Tarrant County, Texas

Local Mitigation Action Plan – June 2015

TARRANT COUNTY
LOCAL MITIGATION ACTION PLAN

The plan was prepared under the direction of the Tarrant County Local Mitigation Action Planning Committee. For additional information, please contact Nicholas F. LaGrassa with the North Central Texas Council of Governments at 817-695-9235.

EXECUTIVE SUMMARY

Mitigation should form the foundation of every emergency management agency's plans and procedures. Emergency management agencies must adopt mitigation practices to reduce, minimize, or eliminate hazards in their community. The Tarrant County Local Mitigation Action Plan (LMAP) identifies the hazards faced in the community, vulnerabilities to these hazards, and mitigation strategies for the future. The plan fulfills the requirements of the Federal Disaster Mitigation Act as administered by the Texas Division of Emergency Management (TDEM) and the Federal Emergency Management Agency (FEMA).

The Tarrant County LMAP is a guide for all communities that participated in its development. Participating municipalities include the Cities of Arlington, Azle, Bedford, Blue Mound, Colleyville, Crowley, Euless, Forest Hill, Fort Worth, Grapevine, Haltom City, Haslet, Hurst, Keller, Kennedale, Lake Worth, Lakeside, North Richland Hills, Richland Hills, Saginaw, Southlake, Watauga, Westlake, and Westworth Village. The Dallas Fort Worth International Airport, Tarrant County, and the North Central Texas Council of Governments (NCTCOG) also participated in development of the Tarrant County LMAP.

Representatives and citizens from participating communities attended public meetings to discuss the hazards their communities face and the vulnerabilities those hazards present. Representatives from each participating municipality reviewed drafts of the LMAP and added input to the mitigation strategies presented in the plan. Tarrant County citizens were also active participants in the development of the plan. Citizens attended public meetings that were advertised online and in news articles to share their concerns about hazards faced in the community and how to mitigate the effects of these hazards.

All participants involved in this plan understand the benefits of developing and implementing mitigation plans and strategies. Elected officials, public safety organizations, planners, and many others have worked together to develop and implement this LMAP, proving that they have the vision to implement mitigation practices and therefore reduce the loss of life and property in their communities.

TARRANT COUNTY
LOCAL MITIGATION ACTION PLAN

Table of Contents

TARRANT COUNTY LOCAL MITIGATION ACTION PLAN....1

EXECUTIVE SUMMARY....1

PREFACE....1

Section 1 PLAN, BACKGROUND, AND PURPOSE....1-1
- 1.1 Overview....1-1
- 1.2 Authority....1-1
- 1.3 Scope....1-1
- 1.4 Purpose....1-2
- 1.5 Consistency with Federal and State Mitigation Policies....1-2
- 1.6 Goals and Objectives....1-3

Section 2 COMMUNITY PROFILE....2-1
- 2.1 Overview....2-1
- 2.2 Demographics....2-2
- 2.3 Economy....2-5
- 2.4 Climate....2-6
- 2.5 Land Use....2-8
  - 2.5.1 Current Land Use....2-8
    - 2.5.1.1 Manufactured Homes....2-10
  - 2.5.2 Future Land Use....2-13
  - 2.5.3 Watersheds....2-16
- 2.6 Transportation....2-16
  - 2.6.1 Commuter Rail....2-17
  - 2.6.2 Airports....2-18
  - 2.6.3 Transit....2-20
- 2.7 Tarrant County Capabilities....2-20
- 2.8 Government....2-36

Section 3 PLANNING PROCESS....3-1
- 3.1 Tarrant County Local Mitigation Action Planning Committee....3-1
  - 3.1.1 Additional Partners....3-1
- 3.2 Plan Organization....3-6
- 3.3 Planning Team Goals and Objectives....3-6
- 3.4 Multijurisdictional Considerations....3-7
- 3.5 Review of Existing Technical/Planning Information....3-13
- 3.6 Public Involvement....3-14

Section 4 RISK AND VULNERABILITY ASSESSMENT 4-1
4.1 Natural Hazards 4-5
4.1.1 Tornadoes 4-5
4.1.2 Flooding 4-14
4.1.3 Severe Thunderstorms and High Winds 4-52
4.1.4 Hail 4-70
4.1.5 Lightning 4-83
4.1.6 Winter Storms 4-95
4.1.7 Drought 4-106
4.1.8 Wildfires 4-118
4.1.9 Extreme Temperatures 4-128
4.1.10 Expansive Soils 4-138
4.2 Technological Hazards 4-150
4.2.1 Power Failure 4-150
4.2.2 Infectious Disease Outbreak 4-151
4.2.3 Hazardous Materials Release 4-153
4.2.4 Terrorism 4-157
4.2.5 Dam Failure 4-159
4.3 Vulnerability of Critical Facilities 4-167

Section 5 MITIGATION STRATEGIES 5-1
5.1 Mitigation Goals and Considerations 5-2
5.1.1 Goals that Address Multiple Hazards 5-2
5.1.2 Tornadoes and Severe Thunderstorms and High Winds 5-3
5.1.3 Flooding 5-4
5.1.4 Power Failure 5-4
5.1.5 Hail 5-5
5.1.6 Wildfires 5-5
5.1.7 Winter Storms 5-6
5.1.8 Dam Failure 5-6
5.1.9 Infectious Disease Outbreak 5-7
5.1.10 Drought 5-7
5.1.11 Terrorism 5-8
5.1.12 Lightning 5-9
5.1.13 Hazardous Materials Release 5-10
5.1.14 Extreme Temperatures 5-10
5.1.15 Expansive Soils 5-11
5.2 City of Arlington Mitigation Strategy 5-12
5.3 City of Azle Mitigation Strategy 5-20
5.4 City of Bedford Mitigation Strategy 5-31
5.5 City of Blue Mound Mitigation Strategy 5-49
5.6 City of Colleyville Mitigation Strategy 5-62
5.7 City of Crowley Mitigation Strategy 5-73
5.8 Dallas Fort Worth International Airport Mitigation Strategy 5-86
5.9 City of Euless Mitigation Strategy 5-104
5.10 City of Forest Hill Mitigation Strategy 5-111
5.11 City of Fort Worth Mitigation Strategy 5-123

5.12 City of Grapevine Mitigation Strategy 5-132
5.13 Haltom City Mitigation Strategy 5-146
5.14 City of Haslet Mitigation Strategy 5-156
5.15 City of Hurst Mitigation Strategy 5-164
5.16 City of Keller Mitigation Strategy 5-170
5.17 City of Kennedale Mitigation Strategy 5-183
5.18 City of Lake Worth Mitigation Strategy 5-200
5.19 Town of Lakeside Mitigation Strategy 5-208
5.20 North Central Texas Council of Governments Mitigation Strategy 5-216
5.21 City of North Richland Hills Mitigation Strategy 5-220
5.22 City of Richland Hills Mitigation Strategy 5-231
5.23 City of Saginaw Mitigation Strategy 5-248
5.24 City of Southlake Mitigation Strategy 5-254
5.25 Tarrant County Mitigation Strategy 5-258
5.26 City of Watauga Mitigation Strategy 5-268
5.27 City of Westlake Mitigation Strategy 5-283
5.28 City of Westworth Village Mitigation Strategy 5-296

Section 6 EXECUTING THE PLAN 6-1
6.1 Plan Implementation 6-1
6.2 Evaluation 6-1
6.3 Multijurisdictional Strategy and Considerations 6-2
6.4 Plan Update 6-2
6.5 Plan Maintenance 6-2
6.6 Incorporation into Existing Planning Mechanisms 6-5

Section 7 SUMMARY 7-1
7.1 Conclusion 7-1
7.2 References 7-1

List of Tables

Table 2-1 Demographics 2-2
Table 2-2 Economy 2-5
Table 3-1 Tarrant County LMAPC 3-1
Table 3-2 Jurisdiction Stakeholder Outreach 3-2
Table 3-3 Calendar of Events 3-7
Table 3-4 Jurisdiction Participation in the Tarrant County LMAP 3-8
Table 3-5 Type of Jurisdiction Participation 3-9
Table 3-6 Jurisdiction Outreach Methods 3-14
Table 4-1 Hazards Included in the Risk and Vulnerability Assessment 4-1
Table 4-2 Hazards Not Included in the Risk and Vulnerability Assessment 4-2
Table 4-3 Tarrant County Local Mitigation Action Plan Hazard Ranking 4-4
Table 4-4 EF Scale 4-2
Table 4-5 Confirmed Tornadoes in Tarrant County 4-5
Table 4-6 Significant Floods Events in Tarrant County 4-17

Table 4-7 Tarrant County Communities Participating in the NFIP 4-32
Table 4-8 NFIP Compliance Activities 4-33
Table 4-9 Repetitive Loss Properties in Tarrant County and Participating Jurisdictions 4-44
Table 4-10 Potential Losses from Flooding 4-51
Table 4-11 Beaufort Wind Scale 4-52
Table 4-12 Severe Thunderstorm and High Winds 4-54
Table 4-13 TORRO Hail Storm Intensity Scale 4-70
Table 4-14 Hail Events 4-71
Table 4-15 Lightning Activity Scale 4-83
Table 4-16 Lightning Strikes in Tarrant County 4-85
Table 4-17 Winter Storm Events 4-98
Table 4-18 Tarrant County Drought History 4-109
Table 4-19 Keetch-Byram Drought Index 4-118
Table 4-20 Wildfires in Tarrant County 4-120
Table 4-21 Extreme Weather Events 4-131
Table 4-22 Significant Hazmat Releases in Tarrant County 4-154
Table 4-23 Tarrant County Dams 4-161
Table 6-1 Jurisdiction Representatives for Plan Implementation, Evaluation and Maintenance. 6-3
Table 6-2 Jurisdiction Incorporation into Planning Mechanisms 6-6

List of Figures

Figure 2-1 Location Map of Tarrant County, Texas 2-2
Figure 2-2 Arlington Existing Land Use 2-9
Figure 2-3 City of Arlington Manufactured Home Parks 2-11
Figure 2-4 City of Grapevine Manufactured Home Parks 2-12
Figure 2-5 City of Fort Worth Future Land Use 2-14
Figure 2-6 City of Southlake Future Land Use 2-15
Figure 2-7 Tarrant County Transportation Routes 2-17
Figure 2-8 Airports in Tarrant County 2-19
Figure 2-9 Fire Stations in Tarrant County 2-34
Figure 2-10 Hospitals in Tarrant County 2-35
Figure 2-11 Police Stations in Tarrant County 2-36
Figure 3-1 Example of Tarrant County LMAP Survey 3-17
Figure 4-1 Vulnerability Classifications 4-3
Figure 4-2 Tornado Tracks (1950-2011) and Population Density (2010) 4-1
Figure 4-3 Average Annual Number of Tornadoes Averaging Period: 1991 - 2010 4-1
Figure 4-4 Tornado Touchdowns in Tarrant County 4-3
Figure 4-5 Tarrant Flood Zones 4-24
Figure 4-6 Sperry-Piltz Ice Accumulation Index 4-96
Figure 4-7 Regional Snowfall Index 4-96
Figure 4-8 Drought Severity Index 4-107
Figure 4-9 Texas Drought Monitor (as of May 2014) 4-108
Figure 4-10 Tarrant County WUI Response Index 4-121

Figure 4-11 Tarrant County Fire Intensity Scale 4-122
Figure 4-12 Wind Chill Chart 4-128
Figure 4-13 National Weather Service Heat Index 4-129
Figure 4-14 Extreme Heat in Texas 4-130
Figure 4-15 Expansive Index 4-140

Mitigation Vision for the Future

Mitigation should be the very foundation of every emergency management agency's plans and procedures. Emergency management agencies must adopt mitigation practices to reduce, minimize, or eliminate hazards in their community. The Disaster Mitigation Act of 2000 (PL 106-390) outlines the criteria for communities to successfully implement hazard mitigation practices.

Tarrant County and its cities and townships realize the benefits achieved by the development and implementation of mitigation plans and strategies. Tarrant County and participating jurisdiction elected officials, public safety organizations, planners, and many others have worked together in the development and implementation of this Local Mitigation Action Plan, proving that they have the vision to implement mitigation practices and therefore reduce the loss of life and property in their communities.

Section 1
PLAN, BACKGROUND, AND PURPOSE

1.1 Overview

The Tarrant County Local Mitigation Action Plan (LMAP) as written fulfills the requirements of the Disaster Mitigation Act of 2000, which is administered by the Federal Emergency Management Agency (FEMA). The Disaster Mitigation Act provides federal assistance to state and local emergency management to mitigate the effects of disasters. The LMAP also encourages cooperation among various organizations and crosses political subdivisions.

The following communities participated in the update of the Tarrant County LMAP: the Cities of Arlington, Azle, Bedford, Blue Mound, Colleyville, Crowley, Euless, Forest Hill, Fort Worth, Grapevine, Haltom City, Haslet, Hurst, Keller, Kennedale, Lake Worth, Lakeside, North Richland Hills, Richland Hills, Saginaw, Southlake, Watauga, Westlake, and Westworth Village. Also participating were Dallas Fort Worth International Airport, Tarrant County, and the North Central Texas Council of Governments (NCTCOG).

The City of Fort Worth includes land in portions of Denton, Parker, and Wise Counties.

1.2 Authority

Section 409 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act Title 44 CFR as amended by Section 102 of the Disaster Mitigation Act of 2000 gives state and local governments the framework to evaluate and mitigate all hazards as a condition of receiving federal disaster funds. The Tarrant County LMAP is a requirement of the law. In Texas, federal regulatory authority for Local Mitigation Action Planning resides with FEMA Region VI.

1.3 Scope

The scope of the Tarrant County LMAP encompasses all areas of Tarrant County, as noted in Section 1.1. The plan will identify the natural and technological hazards that could threaten life and property in our communities. The scope of this plan includes both short-term and long-term mitigation strategies, implementation, and possible sources of project funding.

The plan also contains the following information:

- General information about the plan (Executive Summary).
- The vision for mitigation in our community (Preface).
- The profile of Tarrant County, its geography, history, physical features, and other community indicators (Section 2: Community Profile).
- The planning process and the involvement of all cities, state and federal governments, the public, the private sector, and other community players (Section 3: Planning Process).

- Documentation of Tarrant County's past and predicted exposure to natural hazards and the potential risks that include the impacts on critical infrastructure with anticipated losses (Section 4: Risk and Vulnerability Assessment).
- An overview of Tarrant County's capabilities to implement hazard mitigation goals, objectives, and policies that will effectively mitigate risks to our community (Section 5: Mitigation Strategies).
- Procedures for maintaining an effective, long-range LMAP and the strategy to implement it (Section 6: Executing the Plan).
- Critical facilities information.

1.4 Purpose

The purpose of the Tarrant County LMAP is to identify risks and vulnerabilities and to formulate a plan of action to reduce damage and loss of life from natural and technological disasters. This plan shall serve as a benchmark for future mitigation activities and will identify mitigation goals and objectives for Tarrant County and its cities and townships. The plan will also prioritize potential risks and vulnerabilities in an effort to minimize the effects of disasters in our community.

Realizing that identifying our community's risks and working collectively toward the prevention of disasters in our community is in everyone's best interest, the NCTCOG has taken a lead role in the development of the Tarrant County LMAP.

Mitigation planning is imperative to lessen the impact of disasters in Tarrant County. The written plan is an excellent method by which to organize Tarrant County's mitigation strategy. The implementation of the plan and its components is vital to preparing a community that is resistant to the effects of a disaster. The implementation of the LMAP will reduce loss of life and property and allow the community to prosper with minimal disruption of vital services to citizens. The LMAP provides a risk assessment of the hazards Tarrant County is exposed to and puts forth several mitigation goals and objectives that are based on that risk assessment. The LMAP has been formally adopted by each participating entity and is required to be updated every five years.

