-Made Hazards
- GIS Mapping

A copy of this presentation was sent to the Jeff Turner who will distribute to the team.

JW covered the following agenda items:

Establishing the process – A discussion was held about the update process. In this discussion, it was acknowledged that, where the original plan had good data that could/will be incorporated into the plan update, the plan update would proceed similar to a new plan. The County concurred with this approach.

Communications – It was agreed that communications would be direct between the contractor and each participating jurisdiction. Jeff Turner, as the County's POC for this plan update, would be copied on all communications.

Schedule – The Hays County Hazard Mitigation Plan expires on October 2, 2011. Due to this fact, the update process requires a final draft be completed and sent to the County for review by July, 31, 2011. Work on the plan has begun and it is anticipated the next committee meeting, at which the first draft will be presented and reviewed, will be held in Mid-March - tentatively the week on March 14th 2011.

The Request for Information (RFI) document – The team was presented with a detailed RFI. The RFI will be the guiding document followed to track needed data from the County and each jurisdiction. The RFI provided was reviewed in a general nature (as to the type of items required) but was not reviewed in detail. The detailed County-wide RFI is attached to these minutes.

Mitigation Planning Committee (MPC) and Stakeholders – JW discussed the importance of and differences between the MPC and Stakeholders. The MPC include key members from County departments involved in Mitigation and representatives from each of the participating jurisdictions. The MPC members are expected to provide direct input into the mitigation plan and to attend and participate in all mitigation planning meetings. The MPC will be responsible for identifying mitigations actions and for championing the review and adoption of the plan by their jurisdictions. The Stakeholders are groups such as local independent school districts, adjacent Counties, local industry, large homeowner associations, and civic associations that have a direct interest in the mitigation planning process and outcome. The Stakeholders will be asked to review and comment on the plan during development but will not have direct input in the plan. The MPC determined the Stakeholder team to include the following organizations: Hays County Soil & Water Conservation District; Plum Creek Conservation District; City of Buda, FPPG; Texas State University; EMS/ESD (there are 8); 4 ISDs; Upper San Marcos Watershed Reclamation and Flood Control District; San MarcosRiver Foundation; Travis County; Caldwell County; Blanco County; Guadalupe County; Comal County; LCRA and GBRA.

Structure of the plan/update – JW provided a recommended Table of Contents (TOC) for the plan update. The MPC reviewed this TOC and concurred with this structure for the plan update. The TOC follows the IFR requirements for Hazard Mitigation plans and will be used to reformat the old plan for the plan update.

Discussion of municipalities – there was a general discussion of location and size of the incorporated, participating jurisdictions. It was discussed that the large jurisdictions (population areas) within the planning area include the cities of San Marcos, Buda, Kyle and Wimberley. In total, there are 12 participants in this plan update process, including Hays County, and cities of Buda, Bear Creek, Dripping Springs, Hays, Kyle, Mountain City, Niederwald, Uhland, Wimberley, Woodcreek and San Marcos.

JW led the discussion of the major sections of the plan. These included a high level overview of the following:

- Documenting the planning process – JW presented a high level overview of the importance.
- Hazard identification and profiling – The team had a detailed discussion of the types of hazards that were profiled in the original plan and those that were eliminated from further risk assessment due to a low probability of occurrence and low impact on property or lives. It is anticipated the list of hazards for which a more detailed risk assessment will be completed as part of the plan update, will remain the same as in the original plan.
- Vulnerability assessment and loss estimation (facilities) – the team had a detailed discussion about the data needed to complete this section. It was agreed that JW would provide a condensed RFI memorandum that would help facilitate this assessment and loss estimation. This memorandum will include a template to be used by each jurisdiction to provide information on publicly owned facilities.
- Mitigation actions – Discussion centered on the need to provide status on all actions from the existing plan (what has been accomplished in the past 5 years) and the importance of identifying new actions for the plan update. JW highlighted the importance of having geographically specific actions in the plan and the desire to have actions that could result in potential, fundable Mitigation grant applications.
- Plan monitoring and maintenance – Jeff Turner discussed his desire to reconvene the MCT after any future disaster and/or at least annually to review current actions included in the plan update and to discuss whether or not any actions needed to be added to the approved plan.
- Plan adoption – the team discussed the process that will be followed to get the plan adopted once FEMA has reviewed and tentatively approved the draft for adoption.