1.5 Consistency with Federal and State Mitigation Policies

The LMAP is intended to enhance and complement state and federal recommendations for the mitigation of natural and technological hazards in the following ways:

- Substantially reduce the risk of loss of life, injuries, and hardship from the destruction of natural and technological disasters on an ongoing basis.
- Improve the public's awareness of the need for individual preparedness and building safer, more disaster-resilient communities.
- Develop strategies for long-term community sustainability during community disasters.
- Develop governmental and business continuity plans that will continue essential private sector and governmental activities during disasters.

FEMA publishes many guidance documents for local governments for mitigating natural disasters. The Tarrant County LMAP fully recognizes, adopts, incorporates, and endorses the following principles:

- Develop a strategic mitigation plan for Tarrant County.
- Enforce current building codes.
- Develop incentives to promote mitigation.
- Incorporate mitigation of natural hazards into land use plans.
- Promote awareness of mitigation opportunities and programs throughout our community on a continual basis.
- Identify potential funding sources for mitigation projects.

The private sector is often an overlooked segment of the community during disasters. It is vital that this sector of a community is included in mitigation efforts that are consistent with state and federal recommendations such as the following:

- Develop mitigation incentives with insurance agencies and lending institutions.
- Encourage the creation of a business continuity plan for the continuance of commerce during disasters.
- Partner with businesses in an effort to communicate with customers about the hazards in the community and possible solutions.

Individual citizens must be made aware of the hazards they face. Additionally, they must be educated regarding how to protect themselves from the hazards they face. They must be shown that mitigation is an important part of reducing loss of life and property in their community. Their support is critical to the success of any mitigation effort. The Tarrant County LMAP supports the following FEMA recommendations regarding individual citizens:

- Become educated on the hazards that you and your community face.
- Become part of the process by supporting and encouraging mitigation programs that reduce vulnerability to disasters.
- Take individual responsibility for safeguarding yourself and your family prior to a disaster.

1.6 Goals and Objectives

The following goals and objectives are the basis of this plan and summarize what the Tarrant County Local Mitigation Action Planning Committee (LMAPC) will accomplish because of implementing this plan.

- Maximize the use of all resources by promoting intergovernmental coordination and partnerships in the public and private sectors.
- Harden our communities against the effects of disasters through the development of new mitigation strategies and strict enforcement of current regulations that have proved effective.
- Reduce and, where possible, eliminate repetitive damage and loss of life and property from disasters.

- Bring greater awareness throughout the community about potential hazards and the need for community preparedness.
- Continue training for Tarrant County departments.

Section 2
COMMUNITY PROFILE

2.1 Overview

Tarrant County is located in the state of Texas and has a total area of 897 square miles (863 square miles of land and 34 square miles of water). The county seat is in Fort Worth. The 2010 census reported a population of 1,809,034. Tarrant County is the 26th most populous county in the United States and the third most populous in Texas.

Tarrant County is one of 254 counties in Texas, which were originally set up by the State of Texas to serve as decentralized administrative divisions providing state services and collecting state taxes. Tarrant County, one of 26 counties created out of the Peters Colony, was established in 1849. It was named for General Edward H. Tarrant, commander of militia forces of the Republic of Texas at the Battle of Village Creek in 1841. The Village of Grapevine; the Texas Ranger outpost of Johnson's Station (in what is now south Arlington); and Bird's Fort, a short-lived private fort just south of present-day Euless, were early areas of western civilization in the region.

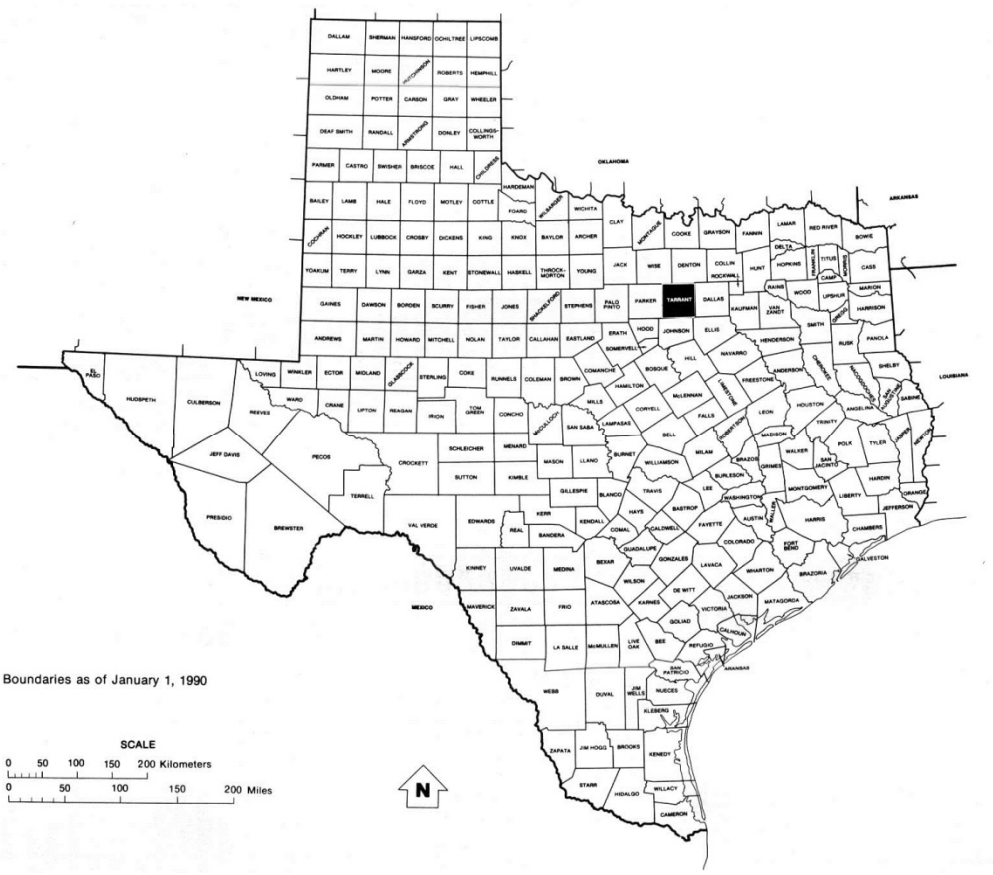
Where the Tarrant County Courthouse is now located, a military post was established in 1849 by a company of the 2nd U.S. Dragoons under the command of Major Ripley A. Arnold. The fort was named in honor of General William Jenkins Worth, a hero of the Mexican War and commander of United States forces in this region.

The first county seat election was held in 1851 and the location receiving the most votes, a few miles to the northeast, became Tarrant County's first county seat, designated Birdville as required by the statute creating the county. After the military post closed in 1853 and the small towns of Fort Worth and Birdville grew, competition began between them to be the seat of county government. A second special county seat election was held in 1856, when Fort Worth edged out Birdville by only a handful of votes. Fights ensued over the next four years by supporters of both locations. Finally, in 1860, another special election was held. This time, Fort Worth, by now the larger town, received 548 votes. The geographical center of Tarrant County, a compromise location, garnered 301 votes. From as early as 1856, regular stagecoach service passed through Tarrant County, carrying mail and passengers from the east on to the frontier forts and the West Coast. By the 1870's, mail stagecoaches arrived and departed from downtown Fort Worth six days a week. After the Texas & Pacific Railroad reached Tarrant County and Fort Worth in 1876, Fort Worth became the largest stagecoach terminus in the Southwest - a hub for rail passengers to continue their journeys west by stagecoach.

Today, Tarrant County has a population of over 1.8 million, more than 2,700 times larger than in 1850, when its inhabitants numbered only 664.

Information on the individual participating jurisdictions can be found in Appendix B.

Figure 2-1
Location Map of Tarrant County, Texas



2.2 Demographics

Tarrant County's 2012 population was 1,880,153, which is a 3.9% increase from the 2010 population count. The table below includes U.S. Census Bureau demographic data.

Table 2-1
Demographics[1]

People Quick Facts	Tarrant County	Texas
Population, 2012 estimate	1,880,153	26,059,203
Population, 2010 (April 1) estimates base	1,809,034	25,145,561

[1] U.S. Census Bureau: State and County Quick Facts. Data derived from Population Estimates, American Community Survey, Census of Population and Housing, State and County Housing Unit Estimates, County Business Patterns, Nonemployer Statistics, Economic Census, Survey of Business Owners, Building Permits, Consolidated Federal Funds Report

People Quick Facts	Tarrant County	Texas
Population,% change, April 1, 2010 to July 1, 2012	3.9%	3.6%
Persons under 5 years,%, 2012	7.6%	7.5%
Persons under 18 years,%, 2012	27.5%	26.8%
Persons 65 years and over,%, 2012	9.6%	10.9%
Female persons,%, 2012	50.9%	50.3%
White alone,%, 2012 (a)	76.2%	80.6%
Black or African American alone,%, 2012 (a)	15.6%	12.3%
American Indian and Alaska Native alone,%, 2012 (a)	0.9%	1.0%
Asian alone,%, 2012 (a)	5.0%	4.2%
Native Hawaiian and Other Pacific Islander alone,%, 2012 (a)	0.2%	0.1%
Two or more races,%, 2012	2.2%	1.7%
Hispanic or Latino,%, 2012 (b)	27.4%	38.2%
White alone, not Hispanic or Latino,%, 2012	50.7%	44.5%
Living in same house 1 year & over,%, 2007-2011	81.7%	82.1%
Foreign born persons,%, 2007-2011	15.6%	16.2%
Language other than English spoken at home,% age 5+, 2007-2011	27.0%	34.4%
High school graduate or higher,% of persons age 25+, 2007-2011	84.0%	80.4%
Bachelor's degree or higher,% of persons age 25+, 2007-2011	28.9%	26.1%
Veterans, 2007-2011	120,596	1,618,413
Mean travel time to work (minutes), workers age 16+, 2007-2011	25.7	24.8
Housing units, 2011	723,263	10,098,750
Homeownership rate, 2007-2011	63.0%	64.5%
Housing units in multi-unit structures,%, 2007-2011	27.9%	24.0%
Median value of owner-occupied housing units, 2007-2011	$136,100	$126,400

People Quick Facts	Tarrant County	Texas
Households, 2007-2011	643,917	8,667,807
Persons per household, 2007-2011	2.73	2.79
Per capita money income in the past 12 months (2011 dollars), 2007-2011	$27,920	$25,548
Median household income, 2007-2011	$56,178	$50,920
Persons below poverty level,%, 2007-2011	14.2%	17.0%
Geography Quick Facts	**Tarrant County**	**Texas**
Land area in square miles, 2010	863.61	261,231.71
Persons per square mile, 2010	2,094.7	96.3
Metropolitan or Micropolitan Statistical Area	Dallas-Fort Worth-Arlington, TX Metro Area	
Business Quick Facts	**Tarrant County**	**Texas**
Private nonfarm establishments, 2011	37,210	525,420
Private nonfarm employment, 2011	687,510	8,987,663
Private nonfarm employment,% change, 2010-2011	2.3%	2.3%
Nonemployer establishments, 2011	146,030	1,975,620
Total number of firms, 2007	158,104	2,164,852
Black-owned firms,%, 2007	10.3%	7.1%
American Indian- and Alaska Native-owned firms,%, 2007	0.7%	0.9%
Asian-owned firms,%, 2007	6.1%	5.3%
Native Hawaiian and Other Pacific Islander-owned firms,%, 2007	S	0.1%
Hispanic-owned firms,%, 2007	11.8%	20.7%
Women-owned firms,%, 2007	30.0%	28.2%
Manufacturers' shipments, 2007 ($1000)	43,337,529	593,541,502
Merchant wholesaler sales, 2007 ($1000)	25,801,512	424,238,194
Retail sales, 2007 ($1000)	24,931,407	311,334,781
Retail sales per capita, 2007	$14,582	$13,061
Accommodation and food services sales, 2007 ($1000)	3,763,516	42,054,592
Building permits, 2012	7,372	135,514

2.3 Economy

Tarrant County is traditionally a diverse center of manufacturing and a booming tourism destination. Currently, there is an expected annual growth rate of 1.2% for manufacturing jobs and government, transportation, communication, and utilities sector jobs continue to show growth as well. Major employers in the area include American Airlines, Lockheed Martin Tactical Aircraft Systems, Bell Helicopter Textron, Radio Shack Corporation, Sabre Pier 1 Imports, and Burlington Northern Santa Fe. .

The local economy is also bolstered by tourism. Attractions such as Legoland at Grapevine Mills, Six Flags Over Texas, Six Flags Hurricane Harbor, and Sea Life Aquarium not only bring thousands of jobs to the area, but also bring millions of tourists who support the service industry. In addition to these attractions, hundreds of thousands of people travel to see the Texas Rangers and Dallas Cowboys play in Arlington during their respective seasons.

An economic snapshot of Tarrant County is found in the table below.

Table 2-2
Economy[2]

Economy	Tarrant County	United States
Unemployment Rate	7.40%	8.60%
Recent Job Growth	0.58%	0.35%
Future Job Growth	33.76%	32.10%
Sales Taxes	8.25%	5.00%
Income Taxes	0.00%	4.70%
Income per Cap.	$26,492	$26,154
Household Income	$56,532	$50,935
Estimated Households by Household Income		
Income Less Than 15K	9.00%	12.37%
Income between 15K and 25K	8.99%	10.53%
Income between 25K and 35K	10.40%	10.88%
Income between 35K and 50K	15.62%	15.37%
Income between 50K and 75K	21.44%	20.14%
Income between 75K and 100K	13.81%	12.41%

[2] http://www.bestplaces.net/economy/county/texas/tarrant

Economy	Tarrant County	United States
Income between 100K and 150K	13.05%	11.27%
Income between 150K and 250K	5.56%	5.01%
Income between 250K and 500K	1.94%	1.86%
Income greater than 500K	0.17%	0.16%
Population By Occupation		
Management, Business, and Financial Operations	16.14%	14.04%
Professional and Related Occupations	20.46%	20.61%
Service	12.23%	14.45%
Sales and Office	29.54%	26.75%
Farming, Fishing, and Forestry	0.08%	0.70%
Construction, Extraction, and Maintenance	9.00%	9.42%
Production, Transportation, and Material Moving	12.56%	14.05%

2.4 Climate

Tarrant County is located in North Central Texas, approximately 250 miles north of the Gulf of Mexico. It is near the headwaters of the Trinity River, which lie in the upper margins of the Coastal Plain. The rolling hills in the area range from 500 to 800 feet in elevation. According to the National Weather Service, Tarrant County's climate is humid subtropical with hot summers. It is also continental, characterized by a wide annual temperature range. Precipitation varies considerably, ranging from less than 20 to more than 50 inches annually.

Winters are mild, but northers occur about three times each month and often are accompanied by sudden drops in temperature. Occasional periods of extreme cold are short-lived; even in January, mild weather occurs frequently.

The highest temperatures of summer are associated with fair skies, westerly winds, and low humidity's. Characteristically, hot spells in summer are broken into three- to five-day periods by thunderstorm activity. There are only a few nights each summer when the low temperature exceeds 80° F. Summer daytime temperatures frequently exceed 100° F. Air conditioners are recommended for maximum comfort indoors and while traveling via automobile.

Throughout the year, rainfall occurs more frequently during the night. Usually, periods of rainy weather last for only a day or two, and are followed by several days with fair skies. A large part of the annual precipitation results from thunderstorm activity, with occasional heavy rainfall over brief periods of time. Thunderstorms occur throughout the year, but are most frequent in the spring.

Hail falls on about two or three days a year, ordinarily with only slight and scattered damage. Windstorms occurring during thunderstorm activity are sometimes destructive. Snowfall is rare.

The average length of the warm season (freeze-free period) in the Dallas-Fort Worth Metroplex is about 249 days. The average last occurrence of 32° F or below is mid-March and the average first occurrence of 32° F or below is in late November.[3]

The impact of climate change on weather patterns and natural hazards is increasingly questioned and researched. The United States Environmental Protection Agency conducted the Intergovernmental Panel on Climate Change Fourth Assessment Report to determine how climate change would impact Region 6, which includes the State of Texas. Their basic findings are listed below.[4]

- There is a shift toward a warmer climate with an increase in extreme high temperatures and a reduction in extreme low temperatures. These changes have been especially apparent in the western half of North America.
- Abnormally hot days and nights and heat waves are very likely to become more frequent. Cold days and cold nights are very likely to become much less frequent.
- Heat waves cause increased stress. This may lead to more illness and death, particularly among the young, elderly and frail.
- Respiratory disorders may be exacerbated by warming-induced deterioration in air quality.
- It is likely that droughts will become more severe in the southwestern United States, in part because precipitation in the winter rainy season is projected to decrease.
- The growing season length is expected to increase. However, as temperature rises, crops grown in the Southwestern United States will increasingly experience temperatures above their optimum, and animal production of meat or dairy products will be impacted by temperature extremes.
- Weeds and other invasive plants will continue to migrate northward.
- Arid areas are very likely to experience increases in erosion and fire risk.
- An increase in the length of the forest fire season and the area subject to forest fires may increase.
- Additional stress to ground water and surface water sources that are already overtaxed in many areas may occur.
- Changes in the abundance and spatial distribution of species and expanded ranges of tree-killing insects and vector-borne and tick-borne diseases may occur.
- Precipitation is likely to be less frequent but more intense, and precipitation extremes are very likely to increase.
- Management of Western reservoir systems is very likely to become more challenging as runoff patterns continue to change.

[3] "National Weather Service Weather Fort Worth Climatology." *National Weather Service Forecast*. National Oceanic and Atmospheric Agency, 27 Oct. 2012.
[4] "Climate Change 2007: The Physical Science Basis," Intergovernmental Panel on Climate Change, 2007.

- Increased weather related losses of property may result.
- The Gulf Coast area may experience rising sea levels.

2.5 Land Use

2.5.1 Current Land Use

The most current Tarrant County 5-Year Consolidated Plan for Housing and Community Development was developed for July 1, 2010 to June 30, 2015. The plan was created as a guide to improving public infrastructure; sustaining and providing decent affordable housing; creating a suitable living environment through public service projects; providing decent, affordable housing; and maintaining decent, affordable ways to prevent homelessness. Currently, Tarrant County's land use is mostly residential or commercial, with minimal land currently used for agriculture purposes. Single-family, low-density residential and manufactured housing occupies 24% of land in the City of Fort Worth and 43% of land in the City of Arlington. Current land use and all future developments are obliged to the Subdivision and Land Use Regulations, administered by the Tarrant County Engineering Department.

The City of Fort Worth encompasses 350 square miles, most of which is residential. Single-family homes occupy 27% of residential land use in Fort Worth, with multifamily homes representing a comparatively small proportion of developed land. Fort Worth has a strong industrial base, with industrial land use occupying 6% of developed land and commercial use occupying 5% of developed land.

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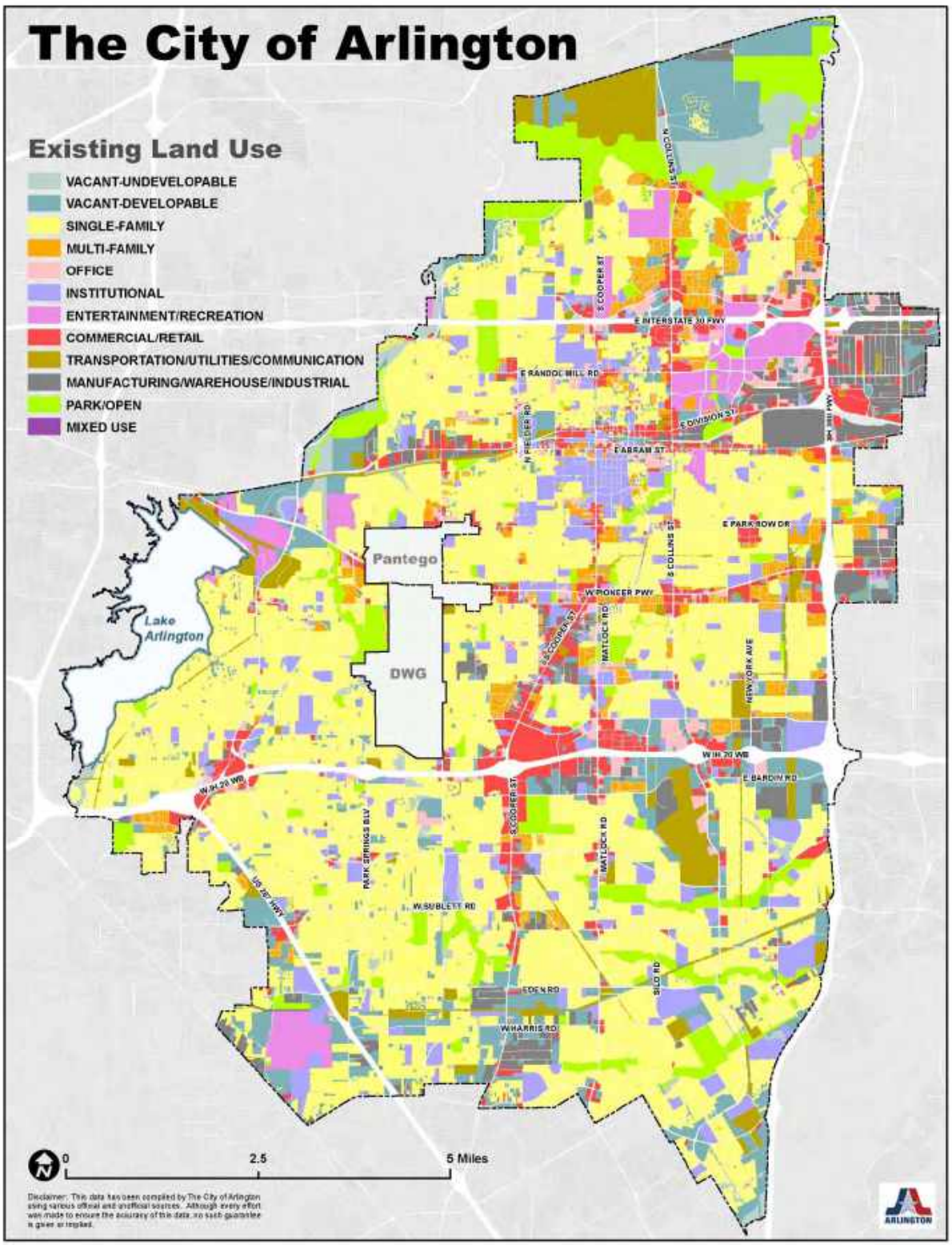
Figure 2-2
Arlington Existing Land Use



2.5.1.1 Manufactured Homes

According to FEMA, a manufactured (mobile) home is a structure, transportable in one or more sections, which is built on a permanent chassis and is designed for use with or without a permanent foundation when attached to the required utilities. The term "manufactured home" does not include a recreational vehicle. Generally, manufactured homes must meet the same requirements as stick built or conventional housing.

The construction of manufactured homes presents unusual vulnerabilities to natural and technological hazards. They are more vulnerable to flood damage, wind damage, and hail. As a result, there are building code standards solely for manufactured homes. Because they are usually residential buildings, they must be elevated so that the lowest floor is above the Base Flood Elevation (BFE). Additionally, manufactured homes must be elevated and anchored to a permanent foundation to resist flotation, collapse, or lateral movement.

Many communities within Tarrant County do not have manufactured home parks within their jurisdiction, but there are many that do. For example, the City of Arlington has 16 manufactured home parks in its jurisdiction, as shown in Figure 2-3. The City of Keller has 70 manufactured homes, and the City of Southlake has 124. The City of Grapevine has 552 manufactured homes within 7 manufactured home parks as identified in Figure 2-4. Unfortunately, there are no dry hydrants located within the City of Grapevine manufactured home parks. The City of Grapevine has identified this as a priority need in their mitigation strategies. The City of Arlington and City of Grapevine manufactured home parks are shown are shown to illustrate the existence of these homes and the importance of including them in mitigation efforts.

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Figure 2-3
City of Arlington Manufactured Home Parks

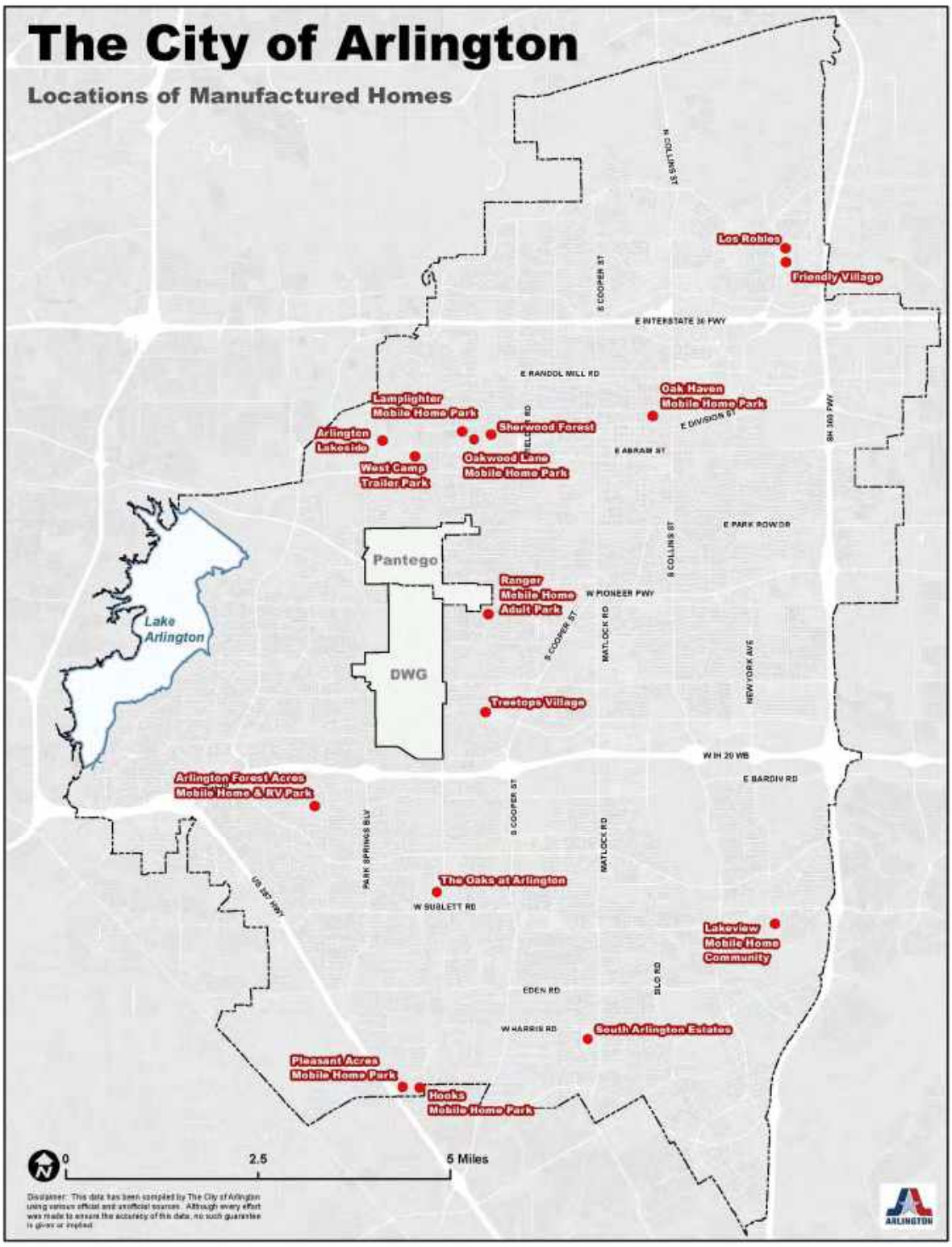
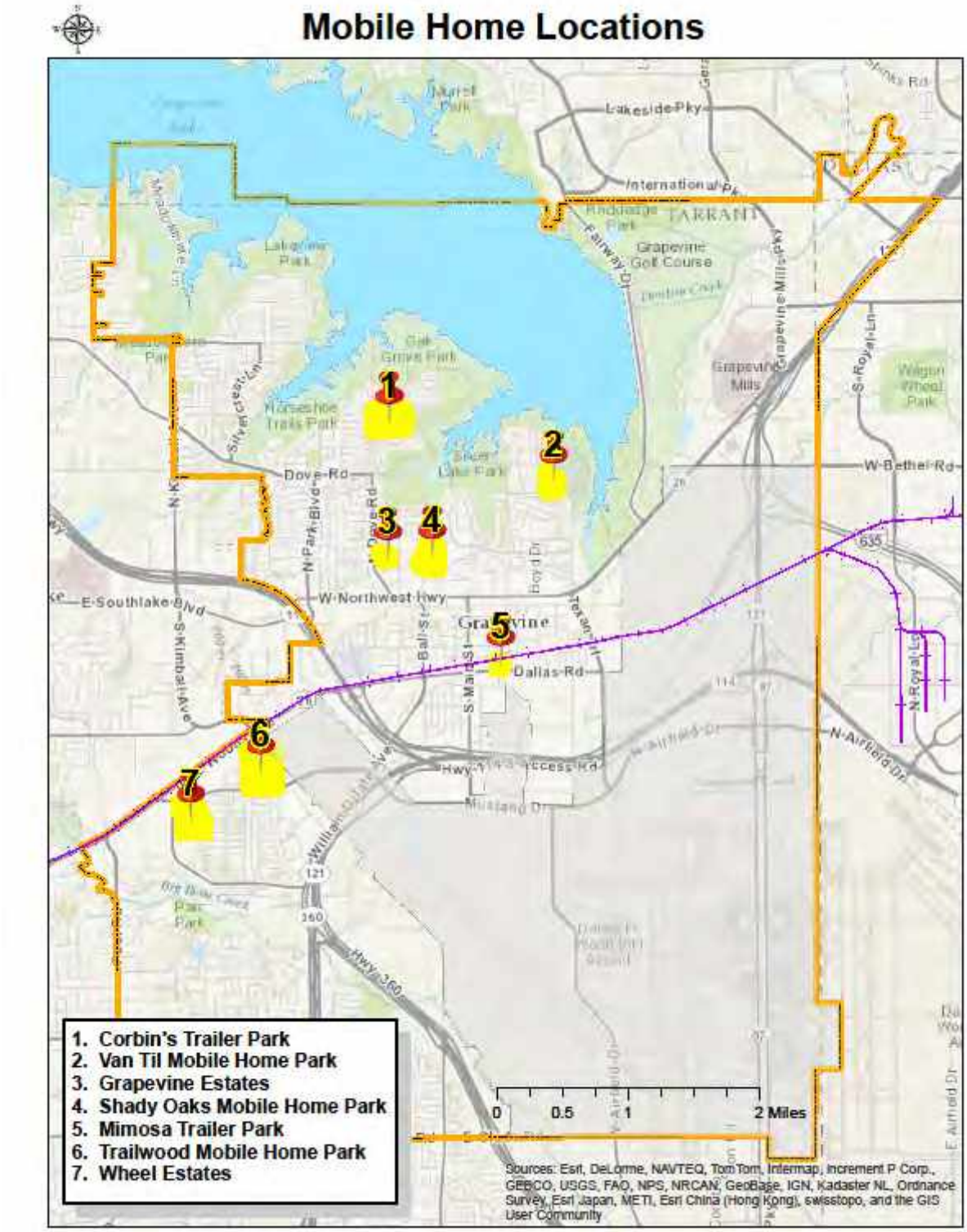


Figure 2-4
City of Grapevine Manufactured Home Parks



2.5.2 Future Land Use

Tarrant County is currently working to build more affordable housing for extremely low-income, very low-income, low-income, and moderate-income homeowners. Better housing provides better protection from the elements, which is essential to mitigating hazards. Tarrant County has found that commercial development is needed in smaller member cities that face an aging housing stock of depreciating value and failing infrastructure. Water and sewer line improvements are priority needs according to many of Tarrant County's jurisdictions. Improving streets and storm drainage systems in poor neighborhoods is also a priority. From a mitigation standpoint, improving streets allows for more efficient evacuations and improving overall water, wastewater, and storm water flow will decrease the threats of flooding in urban neighborhoods.