General discussions/questions

Actions from this meeting

- JW to provide the goal statement from the original plan and request concurrence that it is still the goal statement for the plan updated. – provided by email on 2-11-11
- JW to send GIS lead an overview of current maps – to be provided
- JW to provide the action table from the original plan to the Team to determine status of actions – provided by email on 2-11-11.

- JW to provide draft/sample actions and a blank mitigation action table for completion by each jurisdiction –provided on 2-11-11
- JW to prepare MPC meeting minutes – provided in draft on 2-11-11.
- Establish public meeting dates based on the Commissioners Court. Commissioners Court meets on the 12th and the team can hold 2 public meetings at that time on the 11th and 12th. - HC to confirm

The meeting adjourned at 3:30 p.m.

Sign-In Sheet from MPC meeting of February 2, 2011

FEB 2 2011

Hays County MPC Mtg #1

NAME	ORG	#	EMAIL
JEFF WARD	JSWA	540 668 6945	jwarde@rstarmail.com
JEFF TURNER	HCOEM	512-393-7301	jeff.turner@co.hays.tx.us
PEDRO F. HERNANDEZ JR.	KYLE P.D.	512-268-0859	phernandez@cityofkyle.com
Steve Floyd	Hays Co GIS	393.2160	steveF@co.hays.tx.us
BETTY LAMBRIGHT	HAYS Co.	393-2143	betty.lambright@co.hays.tx.us
Kathy Woodlee *	City of San Marcos	805-2634	kwoodlee@[redacted]sanmarcostx.gov
Mike BEGGS *	City of Buda	512-801-3199	mbeggs@ci.buda.tx.us
STANLEY FEES *	CITY OF BUDA	512-312-0084	sfees@ci.buda.tx.us
Joe Felkel *	City of Dripping Springs	512-858-4725	jfelkel@cityofdrippingsprings.com
Peter Sybesma *	City of Woodcreek	512-847-9390	administrator@cityofwoodcreek.com
Tim VANDE VORDE	Hays County	512-738-0747	tvandevorde@co.hays.tx.us
Tom Pope	Hays Co	512 393-2150	TPope@co.hays.tx.us
Jeff Hauff	Hays Co	512-393-2209	Jeff.Hauff@co.hays.tx.us
Dennis Gowan *	City of Wimberley	512-847-0025	dfergusson@cityofwimberley.com
* James R. Earp	City of Kyle	512-262-3924	jrearp@cityofkyle.com
Lucy Johnson	City of Kyle	512-913-4742	mayor@cityofkyle.com

Status of Actions from February 2, 2011 meeting

- JW to provide the goal statement from the original plan and request concurrence that it is still the goal statement for the plan updated. – see following sample mitigation goal statement. There was not a similar, concise mitigation goal statement in the current Hays County plan

Mitigation Goal Statement

It is the goal of the County to protect public health, safety, and welfare and to reduce losses due to hazards by identifying hazards, by minimizing exposure of citizens and property to hazards, and by increasing public awareness and involvement.

- JW to send GIS lead an overview of current maps. – to be provided the week of 14 Feb
- JW to provide the action table from the original plan to the Team to determine status of actions – provided by email on 2-11-11.
- JW to provide draft/sample actions and a blank mitigation action table for completion by each jurisdiction – provided by email on 2-11-11.
- JW to prepare MPC meeting minutes. Complete
- Establish public meeting dates based on the Commissioners Court. Commissioners Court meets on the 12th and the team can hold 2 public meetings at that time on the 11th and 12th. – Jeff Hauff to confirm

Mitigation Planning Committee Meeting Minutes

Meeting #2
April 26, 2011

These minutes document the proceedings of the first meeting of the Hays County Mitigation Planning Committee (MPC). The MPC held its second meeting on Monday, April 26, 2011 beginning at 2:00 p.m. at Hays County Development Services building located at 2171 Yarrington Road, San Marcos.

Participants

Jeff Ward	Jeffrey S. Ward & Associates (consultant) (JW)
County and City Reps	See attached sign in sheet

There was good representation at this second meeting from the County and many of the participating incorporated areas. There were a couple of incorporated areas that were unable to attend this second meeting and the County is following up with these jurisdictions regarding the items reviewed, discussed, and requested during this meeting.