The City of Fort Worth expects city limits to expand from 350 miles in 2011 to 372 square miles in 2030 or approximately 1.2 square miles per year. As a result of this growth, population is expected to grow 50% by 2032. With these projections, 69% of the City's total land area should be developed in the year 2032, a 23% growth from the year 2000. A map of future land use for the City of Fort Worth is included as Figure 2-5.

The City of Southlake recently completed their future land use planning. The City identified nine goals to assist in their planning that include promoting quality development, maintaining a balanced approach to growth and development, development of an innovative mobility system, supporting an integrated parks, recreation, and open space system, creating a diversified and sustainable economy, encouraging the conservation, protection, and proper management of the environment, and full coordination with private sector partners. Their resulting future land use map is Figure 2-6

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Figure 2-5
City of Fort Worth Future Land Use

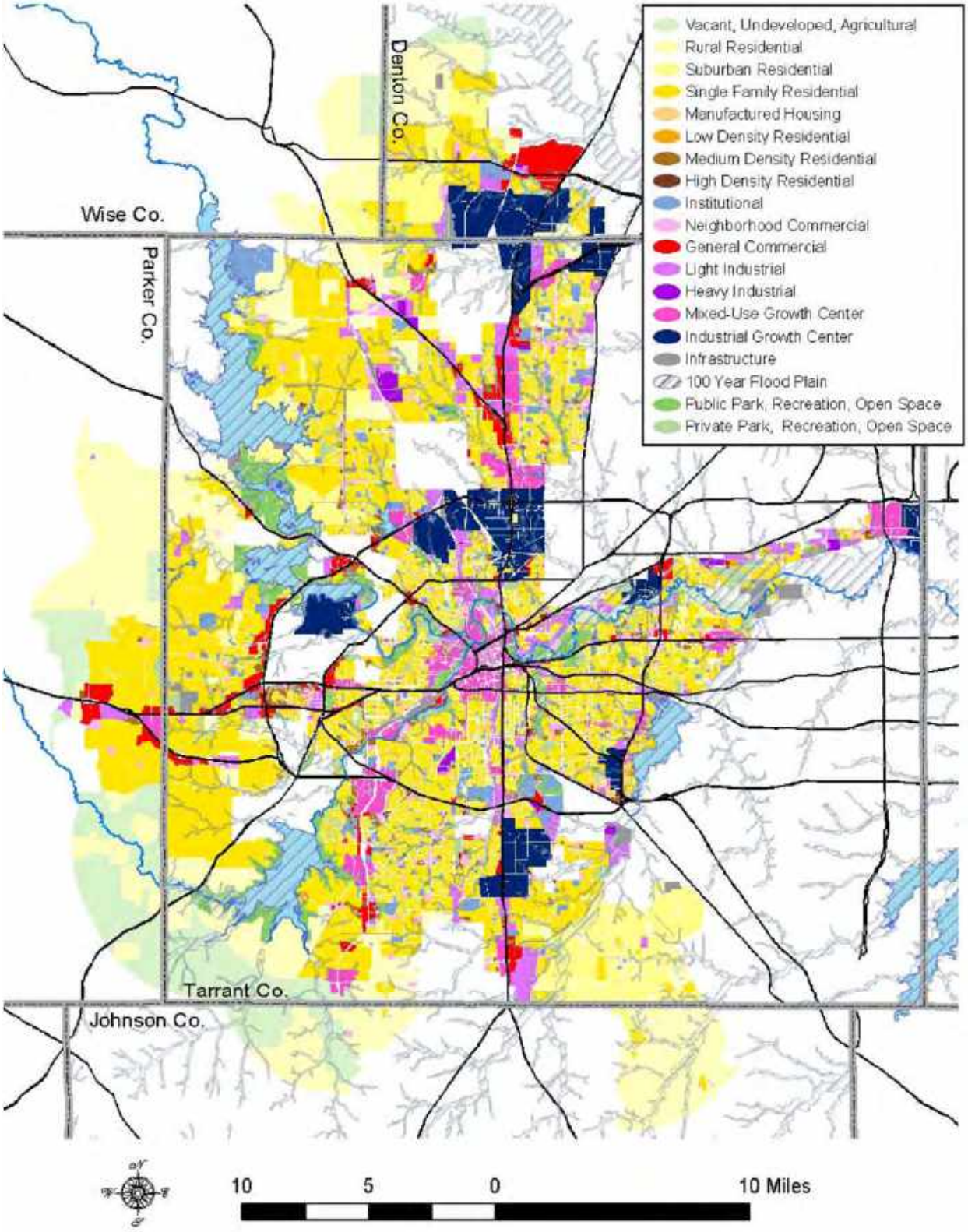
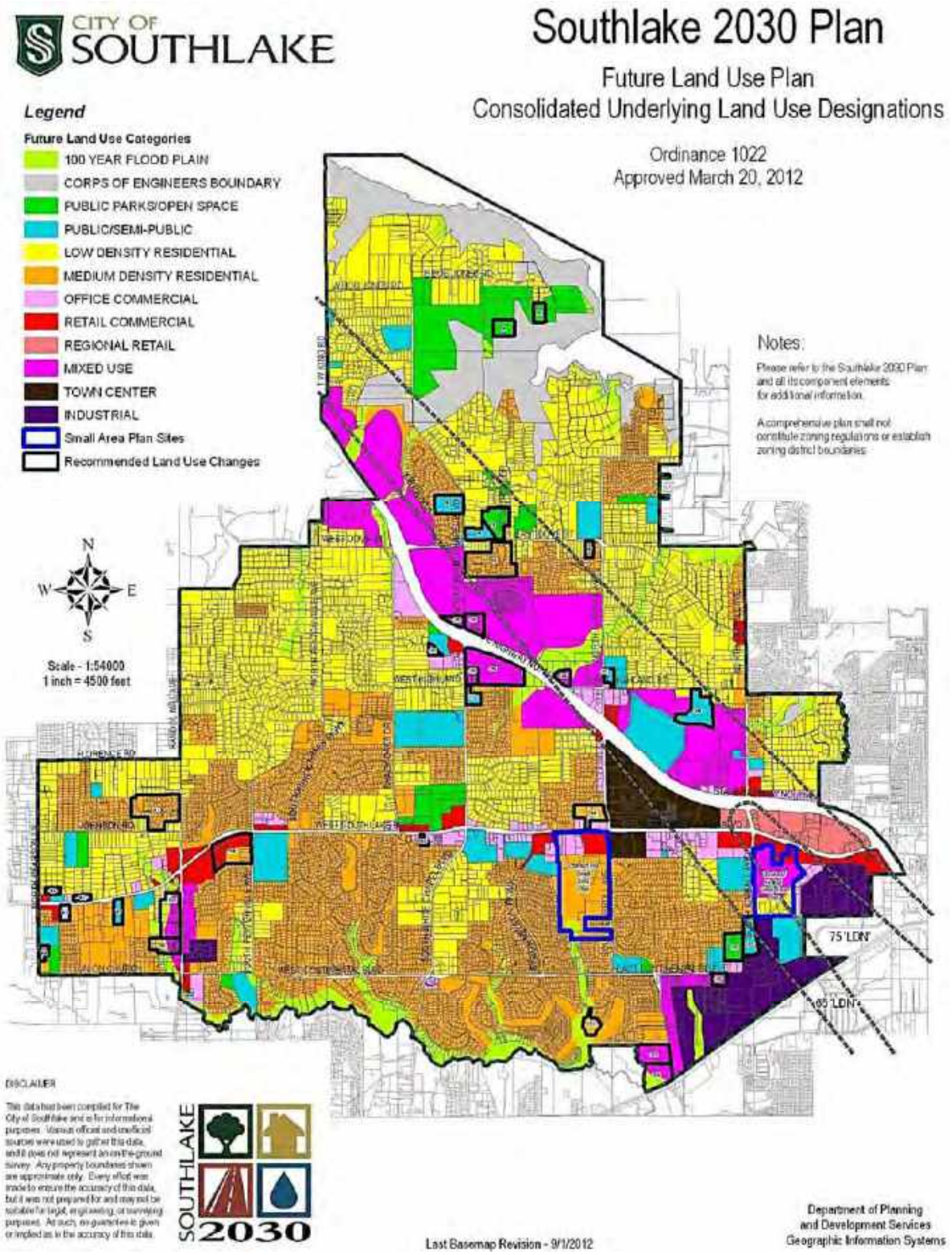


Figure 2-6
City of Southlake Future Land Use



2.5.3 Watersheds

Multiple watersheds exist in Tarrant County, including the Upper West Fork Trinity, the Lower West Fork Trinity, Clear Fork Trinity, and the Big Fossil Creek, which is a primary drainage system for northern Tarrant County.

The Trinity River is the largest river basin whose watershed area is entirely within the State of Texas and the third largest river in Texas by average flow volume. It is also known as the Upper West Fork Trinity Watershed. The basin's namesake river was named La Santisima Trinidad, "the Most Holy Trinity," by early Spanish explorers. The Trinity River flows to Trinity Bay, which drains to the Gulf of Mexico. Smaller streams within the basin include the Clear, East, and West forks of the Trinity River and Cedar, Chambers, and Richland creeks.

The Clear Fork of the Trinity rises in northwestern Parker County and flows first southeast and then northeast forty-five miles to join the West Fork of the Trinity at Fort Worth in central Tarrant County. The Trinity River is a major part of Fort Worth's rich and colorful history. In 1849, an army outpost was established on the banks of the river at the confluence of the West Fork and the Clear Fork, and that convergence anchors downtown Fort Worth today.

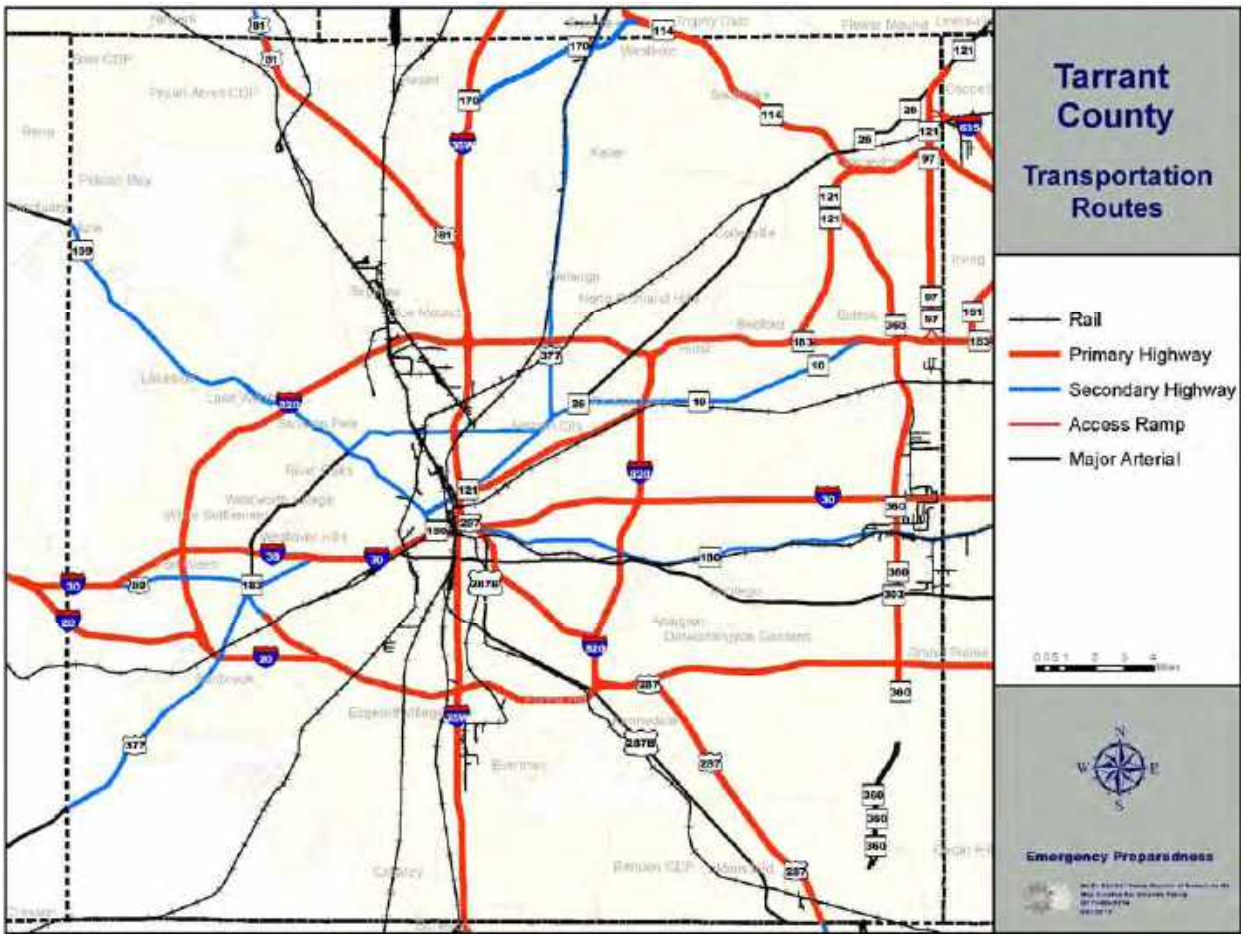
The Lower West Fork Trinity Watershed is located in North Texas. It is part of the Trinity River Basin. The Lower West Fork is classified as a fourth-level (sub-basin) with a unique 8-digit. The Lower West Fork Watershed covers an area of 1513.7 square miles and crosses into seven counties. These counties include Dallas, Ellis, Hood, Johnson, Parker, Tarrant, and Wise. The watershed either totally covers or partially spans across 55 cities/towns. The West Fork of the Trinity River is the primary river in the watershed.

The Big Fossil Creek watershed is one of the most rapidly developing suburban areas in the greater Dallas Fort Worth Metroplex. The North Central Texas Council of Governments, a coalition of North Central Texas member city and county governments and related organizations, is working with the Army Corps of Engineers to develop a long-term urban management plan for Big Fossil Creek and its watershed. This project is intended to serve as a model for the North Texas region in dealing with the effects of growth and urban sprawl on near-urban watersheds, which are pressured, by such rapid growth and expansion. With the presence of a major interstate highway, a major regional airport, and the new Texas Motor Speedway complex, the watershed is expected to experience tremendous growth over the next 20 years. As an integral part of the preparation of the long-term plan for growth in the area, extensive modeling of environmental GIS data was undertaken to form the most accurate assessment of the areas of concern in the watershed.

2.6 Transportation

Multiple forms of transportation exist in Tarrant County, including railways, highways, and airports. An overview of each of these forms of transportation is provided in this section. Figure 2-7 illustrates the major transportation routes in Tarrant County.

Figure 2-7
Tarrant County Transportation Routes



2.6.1 Commuter Rail

Tarrant County has three major rail lines. They include Trinity Railway Express (TRE), TEX Rail, and Cotton Belt Rail.

TRE is a commuter rail service between Fort Worth and Dallas. TRE is provided by the Fort Worth Transportation Authority (The T) and Dallas Area Rapid Transit (DART). The commuter service makes several stops in between Fort Worth and Dallas. Service is conducted Monday through Saturday (no service on Sunday).

Another railway that services Tarrant County is TEX Rail, it is a 27-mile commuter rail project being developed by the Fort Worth Transportation Authority (The T) and will be the next passenger rail service coming to Tarrant County. The service is projected to have over 15,000 daily riders using 10 rail stations at full build out. The line begins in downtown Fort Worth at the existing T&P Station (currently served by the TRE commuter service) and travels through the ITC station, also in downtown Fort Worth, continuing across Northeast Tarrant County to the City of Grapevine and into Dallas Fort Worth International Airport (DFW). The terminus point at DFW Terminal B

will be adjacent to a DART Rail Station, which will also serve the airport and connect to points North and East of DFW International Airport.

The Cotton Belt Rail Line is a planned 67.7-mile commuter rail line in Tarrant County, Dallas County, Collin County, and Rockwall County, that will provide service from Dallas's northeast suburbs to Southwest Fort Worth with a major terminal at DFW International Airport. The corridor would connect downtown Fort Worth, Grapevine, and DFW International Airport with Carrollton (at a junction with both the Denton County Transportation Authority A-train commuter rail line and DART's Green Line light rail line), Addison, Richardson, and Plano. The current name for the line comes from the St. Louis Southwestern Railway, a former subsidiary of the Southern Pacific Railroad commonly known as the Cotton Belt Railroad, which previously owned the line. DART purchased the right-of-way in 1990 for future transit use. In 2010, the Regional Transportation Council of the North Central Texas Council of Governments sought permission to enter a public-private partnership for the rail line. Using private money to build the rail line, they argue, the project's construction timeline could be shortened.

2.6.2 Airports

Tarrant County houses multiple airports that are used publically. Figure 2-8 depicts nine airports that are located within Tarrant County, the four largest being the Dallas Fort Worth International Airport, Fort Worth Alliance Airport, Fort Worth Meacham International Airport and Arlington Municipal Airport. The four largest airports are described below.

Dallas Fort Worth International Airport (DFW) is partially in the cities of Grapevine and Euless in Tarrant County and Irving in Dallas County. As of April 2013, DFW is the world's third busiest airport by aircraft movements. In terms of passenger traffic, it is the eighth busiest airport in the world. It is the largest hub for American Airlines. DFW International Airport is considered to be an Airport City. In terms of land area, at 17,207 acres, it is the largest airport in Texas. DFW has its own post office zip code, and public services, including its own police, fire protection, and emergency medical services. The United States Postal Service gave the airport its own city designation, DFW International Airport, TX. The members of the airport's Board of Directors are appointed by the "owner cities" of Dallas and Fort Worth. Dallas Fort Worth International Airport achieved a major milestone in 2013 by reaching 200 nonstop destinations, with the announcements of new service by American Eagle to Hermosillo and Zacatecas, Mexico. The new flights, which began in June 2013, gave DFW International Airport a grand total of 200 destinations, including 52 international and 148 U.S. domestic destinations.

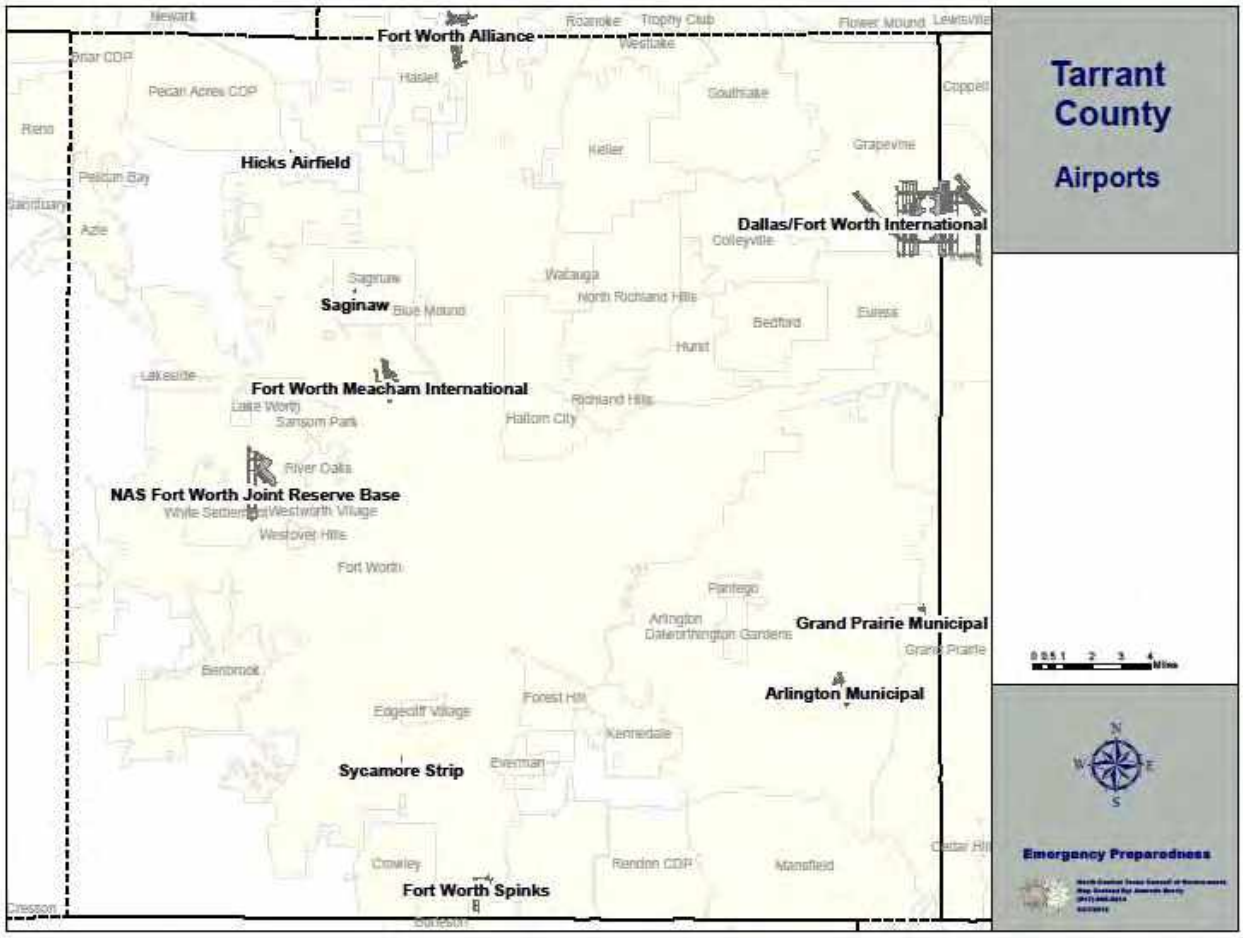
Fort Worth Alliance Airport is a city-owned public use airport located 14 miles north of the central business district of Fort Worth on Interstate 35W. Billed as the world's first purely industrial airport, it was developed in a joint venture among the City of Fort Worth, the Federal Aviation Administration, and Hillwood Development Company, a real estate development company owned by H. Ross Perot, Jr. Alliance Airport has 9,600' and 8,200' runways. The airport is owned by the City of Fort Worth and managed by Alliance Air Services, a subsidiary of Hillwood Development, and is the second largest airport facility in North Texas, behind DFW. Besides general aviation services, the airport serves as a maintenance hub for FedEx Express aircraft and can serve as an auxiliary cargo-handling destination relieving FedEx's primary Dallas-area hub at DFW.

Fort Worth Meacham International Airport is located at the intersection of Interstate 820 and U.S. Business Highway 287 in northwest Fort Worth, 5 miles from the downtown business district.

Meacham International Airport has two parallel runways and a crosswind runway. Currently Fort Worth Meacham International Airport is catering to private and small corporate air traffic.

The Arlington Municipal Airport is a full-service general aviation "reliever" airport. Runway 16/34 is 6,080 ft. x 100 ft. with medium intensity lighting and a full parallel taxiway. An Instrument Landing System (ILS) provides a precision approach and two published non-precision approaches are available to assist aircraft operations in inclement weather. The MALSF is being converted to MALSR, and is projected to be completed in February 2014. Construction was recently completed on a 4,900 ft. x 75 ft. west parallel taxiway. Approximately 300 aircraft are based at Arlington. The City owns and manages: 96 t-hangars, a 10,000 sq. ft. maintenance hangar, and 51 tie down spaces.

Figure 2-8
Airports in Tarrant County



2.6.3 Transit

Tarrant County has several transit/paratransit companies and programs that service the county. One of the major providers is the Fort Worth Transportation Authority (The T). The T is the operator of the bus system in Fort Worth, Texas and Richland Hills, Texas area. The T also partners with DART of Dallas through the TRE, which offers commuter rail service from downtown Fort Worth to DFW International Airport and downtown Dallas.

Arlington has a program called Ride 2 Work. This program will provide transportation to qualified, low-income and moderate-income Arlington residents to help them access a broad range of employment-related activities, including jobs, job training, job interviews, educational resources, and child care. To qualify for Ride 2 Work, you must live in the City of Arlington, have a household income that is low or moderate according to U.S. Department of Housing and Urban Development (HUD) standards, be unable to be eligible to ride Handitran, and need transportation to work or a work-related activity like training, interviews, education, or childcare.

Arlington also has a program called Handitran, which is a service to the community that promotes individual independence. Handitran transports elderly and disabled citizens to essential services, medical appointments, work, or any location within our service area, utilizing a scheduling and dispatching system.

There is also the Hurst, Euless, and Bedford (HEB) transit, which is a service operating in the Cities of Hurst, Euless, and Bedford. The primary focus of the service is transporting people to and from work and work-related activities. The service is provided to individuals that have limited transportation options and do not qualify for existing programs such as the Northeast Transportation Services (NETS) or the Catholic Charities transportation program, Wheels. Trips must begin and end within HEB or the TRE stations at CentrePort/DFW International Airport and Hurst/Bell.

The Northeast Transportation System is a partnership of the cities of Bedford, Euless, Grapevine, Haltom City, Hurst, Keller, and North Richland Hills. NETS is a door-to-door, demand responsive paratransit service and is available to any resident of a participating city who is disabled or 55 years of age or older. NETS may be used for medical appointments, socialization, employment, essential shopping, and education purposes. NETS brings many organizations together to provide this service to its customers. The Board of Directors of the NETS Urban Transit District is comprised of the city manager of each member city. The NETS Board establishes the annual budget, fare policy, and passenger eligibility requirements.

2.7 Tarrant County Capabilities

The planning and response capabilities of any county are vital to its success in hazard mitigation. A few keys areas to ensure strong capabilities include having plans and policies in place to guide development and mitigation projects, understanding and identifying critical infrastructure, and having trained staff to assist with mitigation planning and respond to disasters. The Tarrant County Local Mitigation Action Planning Committee (LMAPC) conducted a review of its legal, staffing, and financial capabilities related to hazard mitigation planning. The results of these capabilities can be found in Appendix C and provide the details regarding resources available for each jurisdiction to accomplish hazard mitigation activities. In addition to identifying the

administrative, fiscal, and legal and regulatory capabilities each jurisdiction possesses, each participating jurisdiction provided information on how they could improve their capabilities in the table below.

Jurisdiction	Administrative Capabilities	Fiscal Capabilities	Legal and Regulatory Capabilities
Arlington	Arlington has the capability to hire additional staff or train existing staff to augment and expand the hazard mitigation program.	Fiscal capabilities are limited to: Local property and sales tax; Fines and user fees; Grants	City leadership, which includes City Council members, Senior City Management, Department Heads, and senior supervisory personnel, will continue to review current practices, laws, codes and ordinances to ensure the safety of the citizens of our community relating to potential hazards identified within our city.
Azle	Our ability to achieve our capabilities would be enhanced with additional staff, more training and some equipment needs.	Additional capacity building would require additional revenue, grant funding or free training.	Staff can handle legal and regulatory enforcement at this time.
Bedford	Risk reduction could improve with additional staff positions and additional funding. Add 1- Emergency assistant; 1- Land Manager; 1- Civil Engineer; 1- Surveyor. Additionally any specific training for these new positions and updating our plan to incorporate these new resources. These improvement goals cannot be met without additional funding.	Fiscal capabilities are limited to: Local property and sales tax; Fines and user fees; Grants	Local government (city) ordinances and adopted national codes. Enforcement of Local, State and Federal laws. Police Department; Fire Marshal; Building Official; Code Enforcement Officer; City Attorney.
Blue Mound	Blue Mound has the capability to hire additional staff or train existing staff to augment and expand the hazard mitigation program.	Fiscal capabilities are limited to: Local property and sales tax; Fines and user fees; Grants	City leadership, which includes City Council members, Senior City Management, Department Heads, senior supervisory personnel, and the City Attorney, will continue to review current practices, laws, codes and ordinances to ensure the safety of the citizens of our community relating to potential hazards identified within our city.
Colleyville	The City of Colleyville will be adding more public safety personnel to the staff. The leadership team will be trained on the roles of the EOC.	The City will continue to look at combining resources with other cities to reduce the cost of services, such as jail, animal control, and courts.	Colleyville Council will consult the City Attorney to make codes and policies that make the citizens safer
Crowley	Add staffing to the Fire and Police Department. Enhance training for Fire and Police. Enhance training of all staff assigned to operations in the EOC. Add staff to other City Department as needs of the City grow.	Continue to improve tax base by improving economic development. Apply for eligible grants as they come available.	Review and update City Ordinances and Codes to ensure they are up to date with current standards and needs.

Jurisdiction	Administrative Capabilities	Fiscal Capabilities	Legal and Regulatory Capabilities
DFW	Conduct After Action Conferences to determine the level of effectiveness of the current staffing and administrative levels.	Conduct annual assessments to ensure that adequate funding is made available to maintain and enhance current capabilities. Also, review capital requests for hazard reduction elements.	As incidents transpire, conduct after action conferences to ensure all plans and regulations are relevant and up to date. Ensure that annual reviews of plans incorporate hazard reduction activities.
Euless	Administrative Capabilities may be improved upon primarily through training and education. We have been able to adequately maintain staffing, however taking advantage of existing training opportunities and actively training new personnel will be beneficial. Refresh training/education and update training will be beneficial for tenured staff.	Fiscal Capabilities may be expanded upon and improved through more active utilization of grant opportunities. Fiscal opportunities for improvement may exist through grant management position(s) and/or education and training.	Legal and Regulatory Capabilities may be expanded upon and improved through the solicitation of more involvement from the City Attorney's Office and all departments discussions and planning.
Forest Hill	The city has no plans to add additional staff. Training is planned for directors and managers with responsibilities within the EOC, and members of the city's Damage Assessment Team.	The city currently participates in regional partnerships in the delivery of services and plans to continue to do so. Regional partners within the community will be utilized to implement educational programs with a shared cost. Use of grant funding will be explored to implement mitigation action items found to be too costly for the normal operating budget to support.	City leadership, including members of the City Council, City Manager, City Attorney and senior management staff, will review current practices, codes, and ordinances to ensure the safety of the citizens as it relates to the potential hazards identified within the city.
Fort Worth	The City of Fort Worth can complete the Enterprise Resource Planning tool to improve access to data sets across the business enterprise in real time. The City of Fort Worth can implement the recommendations from the compensation study currently underway to allow for better allocation of personnel resources, recruit better staff, and retain knowledgeable tenured employees. The City of Fort Worth can provide additional training and planning to reduce risk.	The City of Fort Worth can complete the Enterprise Resource Planning tool to improve access to data sets across the business enterprise in real time. The City of Fort Worth can provide additional training to meet state and federal fiscal management and auditing standards.	The City of Fort Worth can provide additional training on legal issues and regulatory capabilities for mitigation standards, and risk reduction and resiliency.
Grapevine	The City of Grapevine will be conducting training to enhance the leadership team in its roles of the EOC.	The City of Grapevine will continue to look at combining resources with other cities to reduce the cost of services. In addition, the city will explore grant opportunities applicable to risk reduction.	Grapevine City Council will consult the City Attorney to make codes and policies that make the citizens safer.