Minutes

General

Jeff Hauff and JW opened the meeting with a discussion of the progress made since last meeting.

1. Introductions (Sign-in)

A sign-in sheet was distributed to all meeting members (see attached). Each MPC participant re-introduced themselves.

2. **Approval of Committee Meeting 1 meeting minutes**

The team approved the minutes from the first committee meeting

3. **Review of Status of RFI requests**

JW went through the request for information with all team members and discussed the importance of obtaining this information from each participating jurisdiction in order to get specific details to complete the plan update. The team was given a deadline of May 15, 2011 to get the requested data to JW. It was noted that City of Buda and City of Woodcreek had provided inputs.

4. **Review of Draft Action Items**

JW reviewed sample actions that could be considered to address the various hazards that impact the planning area. As part of the RFI, jurisdictions were asked to provide new actions for inclusion in the plan

update and status of actions that are in the current plan. A summary of actions from the current plan were provided to facilitate providing status for the plan update.

5. **Review Draft of Section 5 and one Jurisdiction Appendices**

JW provided the draft of Section 5, Hazard Identification and Profiling and a sample jurisdictional appendix (City of Woodcreek). These draft were passed around the room and no comments were provided. A copy of these two sections were provided when these meeting minutes were distributed.

6. Public Meeting

JW provided an overview of what would be discussed during the public meeting, scheduled for Tuesday, April 26th, 2011, during an open session of Commissioner's Court. This meeting was held as scheduled.

7. **GIS Mapping**

Plan update mapping needs were discussed and reviewed.

Steve Floyd, Hays GIS Programs Manager asked JW some questions clarifying the types of maps that would be needed for this plan update. Steve agreed he would begin to develop maps and they would be provided in the near future. As of the writing of these minutes, several county-wide maps and jurisdictional maps had been received.

8. **Adjourn**

The meeting adjourned at 3:00 PM.

It was agreed the next meeting would be held in early June. Due to the limited response from RFIs from jurisdictions, this meeting has been moved to June 23, 2011

Actions from this meeting

- RFI inputs from all jurisdictions due May 15, 2011

The meeting adjourned at 3:30 p.m.

Sign-In Sheet from MPC meeting of April 26, 2011

Status of Actions from February 2, 2011 meeting

- JW to provide the goal statement from the original plan and request concurrence that it is still the goal statement for the plan updated. – see following sample mitigation goal statement. There was not a similar, concise mitigation goal statement in the current Hays County plan

Mitigation Goal Statement

It is the goal of the County to protect public health, safety, and welfare and to reduce losses due to hazards by identifying hazards, by minimizing exposure of citizens and property to hazards, and by increasing public awareness and involvement.

- JW to send GIS lead an overview of current maps. – to be provided the week of 14 Feb
- JW to provide the action table from the original plan to the Team to determine status of actions – provided by email on 2-11-11.
- JW to provide draft/sample actions and a blank mitigation action table for completion by each jurisdiction – provided by email on 2-11-11.
- JW to prepare MPC meeting minutes. Complete
- Establish public meeting dates based on the Commissioners Court. Commissioners Court meets on the 12th and the team can hold 2 public meetings at that time on the 11th and 12th. – Jeff Hauff to confirm

HAZARD MITIGATION PLAN

DATE: April 25, 2011 Time: 2:00p.m. Location: 2171 Yarrington Road, San Marcos, Texas

	Name	Organization	Phone Number	E-Mail Address
1	Jeff Hauff	Hays Co	393-2209	Jeff.Hauff@co.hays.tx.us
2	Jeff Ward	Mt. Consultant	540 668 6945	Jward@rstormail.com
3	Steve Floyd	Hays Co	393.2160	Stevef@co.hays.tx.us
4	Stanley Fees	City of Buda	512-312-0084	sfees@ci.buda.tx.us
5	Mike Beggs	City of Buda	512 312-2876	mbeggs@ci.buda.tx.us
6	Tim Vande Vorde	Hays Co.	512-738-0747	tvandevorde@co.hays.tx.us
7	Daniel A. Heideman	City of Wohland	512 738-2073	heideman@cLms.com
8	Pedro F. Hernandez Jr.	City of Kyle (P.D.)	512-557-6395	phernandez@cityofkyle.com
9	Eric C. Eskelund	City of Woodcreek	512 847-9390	Mayor@cityofwoodcreek.com
10	Pieter Sybesma	City of Woodcreek	512 847-9390	Administrator@cityofwoodcreek.com
11	Tom Pope	Hays Co	512 393-2158	TPope@co.hays.tx.us
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Mitigation Planning Committee Meeting Minutes