Jurisdiction	Administrative Capabilities	Fiscal Capabilities	Legal and Regulatory Capabilities
Haltom City	The City of Haltom City will be adding more public safety personnel to the staff. The leadership team will be trained on the roles of the EOC.	The City will continue to find additional efficiencies through management policies directed towards good fiscal responsibility.	The City Council of Haltom City will consult the City Attorney to adopt codes and policies that make the Haltom City a safer place to live and call home.
Haslet	The city has no plans to add additional staff. Training is planned for directors and managers with responsibilities within the EOC and members of the city's Damage Assessment Team.	The city currently participates in regional partnerships in the delivery of services and plans to continue to do so. Regional partners within the community will be utilized to implement educational programs with a shared cost. Use of grant funding will be explored to implement mitigation action items found to be too costly for the normal operating budget to support.	City leadership, including members of the City Council, City Administrator and City Attorney, will review current practices, codes, and ordinances to ensure the safety of the citizens as it relates to the potential hazards identified within the city.
Hurst	Additional training in various emergency management disciplines would improve our ability to prepare, mitigate, plan and respond to emergencies.	Current fiscal capabilities allow the City to function adequately. Additional funding to allow for more training, functional and full-scale exercises would improve upon our current situation.	Hurst is constantly looking to improve items like codes and ordinances to improve building resiliency, citizen safety and mitigate hazards. Funding for additional staffing would improve the capability to manage legal and regulatory capabilities.
Keller	The city has no plans to add additional staff. Training is planned for directors and managers with responsibilities within the EOC, members of the city's Damage Assessment Team, and volunteer members of the city's CERT program.	The city currently participates in regional partnerships in the delivery of services and plans to continue to do so. Regional partners within the community will be utilized to implement educational programs with a shared cost. Use of grant funding will be explored to implement mitigation action items found to be too costly for the normal operating budget to support.	City leadership, including members of the City Council, City Manager, City Attorney and senior management staff, will review current practices, codes, and ordinances to ensure the safety of the citizens as it relates to the potential hazards identified within the city.
Kennedale	The city may hire or contract with additional staff.	Construction grant funds for Emergency Operations Center	The city can build adequate emergency facilities to increase its legal and regulatory capabilities.
Lake Worth	Lake Worth has the capability to hire additional staff or train existing staff to augment and expand the hazard mitigation program.	Fiscal capabilities are limited to: Local property and sales tax; Fines and user fees; Grants	City leadership, which includes City Council members, Senior City Management, Department Heads, and senior supervisory personnel, will continue to review current practices, laws, codes and ordinances to ensure

Jurisdiction	Administrative Capabilities	Fiscal Capabilities	Legal and Regulatory Capabilities
			the safety of the citizens of our community relating to potential hazards identified within our city.
Lakeside	Lakeside has the capability to hire additional staff or train existing staff to augment and expand the hazard mitigation program.	Fiscal capabilities are limited to: Local property and sales tax; Fines and user fees; Grants	City leadership, which includes City Council members, Senior City Management, Department Heads, and senior supervisory personnel, will continue to review current practices, laws, codes and ordinances to ensure the safety of the citizens of our community relating to potential hazards identified within our city.
NCTCOG	Through training of new and existing staff, COG can increase the awareness of natural hazards and personal mitigation activities	Through mitigation grants, COG could increase the budget for mitigation projects. COG has no taxation authority and relies on user fees and grants to fund programs	COG currently has no legal or regulatory authority. The only means of expanding this capability would be an amendment to the Texas State Constitution
North Richland Hills	The City of North Richland Hills will be adding more public safety personnel to the staff. The leadership team will be trained on the roles of the EOC.	The City will continue to find additional efficiencies through management policies directed towards good fiscal responsibility.	The City Council of North Richland Hills will consult the City Attorney to adopt codes and policies that make NRH a safer place to live and call home.
Richland Hills	Continued education of city employees on community risk reduction practices incorporating all city departments. Increase in public education activities to inform the residents and business community of risk reduction practices in place already and those that can be put in place to reduce impact of natural and manmade destructive events. Continued updating of building codes, city ordinances and emergency operating plans to improve the planning, preparedness and response to events.	The City's tax revenue has gradually increased over the past three years with additional sales tax revenue increase forecasted. Property values in the City have gradually risen which will slowly increase property tax revenues. With the increase in tax revenues, the continued fiscal management of city bond issuance, and the continuation of pursuing state and federal grants for mitigation project funding the city will continue to work towards mitigating risk to the city. Due to the size of the city additional staffing is not an option. Sharing services and programs with surrounding communities will be the greatest impact on expanding and improving risk reduction.	During 2014 the City has reviewed, updated and adopted a new Comprehensive Plan, (adopted May 2014), updated and adopted by ordinance the 2012 Edition of the ICC Building and Fire Codes (Jan and Feb 2014), Zoning Ordinances were revised, updated and adopted in conjunction with the Comprehensive Plan (May 2015) and the City will, in 2015-16 will move from a city Emergency Operating Plan (currently up to date with the State of Texas) to the Tarrant County EOP. The City Engineer with consultants are preparing changes in ordinances to increase the city's CRS rating to reduce risk.
Saginaw	The City of Saginaw does plan to add staff as annual funding permits. Training is planned for department	The City aggressively participates in local and regional partnerships in the delivery of	City leadership, which includes City Council members, Senior City

Jurisdiction	Administrative Capabilities	Fiscal Capabilities	Legal and Regulatory Capabilities
	Chiefs, Directors and Managers from within all city departments with responsibilities in emergency response operations and responsibilities within the Emergency Operations Center or EOC. In addition, continued training is planned for the City's Citizen Patrol and CERT organizations.	services and plans to not only continue these partnerships but expand where possible. Partner agencies and organizations in our local and regional area will be utilized to implement educational programs sharing the costs. Use of grant funding will be pursued to implement mitigation actions that may not or cannot be funded through normal operational budgeting due to the high cost associated.	Management, Department Heads, senior supervisory personnel, and the City Attorney, will continue to review current practices, laws, codes and ordinances to ensure the safety of the citizens of our community relating to potential hazards identified within our city.
Southlake	Additional training to increase capabilities is always beneficial. We are currently developing a multiyear training and exercise program that will increase the capabilities and awareness levels of staff with roles and responsibilities during an EOC-level event. The EOC response teams are trained twice a year, and conduct at least one exercise a year.	We always strive for the highest level of fiscal responsibility and efficiency. This aligns with our City's strategy map to "adhere to financial management principles & budget, invest to provide & maintain high quality public assets, achieve fiscal wellness standards, and establish & maintain internal controls. We are currently working on acquiring training and exercise materials for our finance staff through the regional disaster finance coordination program.	Southlake routinely updates and responds to change in legislation for implications on operations; for example, changes in the fire code. Additionally, Southlake adopts and updates codes and policies to continue to ensure Southlake remains one of the top-ranked communities in the country.
Tarrant County	Our Tarrant County Administrative and Technical Capabilities can be expanded and improved to reduce risk with additional staffing, increased training to include position specific training, participation in workshops, conferences, trainings and exercises. These capabilities could be expanded with additional funding and grants.	Our Tarrant County Fiscal Capabilities include Community Grants, Homeland Security Grants, Urban Area Security Initiative Grants and utilizing Tarrant County funds (budget) to increase our level of capability and to reduce risk.	Tarrant County has the capability to initiate resolutions through Tarrant County Commissioners Court to increase our level of capability in emergency preparedness, mitigation, response and recovery. Once the Tarrant County Hazard Mitigation Action Plan has been approved, the Office of Emergency Management will submit the HazMap to Commissioners Court for approval and submit to City Councils across Tarrant County to approve Plan for participating jurisdictions. Approved Plan can be placed onto the Tarrant County Website for public view. 1. Resolution, Court Order, 50529, 10/16/1958. The Office of Civil Defense of Fort Worth and Tarrant

Jurisdiction	Administrative Capabilities	Fiscal Capabilities	Legal and Regulatory Capabilities
			County, Texas performs a service for the entire County of Tarrant and has prepared a Preliminary Operational Survival Plan for the Target Area of Tarrant County wherein the basic concept of emergency government operations. 2. Court Order: 42978, 11/26/1973, Identification of Flood Plain Areas as part of the National Flood Insurance Program (NFIP) for Tarrant County. 3. Court Order: 58828, 08/27/1987, Additional Communications Request from the City of Fort Worth Office of Emergency Management. 4. Tarrant County agreement with Fort Worth for the provision of Emergency Management under the City of Fort Worth Office of Emergency Management, Commissioner's Court Order #58675 dated 7/27/1987. 5. Tarrant County adopted a joint resolution and authorized execution of an inter-jurisdictional emergency management program agreement establishing the Fort Worth – Tarrant County Inter-Jurisdictional Agency for Emergency Management. This joint resolution included the cities of Blue Mound, Dalworthington Gardens, Edgecliff Village, Haslet, Kennedale, Lakeside, Lake Worth, Pantego, Pelican Bay, Sansom Park, Westlake, Westover Hills, and

Jurisdiction	Administrative Capabilities	Fiscal Capabilities	Legal and Regulatory Capabilities
			Westworth Village, Commissioner's Court 58675 dated 6/1/1989. 6. Court Order: 65397, 04/23/1991, Contract between the City of Fort Worth and Tarrant County for Emergency Management Services. 7. Adoption of Fort Worth – Tarrant County Emergency Management Plan, Commissioner's Court Order #70837, dated 6/21/1994. 8. Court Order: 78270, 04/14/1998, Appointment of Tarrant County Fire Marshal under Texas Local Government Code, Section 352.001 established the Office of County Fire Marshal. 9. Court Order: 82684, 04/04/2000, Tarrant County Local Declaration of Disaster for March 28, 2000 tornado that caused tremendous physical and economic losses. 10. Court Order: 88095, 07/23/2002, Resolution supporting Tarrant County's Participation in the North Central Texas Council of Government's Regional Emergency Management Planning Program. 11. Joint Resolution between Tarrant County and the City of White Settlement, Commissioner's Court Order #93498, dated 8/31/2004. 12. Joint Resolution between Tarrant County and the City of River Oaks, Commissioner's Court Order #95009, dated 3/22/2005. 13. Joint Resolution between Tarrant County and the City of Everman,

Jurisdiction	Administrative Capabilities	Fiscal Capabilities	Legal and Regulatory Capabilities
			Commissioner's Court Order #95337, dated 4/12/2005. 14. Court Order: 96092, 08/23/2005, Tarrant County Adoption of the National Incident Management System in accordance with HSPD-5 Homeland Security Presidential Directive – 5. 15. Disaster Declaration for Tarrant County due to significant sheltering operations for Hurricane Katrina from August 28th through mid-September 2005 from the State of Louisiana. 16. Disaster Declaration for Tarrant County due to significant sheltering operations for Hurricane Rita from September 18 through early October 2005 from the Texas Gulf Coast. 17. Joint Resolutions between Tarrant County and the Cities of Azle, Keller, and Saginaw, Commissioner's Court Order #100221, dated 3/27/2007. 18. Court Order: 100421, 04/24/2007 Disaster Declarations for Severe Thunderstorms and Flooding occurred on March 30th and April 13th that caused significant individual, physical and economic losses in Tarrant County. 19. Court Order: 100565, 05/15/2007, Approval to Update the Tarrant County Local Emergency Planning Committee General Membership List and Chairpersons Appointment

Jurisdiction	Administrative Capabilities	Fiscal Capabilities	Legal and Regulatory Capabilities
			for Submission to the State Emergency Response Commission. 20. Court Order: 102960, 04/29/2008, Disaster Declaration of Disaster due to severe thunderstorms, severe winds, tornadoes, flooding that occurred on April 23, 2008. 21. Disaster Declaration for Tarrant County for significant shelter operations for Hurricane Gustav from August 25 through Mid-September 2008 for evacuees from Louisiana. 22. Disaster Declaration for Tarrant County for significant shelter operations for Hurricane Ike from September 1st through Mid-September 2008 for evacuees from the Texas Gulf Coast. 23. Court Order: 104534, 12/9/2008, Approval of a Resolution Adopting the Fort Worth Hazard Mitigation Plan that represent the unincorporated areas of Tarrant County, 19 out of the 41 jurisdictions represented in the Hazard Mitigation Plan. 24. Court Order: 104856, 02/03/2009, Approval revising Amendment 1 to the Interlocal Agreement for Emergency Management with the City of Fort Worth to establish the creation of the Tarrant County Office of Emergency Management and designation of the Tarrant County Emergency Management Coordinator.

Jurisdiction	Administrative Capabilities	Fiscal Capabilities	Legal and Regulatory Capabilities
			25. Court Order: 105584, Declaration of Disaster for Tarrant County For H1N1 Influenza. 26. Court Order: 107929, 04/27/2010, Approval of National Flood Insurance Program's Community Rating System Application to the Federal Emergency Management Agency to reduce flood losses, facilitate accurate insurance rating and promote the awareness of flood insurance in Tarrant County. 27. Court Order: 108488, 08/03/2010, Approval of 2010 Membership to the Tarrant County Local Emergency Planning Committee (LEPC). 28. Disaster Declaration for Tropical Storm Hermine (causing widespread flooding from Guatemala to Oklahoma) from 9/8-9/9/2010 flooding occurred causing damage throughout Tarrant County. 29. Joint Resolution between Tarrant County and the City of Hurst, Commissioner's Court Order #109022, dated 9/28/2010. 30. Court Order: 109311, 11/23/2010, Approval of an Interlocal Agreement with the City of Fort Worth to provide funding for the Joint Emergency Operations Center (JEOC) Project. 31. Court Order: 112555, 04/10/2012, Declaration of Disaster for tornadoes impacting Tarrant County on April 3, 2012.

Jurisdiction	Administrative Capabilities	Fiscal Capabilities	Legal and Regulatory Capabilities
			32. Joint Resolution between Tarrant County and the City of North Richland Hills, Commissioner's Court Order #114212, dated 11/27/2012. 33. Joint Resolution between Tarrant County and the City of Crowley, Commissioner's Court Order #115515, dated 7/2/2013. 34. Court Order: 116819, 12/27/2013, Disaster Declaration for Tarrant County due to Winter Storm / Ice Storm that occurred from December 5-10, 2013 that resulted in impassable roads, transportation accidents, damage to critical infrastructure such as roads and bridges, caused numerous closures that impacted citizens, businesses and the economy within Tarrant County. 35. Court Order: 117392, 04/01/2014 utilize Nixle 360 as internal utilization for providing emergency notification / messaging to county employees (Emergency Notification System). 36. Joint Resolution between Tarrant County and the City of Grapevine, Commissioner's Court Order #118104 dated 7/29/2014. Inter-local Agreements & Contracts.
Watauga	Additional staffing	Increase funding from grant sources to enhance mitigation	integrate mitigation strategies into existing Capital Improvement plan
Westlake	Westlake can improve its administrative capabilities with respect to Emergency Management and Hazard Mitigation by creating, funding, and staffing at least one	Wesltkake can expand and improve its use of existing fiscal capacities through more specific targeting of those capabilities toward	Westlake will maximize its efforts toward hazard management and increased risk reduction through continuous and

Jurisdiction	Administrative Capabilities	Fiscal Capabilities	Legal and Regulatory Capabilities
	full-time management or management-support level position dedicated to those task areas. Such position(s) would allow more continuous focus and consistent effort to be applied directly hazard management and risk reduction.	hazard management and risk reduction goals. We will better integrate our fiscal planning practices to include specific risk reduction strategies and programs, to include funding personnel, education and training in those areas. Westlake can expand its eligibility and use of both State and Federal grants for mitigation and risk reduction projects and programs.	comprehensive review and implementation of existing Legal and Regulatory capabilities. Specifically, all existing Codes and Ordinances, Comprehensive Plans, Capital Improvement Plans, and Regulations will be regularly reviewed with a view towards integration of and compliance with Hazard Mitigation Plans and Risk Reduction strategies and programs. As new strategies and risks are identified existing regulations can be modified or reviewed to include the newest information and guidance.
Westworth Village	Hire a full time Emergency Management Position	Increase funding for full time EMC and add funding for cont. education and cross training of other department employees	Adjust Ordinances as needed to include Penalties for failing to comply with Mitigation ordinances.