Meeting #3
June 23, 2011

These minutes document the proceedings of the third meeting of the Hays County Mitigation Planning Committee (MPC). The MPC held its third meeting on June 23, 2011 beginning at 2:00 p.m. at Hays County Development Services building located at 2171 Yarrington Road, San Marcos.

Participants

Jeff Ward	Jeffrey S. Ward & Associates (consultant) (JW)
County and City Reps	See attached sign in sheet

There was good representation at this third meeting from the County and many of the participating incorporated areas. There were a couple of incorporated areas that were unable to attend this third meeting and the County is following up with these jurisdictions regarding the items reviewed, discussed, and requested during this meeting.

Minutes

General

Jeff Hauff and JW opened the meeting with a discussion of the progress made since last meeting.

1. Introductions (Sign-in)

A sign-in sheet was distributed to all meeting members (see attached). Each MPC participant re-introduced themselves.

2. **Approval of Committee Meeting 2 meeting minutes**

The team approved the minutes from the first committee meeting

3. **Review of Status of RFI requests**

JW went through the request for information with all team members and again discussed the importance of obtaining this information from each participating jurisdiction in order to get specific details to complete the plan update. All team members indicated they were working on the needed data and would continue to provide as it was developed.

4. **Detailed discussion of the remaining items needed**

JW reviewed a list of outstanding items in the draft. These include:

List of Stakeholders and Civic groups that would be asked to review the draft:

- Texas State University
- Private Utility companies
    - PEC
    - Blue Bonnett
    - LCRA
    - Aqua TX
    - Centerpoint
    - Time Warner
    - Wimberly Valley Water Supply

Impacts from Hazards

- Wildfire – crop and drought damage in 2008
- The MPC suggested checking old plan to get confirmation on list of DRs that have impacted Hays to include Rita and Ike where the County was declared for PA for sheltering

Design Wind speed for construction – 90 MPH

Stream and River Gages – Hays has worked with GBRA and USGS to have gages moved to priority areas such as low water crossings

There was an action in the prior plan to increase flood warning capability on high hazard dams. The MPC reported that no progress has been made and this action will carry forward to the plan update

The MPC was asked for a list of Dams that had an emergency action plan. Ken Bell took an action to get a list of these Dams.

There have been no Dam failures within Hays County

There have been no extreme cold events with any impact to lives or properties in Hays County.

Hays County has provided shelter for other Texas Counties post major events. Ken Bell took an action to get PA info from these prior sheltering.

Steve Floyd took an action to provide a data table for Hays County properties located in the SFHA.

Steve Floyd provided a disc with a multitude of GIS maps for use in the plan.

5. **Review of Updated Draft**

JW provided the team with a hardcopy of the draft plan, which included an appendix for all but one of the incorporated areas. This additional jurisdictional appendix will be completed and provided to the MPC in the near future. JW posted a copy of the draft plan and sent each MPC member the link to access the plan for review and comment, which is ongoing.

- **Actions to include in plan update**

The MPC highlighted actions they would like to see in the plan update. This list is being provided by email by each incorporated area. One specific action mentioned was to install generators at all critical facilities and critical infrastructure.