The Tarrant County LMAPC conducted a review of all critical infrastructures in Tarrant County. Critical infrastructure is a term used to describe assets that are essential for the functioning of Tarrant County and its jurisdictions. This includes but is not limited to those facilities that provide electricity, natural gas, oil products, telecommunications, potable water, public health, transportation systems, emergency response, and schools. Below are maps showing the emergency response (fire stations, hospitals, and police stations) critical facilities in Tarrant County. A full list of Tarrant County's critical infrastructure can be found in Appendix G.

Figure 2-9
Fire Stations in Tarrant County

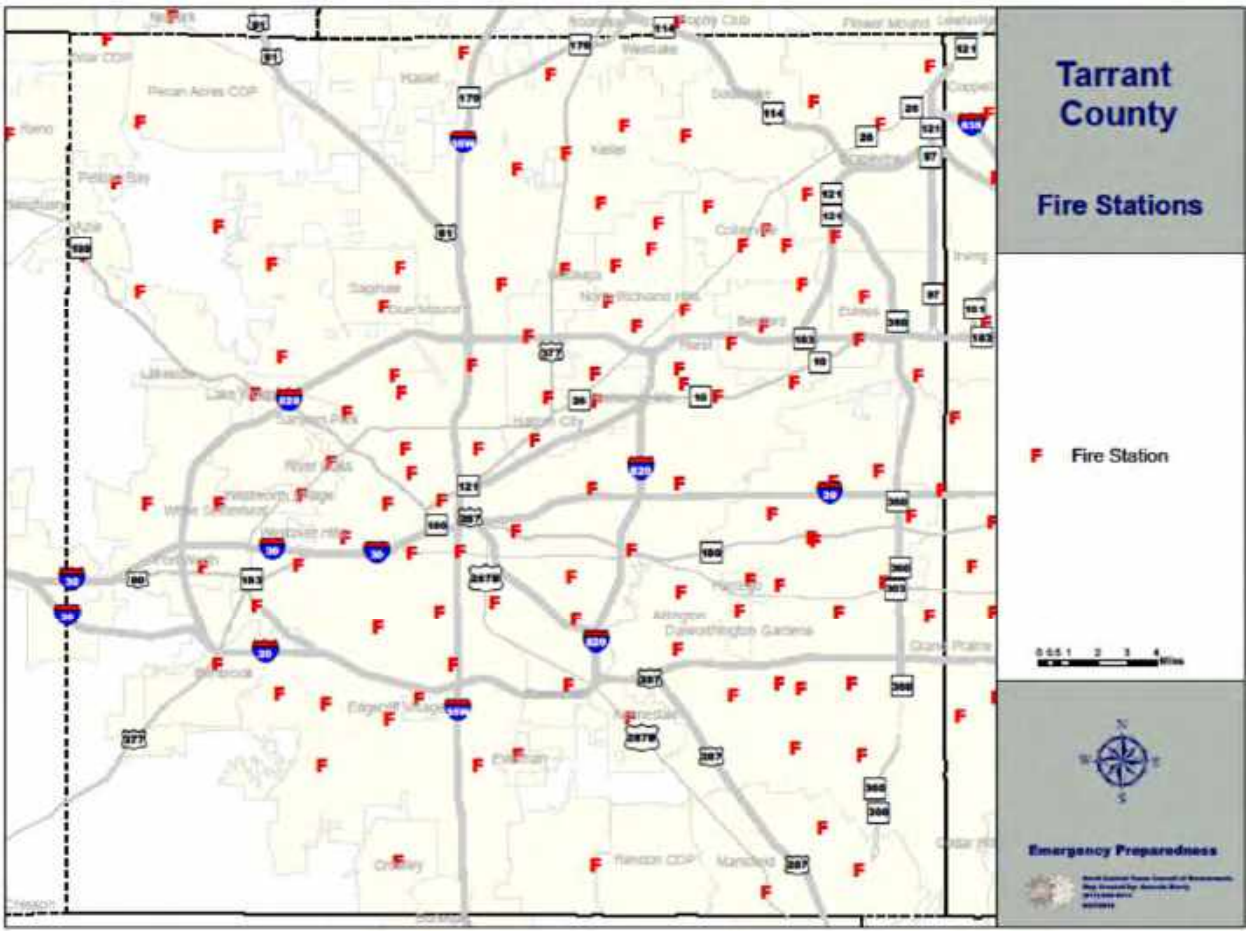


Figure 2-10
Hospitals in Tarrant County

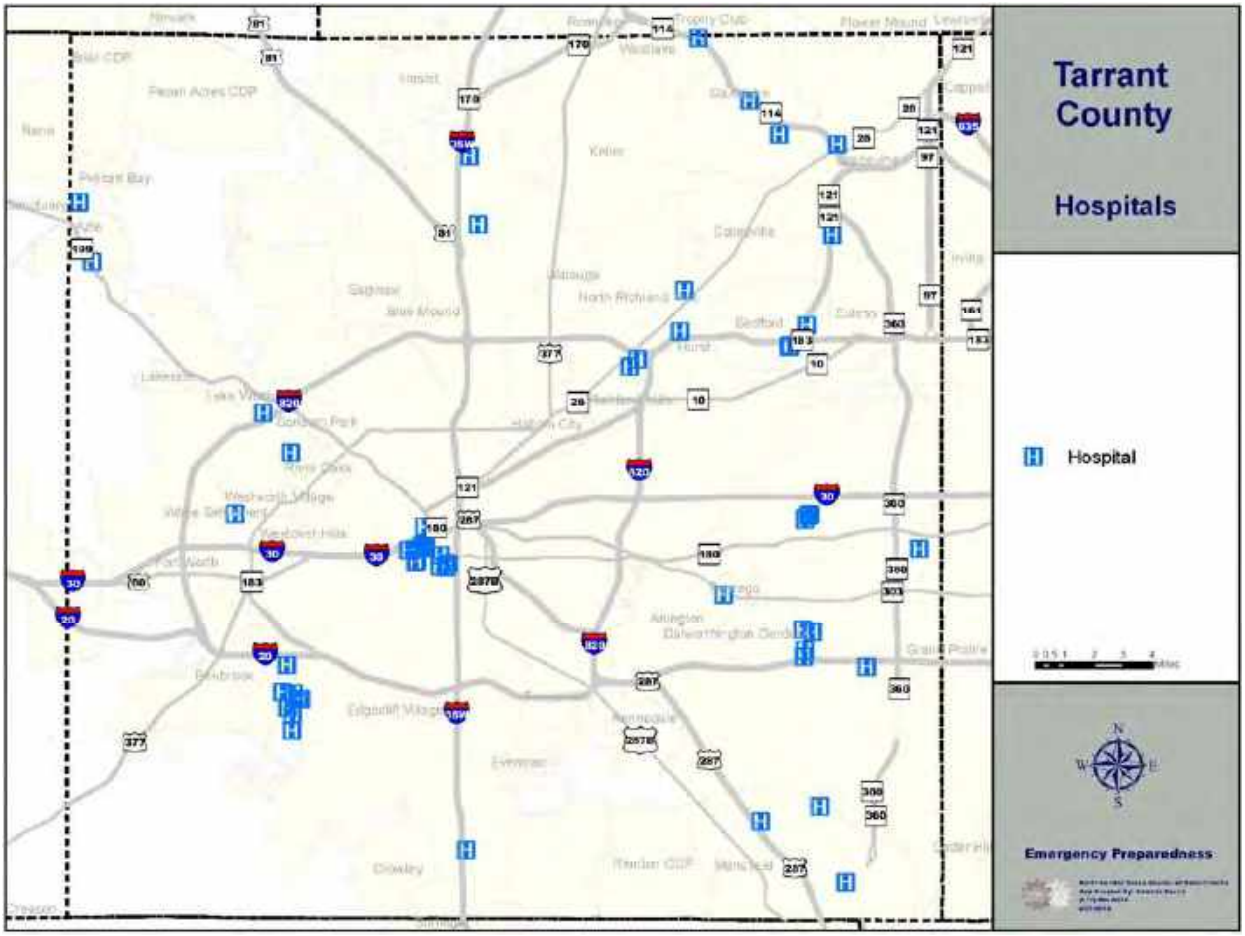
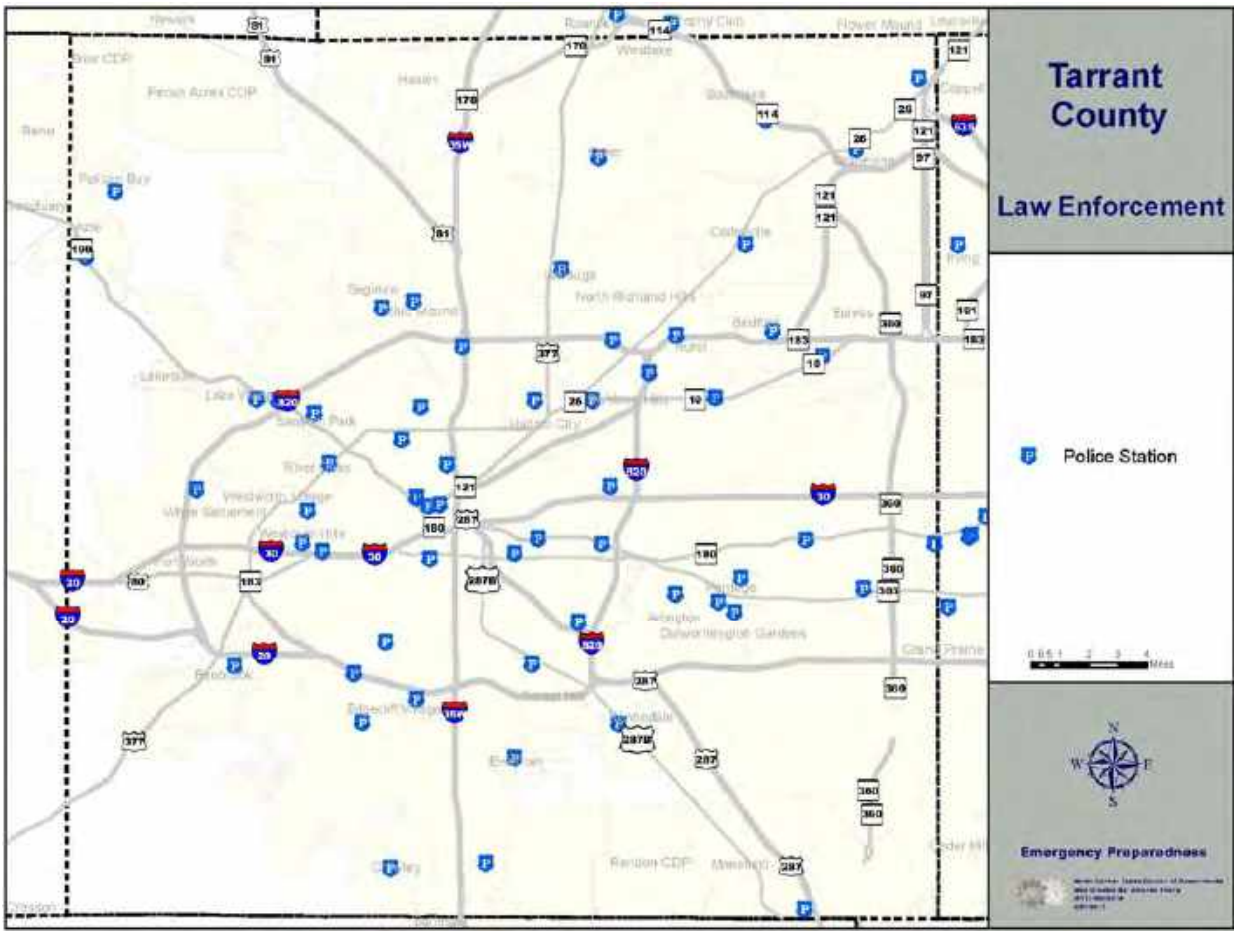


Figure 2-11
Police Stations in Tarrant County



2.8 Government[5]

County government structure is spelled out in the Texas Constitution, which makes counties functional agents of the state. Thus, counties, unlike cities, are limited in their actions to areas of responsibility specifically spelled out in laws passed by the legislature.

At the heart of each county is the Commissioners Court. Each Texas county has four precinct commissioners and a county judge who serve on this court. Although this body conducts the general business of the county and oversees financial matters, the Texas Constitution established a strong system of checks and balances by creating other elective offices in each county.

The major elective offices found in most counties include the county judge, county attorneys, county and district clerks, county treasurers, sheriffs, tax assessor-collectors, justices of the peace, and constables. As a part of the checks and balances system, counties have an auditor appointed by the district courts.

[5] http://www.county.org/texas-county-government/county-govt-structure/Pages/default.aspx

While many county functions are administered by elected officials, others are run by individuals employed by the Commissioners Court. They include such departments as public health and human services, personnel and budget, and in some counties, public transportation, and emergency medical services.

North Central Texas Council of Governments

The North Central Texas Council of Governments (NCTCOG) is a voluntary association of, by, and for local governments and was established to assist local governments in planning for common needs, cooperating for mutual benefit, and coordinating for sound regional development. NCTCOG's purpose is to strengthen both the individual and collective power of local governments and to help them recognize regional opportunities, eliminate unnecessary duplication, and make joint decisions.

NCTCOG serves a 16-county region of North Central Texas, which is centered on the two urban centers of Dallas and Fort Worth. NCTCOG has over 230 member governments including 16 counties, numerous cities, school districts, and special districts.

Each member government appoints a voting representative from its governing body. These voting representatives make up the General Assembly, which annually elects the Executive Board. The Executive Board, composed of 13 locally elected officials, is the policy-making body for all activities undertaken by the Council of Governments, including program activities and decisions, regional plans, and fiscal and budgetary policies. The Board is supported by technical, study, and policy development committees and a professional staff headed by the executive director.

Section 3
PLANNING PROCESS

Requirement 44 CFR 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.

3.1 Tarrant County Local Mitigation Action Planning Committee

The North Central Texas Council of Governments (NCTCOG) was tasked with developing the Tarrant County Local Mitigation Action Planning Committee (LMAPC). The Tarrant County LMAPC was tasked with the development and completion of the Local Mitigation Action Plan (LMAP) as required per state and federal guidelines. The NCTCOG managed the project, organized the data, set meeting dates, documented in-kind services, and worked with the Texas Division of Emergency Management (TDEM) to complete this plan. The table below lists the members of the Tarrant County LMAPC.

Table 3-1
Tarrant County LMAPC

Name	Agency and Title
Irish Hancock	City of Arlington, Emergency Management Administrator
Nicholas F. LaGrassa	NCTCOG, Emergency Preparedness Program Assistant
Carrie Little	City of Grapevine, Emergency Management Coordinator
Molly Thoerner	NCTCOG, Director of Emergency Preparedness
Keith Wells	City of Fort Worth, Senior Emergency Management Officer
William T. Wessel	Tarrant County, Emergency Management Specialist

3.1.1 Additional Partners

Requirement 44 CFR 201.6(b)(2)
An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include: (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.