Actions from this meeting

- JW to post draft plan for review - complete
- Jeff Hauff to provided updated contact list – complete
- Ken Bell to provide list of Dams with emergency action plans in place
- Ken Bell to provide PA info from prior sheltering events

Sign-In Sheet from MPC meeting of April 26, 2011

HAZARD MITIGATION PLAN

Date: June 23, 2011 Time: 10:00 a.m. Location: 2171 Yarrington Road, San Marcos, TX

	Name	Organization	Phone Number	E-Mail Address
1	Jeff Hauff	Hays Co	393-2209	Jeff.Hauff@co.hays.tx.us
2	Olivia Hemby	HCOEM, Intern	512-618-0368	olivia.hemby@gmail.com
3	Pieter Sybesma	City of Woodcreek	512-847-9390	administrator@cityofwoodcreek.com
4	KENNETH BELL	CITY OF SAN MARCOS EMC	512 393 8470	KBELL@sanmarcosTX.gov
5	JEFF WARD	JSWA	540 668 6945	Jward@rstarmail.com
6	Jim Thompson	City of Dripping Springs	512 858 4725	jthompson@cityofdrippingsprings.com
7	Kathy Woodlee	City of San Marcos	512-805-2634	kwoodlee@sanmarcosTX.gov
8	GB WATT	CITY OF SAN MARCOS	512 393 8470	GWATT@SANMARCOSTX.gov
9	Tom Pope	Hay Co Dev. Services Dept	512 393-2150	TPope@co.hays.tx.us
10	ERIC C. ESKELUND	CITY OF WOODCREEK	512 847-9390	MAYOR@CITYOFWOODCREEK.COM
11	Steve Floyd	Hays Co	393.2160	stevef@co.hays.tx.us
12	Mike BEGGS	City of Buda	512-312-2876	mbeggs@ci.buda.tx.us
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Mitigation Planning Committee Meeting Minutes

Meeting #4
November 9, 2011

These minutes document the proceedings of the fourth meeting of the Hays County Mitigation Planning Committee (MPC). The MPC held its fourth meeting on November 9, 2011 beginning at 9:30 a.m. at the Hays County Emergency Operations Center, 1251 Civic Center Loop, San Marcos.

Participants

Jeff Ward	Jeffrey S. Ward & Associates (consultant) (JW)
County and City Reps	See attached sign in sheet

There was good representation at this fourth meeting from the County and many of the participating incorporated areas. There were a couple of incorporated areas that were unable to attend this fourth meeting and the County is following up with these jurisdictions regarding the items reviewed, discussed, and requested during this meeting.

Minutes

General

Jeff Hauff and JW opened the meeting with a discussion of the progress made since last meeting.

1. Introductions (Sign-in)

A sign-in sheet was distributed to all meeting members (see attached). Each MPC participant re-introduced themselves.

2. Moving Forward

JW discussed the next steps and schedule to get to submittal. The Hays County main plan draft is complete. Most jurisdictional appendices were still lacking some data. Each jurisdiction was given until November 18, 2011 to provide the missing data. Once provided, JW will update all appendices by 25 November and post on the County's web site. There will be a LEPC meeting on December 8, 2011. This meeting is open to the public and the meeting announcement will include an agenda item for review of the final draft plan. The public and stakeholders will be informed the draft is available for public review and comment. Comments will be accepted until December 22, at which time the plan will be finalized and provided to TDEM (by December 31, 2011) for review.

3. Appendices

The remainder of the meeting was used to answer any questions the jurisdictions had about the missing elements of their appendix and to update the appendices for anyone that brought the required data with them to the meeting.

Actions from this meeting

- JW to incorporate Hays main plan comments and repost on website - complete
- Jurisdictions to provide missing data for appendices by November 18, 2011
- Hays County to present Draft plan at public LEPC meeting

Sign-In Sheet from MPC meeting of April 26, 2011

Hays County Hazard Mitigation Planning Committee Meeting

November 9, 2011

	Name	Agency	Email
1.	Russell G. Schultz	City Uhland	Russschultz@hotmail.com
2.	Jeff Hauff	Hays Co	Jeff.Hauff@co.hays.tx
3.	Kenneth E. Bell	San Marcos	KBell@sanmarcostx.gov
4.	Jeff Ward	JSWA	Jward@rstermail.com
5.	Jeff Turner	HCOEM	jeff.turner@co.hays.tx.us
6.	Joe Felkel	Dripping Springs	jfelkel@cityofdrippingsprings.com
7.	Pedro F. Hernandez Jr	Kyle P.D.	phernandez@cityofkyle.com
8.	Gib Watt	SM	gwatt@sanmarcostx.gov
9.	Mike Beggs	City of Buda	mbeggs@ci.buda.tx.us
10.	Tom Pool	Hays Co. Devel. Services	TPool@co.hays.tx.us
11.	Steve Floyd	Hays Co. Dev. Svcs.	steve.f@co.hays.tx.us
12.	Eric Eskelund	Woodcreek	Mayor@cityofwoodcreek.com
13.	Victor Sybesma	Wonderwalk	administrator@southwoodcreek.com
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Appendix M Public Notice Documents and Meeting Minutes

Appendix N Adoption Resolution for Hays County

Appendix O TDEM and FEMA Approval Letters

Key Terms

For the most part, terms used in the Plan have the meanings that are commonly associated with them:

- Disaster means the occurrence of widespread or severe damage, injury, loss of life or property, or such severe economic or social disruption that supplemental disaster relief assistance is necessary for the affected political jurisdiction(s) to recover and to alleviate the damage, loss, hardship, or suffering caused thereby (DEM).
- Federal Emergency Management Agency (FEMA) coordinates the federal government's efforts to plan for, respond to, recover from, and mitigate the effects of natural and man-made hazards.
- Flood Insurance Rate Map (FIRM) is prepared by the Federal Emergency Management Agency to show Special Flood Hazard Areas.
- Floodplain: See "Special Flood Hazard Area (SFHA)" below.
- Hazard is defined as the natural or technological phenomenon, event, or physical condition that has the potential to cause property damage, infrastructure damage, other physical losses, and injuries and fatalities.
- Mitigation is defined as actions taken to reduce or eliminate the long-term risk to life and property from hazards. Mitigation actions are intended to reduce the *need* for emergency response – as opposed to improving the *ability* to respond.
- National Flood Insurance Program (NFIP), located within FEMA, is charged with preparing FIRMs, developing regulations to guide development, and providing insurance for flood damage.
- Risk is defined as the potential losses associated with a hazard. Ideally, risk is defined in terms of expected probability and frequency of the hazard occurring, people and property exposed, and potential consequences.
- Special Flood Hazard Area (SFHA) or Floodplain is the area adjoining a river, stream, shoreline, or other body of water that is subject to partial or complete inundation. The SFHA is the area predicted to flood during the 1% annual chance flood, commonly called the "100-year" flood.

Appendix Q Acronyms

The following acronyms are used in the document:

- BCA – Benefit Cost Analysis
- BFE – Base Flood Elevation
- CFR – Code of Federal Regulations
- CRS – Community Rating System (NFIP)
- DEM – Texas Division of Emergency Management
- EAP – Emergency Action Plan (for dams)
- EMC – Emergency Management Coordinator
- EOC – Emergency Operations Center
- ESD – Emergency Service District
- FEMA – Federal Emergency Management Agency
- FIRM – Flood Insurance Rate Map
- FIS – Flood Insurance Study
- FMA – Flood Mitigation Assistance (FEMA)
- GIS – Geographic Information System
- HMC – Hazard Mitigation Committee
- HMP – Hazard Mitigation Plan
- HMGP – Hazard Mitigation Grant Program (FEMA)
- IBC – International Building Code
- ICC – International Council Code
- IFR – Interim Final Rule
- MMI – Modified Mercalli Intensity Scale
- MPC – Mitigation Planning Committee
- NCDC – National Climatic Data Center
- NFIP – National Flood Insurance Program (FEMA)
- NID – National Inventory of Dams
- NOAA – National Oceanic and Atmospheric Administration
- NRCS – Natural Resource Conservation Service
- NWS – National Weather Service
- OEM – Office of Emergency Management
- PDM – Pre Disaster Mitigation
- PDSI – Palmer Drought Severity Index
- PGA – Peak Ground Acceleration
- POC – Point of Contact
- RFC – Repetitive Flood Claim
- RFI – Request For Information
- RL – Repetitive Loss
- SFHA – Special Flood Hazard Area
- SRL – Severe Repetitive Loss
- STAPLEE - Social Technical Administrative Political Legal Economic Environmental
- TCEQ – Texas Commission of Environmental Quality
- TDEM – Texas Division of Emergency Management
- TWDB – Texas Water Development Board
- TXDOT – Texas Department of Transportation
- USACE – United States Army Corps of Engineers
- USGS – United States Geological Survey