The Tarrant County LMAPC relied on the assistance of various public and private organizations to compile the data, maps, and other vital components of the plan.

A range of stakeholders were invited and encouraged to participate in the development of the LMAP. Stakeholder involvement was encouraged through notifications and invitations to agencies and individuals to participate. These included representatives from Tarrant County and each participating jurisdiction, private sector businesses, voluntary agencies, citizens, and surrounding counties. Surveys were also distributed to the public to elicit feedback regarding community concerns of hazards and strategies for mitigation.

Tarrant County engaged Arlington ISD, Birdville ISD, Burton Hill Elementary, Crowley ISD, Fort Worth ISD, Grapevine-Colleyville ISD, Hurst-Euless-Bedford ISD, Keller ISD, Kennedale ISD, Northwest ISD, University of Texas in Arlington, and White Settlement ISD to address hazard mitigation in educational facilities located within county boundaries. Each ISD, Burton Hill Elementary, and University of Texas in Arlington are stakeholders in Tarrant County's Hazard Mitigation Planning Team (HMPT) and may utilize this LMAP to independently seek funding, outside of FEMA Mitigation funds, to procure items outlined in the Mitigation Strategies listed in Section 5.

In addition to the mitigation planning committee meetings, Tarrant County encouraged open and widespread participation in the mitigation planning process through the publication of newspaper notices promoting open public meetings. These media advertisements and survey instruments provided local officials, residents, businesses, academia, and other private interests in Tarrant County the opportunity to be involved and offer input throughout the local mitigation planning process.

Tarrant County encouraged continued stakeholder involvement by reminding all participating jurisdictions to make announcements and notifications consistent with their existing local plan adoption procedures. It will be the responsibility of each participating jurisdiction and its local governing body to determine if and how any additional specific stakeholder groups or individuals should be involved in the planning process going forward.

Many departments, agencies, and individuals were contacted to provide information as the committee gathered data for capability and vulnerability assessments. The table below provides the details on which stakeholders were contacted by each jurisdiction, the method of communication used, and the information received for use in the Tarrant County LMAP.

Table 3-2
Jurisdiction Stakeholder Outreach

Jurisdiction	Agency or Organization	Title of Contact	Method of Contact	Information Provided
Arlington	American Red Cross	Volunteer Lead-Tarrant County	E-mail	Provided information on sheltering needs
Arlington	Arlington ISD	Public Safety Manager	E-mail	Provided information on improving early warning and notification
Arlington	Globe/Rangers Ballpark	Public Safety Manager	E-mail	Did not provide information
Arlington	University of Texas in Arlington	Emergency Management Coordinator and Planner	Meeting	Provided information on: Sheltering, Early Warning and Notification, Public Education
Arlington	Texas Health Resource	Emergency Management Officer	E-mail	Did not provide information

Jurisdiction	Agency or Organization	Title of Contact	Method of Contact	Information Provided
Arlington	Dallas Cowboys	Public Safety Officer	E-mail	Did not provide information
Arlington	Medical Center of Arlington	Emergency Management Officer	E-mail	Did not provide information
Arlington	USMD	Emergency Management Planner	E-mail	Did not provide information
Arlington	Parks at Arlington Mall	Manager	E-mail	Did not provide information
Arlington	Six Flags Over Texas	Public Safety Officer	E-mail	Did not provide information
Arlington	Arlington Christian Disaster Network (FBOs)	Board Member	E-mail	Provided information on volunteer management
Arlington	Mission Arlington	Director	E-mail	Did not provide information
Azle	Azle Water Department	Water Superintendent	E-mail/in-person	Review plan and make suggestions
Azle	Azle Street Department	Parks/Street Superintendent	E-mail/in-person	Review plan and make suggestions
Azle	Azle Building Official	Building Official	E-mail/in-person	Review plan and make suggestions
Azle	Azle Police Department	Lieutenant	E-mail	Review plan and make suggestions
Azle	Azle Stormwater Manager	Stormwater Manager	E-mail/in-person	Review plan and make suggestions
Azle	Azle Fire Department	Fire Chief/EMC	In-person	Review plan and make suggestions
Azle	Azle Emergency Management	EMC	p	Review plan and make suggestions
Bedford	Stakeholders included city personnel only.			
Blue Mound	Stakeholders included city personnel only.			
Colleyville	American Red Cross	Disaster Specialist	E-mail	Provided information on sheltering needs.
Colleyville	Grapevine Colleyville ISD	Emergency Management	Phone	Sheltering/evacuation information
Colleyville	NWS Ft. Worth		Phone/e-mail	Weather history
Crowley	Crowley DPW	Director	Phone	Available resources
Crowley	Crowley Police Department.	Police Chief	Phone	Available resources
Crowley	Crowley Finance Department.	Director	Phone	None
Crowley	Crowley ISD	Administrative Assistant	Phone	None
DFW	American Red Cross	Regional Director	Previous agreement	Provided information on sheltering needs
DFW	Oncor	Distribution Services Consultant	E-mail	Power system design and vulnerabilities

Jurisdiction	Agency or Organization	Title of Contact	Method of Contact	Information Provided
Euless	American Red Cross	Disaster Specialist	E-mail	Provided information on sheltering needs and agreements
Euless	Hurst Euless Bedford ISD	Risk Management	Phone/e-mail	Provide information on sheltering, transportation, food preparation
Euless	Grapevine Colleyville ISD	Risk Management	Phone/e-mail	Provide Information on sheltering, transportation, food preparation
Euless	ONCOR	Area Manager	Phone	Outage and repair information and historical data
Euless	Atmos Energy	Area Manager	Phone	Outage and repair information, line location, historical data, risks
Euless	Trinity River Authority of Texas	Area Manager	Phone	Water availability
Euless	DFW	Police/Fire Chiefs	Phone/e-mail	Airport disaster plan
Forest Hill	American Red Cross	EM Coordinator	E-mail/phone	Provide information on sheltering needs
Forest Hill	Fort Worth ISD	EM Coordinator	Phone	Provide info on local FW ISD Schools
Fort Worth	National Weather Service	Warning Coordination Meteorologist	Telephone, in-person, e-mail	Severe weather hazard/mitigation information
Fort Worth	Naval Air Station Fort Worth Joint Reserve Base	EMC	Telephone, in-person	Common hazard information, potential mitigation projects
Fort Worth	Neighboring cities	OEM Offices	Telephone, in-person, e-mail	Extensive coordination throughout project, including common hazard information, ongoing and/or potential joint mitigation projects
Fort Worth	NCTCOG	Various	Various	Extensive coordination throughout project
Fort Worth	Tarrant County OEM	Various	Various	Extensive coordination throughout project
Fort Worth	Tarrant County Public Health Department	Emergency Preparedness Coordinator	E-mail	Public Health Hazard Risk Assessment
Fort Worth	Tarrant Regional Water District	Hydrologist	Telephone	Hazards associated with lakes and levees
Fort Worth	Texas Commission on Environmental Quality	Dam Safety Program Manager	E-mail	Dam locations
Grapevine	US Army Corps of Engineers	Deputy Chief Emergency Management	E-mail	Did not respond
Grapevine	Grapevine Colleyville ISD	Risk Manager	E-mail and phone	Summary of outreach efforts, student population numbers, critical facility information
Grapevine	Texas Parks and Wildlife	Natural Resources Specialist	E-mail	Did not respond
Grapevine	Oncor Electric Delivery	Area Manager	E-mail and phone	Summary of electrical delivery grid for the area, overview of priority restoration, understanding of critical

Jurisdiction	Agency or Organization	Title of Contact	Method of Contact	Information Provided
				facility restoration and redundant delivery systems
Grapevine	Paradigm Pipeline		E-mail	Maps of pipeline and summary of materials carried in pipelines running through Grapevine
Grapevine	NuStar	District Manager	E-mail	Information on product in storage at tank farm immediately adjacent to city limits
Haltom City	American Red Cross	Disaster Specialist	E-mail	Provided information on sheltering needs
Haltom City	BISD	Assistant Superintendent	Phone	Provided Information on evacuation transportation
Haltom City	ONCOR	Community Liaison	E-mail	Power grid information
Haslet	Haslet FD Support Group	President	Monthly meeting	Provide manpower assistance as needed
Haslet	Local Lions Club	President	Monthly meeting	Provide manpower assistance as needed
Haslet	Northwest ISD	Administration	Phone	Will provide buses for mass transportation
Hurst	Stakeholders included city personnel only			
Keller	Keller ISD	Administrative Office	Phone	Provided site specific info for the schools in the City of Keller
Kennedale	American Red Cross	Disaster Specialist	E-mail	Provided information on sheltering security needs and contacts
Kennedale	Kennedale ISD	Communications Specialist	E-mail	Updated KISD Emergency Contact Information
Kennedale	Mansfield-Kennedale Dispatch	Information Tech. Manager	E-mail	Updated emergency incident response assignments
Lake Worth	Lake Worth Independent School District	Director of Operations	Telephone and in-person	Lake Worth Independent School District Emergency Action Plan
Lakeside	Stakeholders included city personnel only.			
North Richland Hills	Stakeholders included city personnel only.			
Richland Hills	Stakeholders included city personnel only.			
Saginaw	Eagle Mountain Saginaw ESD	Administration	E-mail	No pertinent information provided
Southlake	Stakeholders included city personnel only			
Tarrant County	American Red Cross	Disaster Specialist/Emergency Services personnel	E-mail	Provided information on sheltering needs

Jurisdiction	Agency or Organization	Title of Contact	Method of Contact	Information Provided
Watauga	City of Watauga Water & Sewer Utilities	Keith Miertchin	Phone	Flood maps and utility information
Westlake	Public Works and Planning Departments	Directors	In-person meetings	Shared information regarding contingency plans and operations
Westlake	Westlake Academy	Head of School and Principles	In-person meetings	Shelter and emergency operation plans
Westlake	City of Keller Public Service Department		E-mail	None provided
Westlake	Resident Businesses	Security Managers	E-mails and face-to-face	Monthly EP updates and coordination of emergency plans
Westworth Village	Burton Hill Elementary	Principal	Phone	Provided space availability for shelter and staging use
Westworth Village	Burton Hill Baptist Church	Pastor	Phone	Provided space availability for shelter and staging use

3.2 Plan Organization

The LMAPC was responsible for the organization, data collection, and completion of the plan.

It was the responsibility of the members of the LMAPC to include all pertinent departments within their respective governments and to request information as needed for the completion of the plan. These other departments include a variety of organizations whose input and data is vital to the success and accuracy of the plan.

The LMAPC conducted several meetings and involved all available departments and resources in an effort to gain any information that would increase the effectiveness of the plan.

The LMAPC was also tasked with including any external organizations that could benefit from the overall effectiveness of the plan. The LMAPC is aware of the importance of including a variety of external and internal organizations. Their input is vital to the short-term and long-term success of the plan. External organizations include but are not limited to the Texas Division of Emergency Management (TDEM); the Federal Emergency Management Agency (FEMA); the National Weather Service (NWS); local citizens, businesses, and industry; media outlets, the National Flood Insurance Program (NFIP) representatives; and others. These agencies and organizations were invited to the public meetings, provided information for data collection, and provided feedback on documents throughout the planning process.

The plan is based on the data gathered and identified by all committee members, the public, and all jurisdictions in an effort to prioritize mitigation projects in order of severity in an effort to reduce loss of property and life.

3.3 Planning Team Goals and Objectives

The Tarrant County LMAPC, early in the process, established a set of goals and objectives to ensure the effectiveness of this plan. These goals and objectives established the paradigm for the planning process. These goals and objectives are as follows:

- Actively involve and gain support from interested city governments and Tarrant County for the reduction of disasters in our community.
- Prioritize identified mitigation projects.
- Seek and implement any grant funding for the reduction of disasters in Tarrant County and its cities.
- Monitor, evaluate, and update the progress of the plan as needed.
- Form partnerships among local, state, and federal agencies to make Tarrant County more resistant to the effects of disasters.

The table below is the time line agreed upon by the planning team for the development of the Tarrant County LMAP.

Table 3-3
Calendar of Events

Date	Task
May 13, 2013	Kickoff meeting and public meeting of mitigation process
September 5, 2013	Public meeting #2
September 10, 2013	Draft risk assessment and mitigation strategies developed
September 30, 2013	Draft LMAP developed
October 3, 2013	Public meeting #3
October 9, 2013	Draft updated LMAP with changes required from public meeting for submittal to TDEM and FEMA for official review
March 2014 – June 2014	State review period
July 2014 - August 2014	FEMA review period
September 2014	Final draft updated plan based on State of Texas and FEMA recommendations
September 2014	Public meeting #4
October 2014	Jurisdictions obtain signatures from chief elected officials
November 30, 2014	Final approval obtained from jurisdictions and forwarded to FEMA

3.4 Multijurisdictional Considerations

Tarrant County, like many counties in Texas, has numerous cities. All cities were notified of the requirement concerning the Tarrant County LMAP and process. Representatives from all cities and townships and Tarrant County were invited to the general session meeting on April 24, 2013 to receive information regarding the planning process. Many jurisdictions decided to participate in the Tarrant County LMAP; however, some jurisdictions determined they would not participate. Benbrook, River Oaks, and Trophy Club participated in other FEMA-approved hazard mitigation

plans. Participating and nonparticipating communities located within Tarrant County are listed in the bale below.

Table 3-4
Jurisdiction Participation in the Tarrant County LMAP

Participating Jurisdictions	
Arlington	Keller
Azle	Kennedale
Bedford	Lake Worth
Blue Mound	Lakeside
Colleyville	North Central Texas Council of Governments
Crowley	North Richland Hills
Dallas Fort Worth International Airport	Richland Hills
Euless	Saginaw
Forest Hill	Southlake
Fort Worth	Tarrant County
Grapevine	Watauga
Haltom City	Westlake
Haslet	Westworth Village
Hurst	
Non-Participating Jurisdictions	
Benbrook	Pelican Bay
Dalworthington Gardens	River Oaks
Edgecliff Village	Sansom Park
Everman	Trophy Club
Mansfield	Westover Hills
Pantego	White Settlement

The communities that are participating in development of the Tarrant County LMAP have worked collectively over the past months to gather data that included known hazards, flood-prone areas, areas of vulnerability, existing mitigation plans and projects, and technical information for the plan. The data was forwarded to the NCTCOG for review and plan development. Subsequent meetings have been held in an effort to ensure that all information is correct and that all agencies'

and organizations' input was included as presented. A chronology of meetings and events is listed in Section 3.6.

Municipalities participated by providing input and data for the risk assessment section as well as the mitigation strategies. In addition to providing input via e-mail, phone call, and in-person contact, municipalities attended public meetings held to introduce and discuss various elements of the plan. Each jurisdiction was an active participant in the planning and development process. Coordination of the Tarrant County LMAP planning process was managed by the NCTCOG. The jurisdictions' individual contributions are listed in the table below.

Table 3-5
Type of Jurisdiction Participation

Jurisdiction	Participants	Planning Meetings Attended	Provided Jurisdiction Specific Hazard Information	Provided Jurisdiction Capabilities	Identified Mitigation Projects
Arlington	Irish Hancock	Planning Meeting 1 Planning Meeting 2	x	x	X
	Kwaheri Harris	Planning Meeting 2 Planning Meeting 3	x	x	x
Azle	Eddy Wood	Planning Meeting 2	x	x	X
	Will Scott	Planning Meeting 2			
Bedford	Rick Garnett	Planning Meeting 1			
	James Richardson	Planning Meeting 1 Planning Meeting 2			
	Bobby Sewell	Planning Meeting 1 Planning Meeting 2	x	x	x
	Bill Shelton	Planning Meeting 1 Planning Meeting 2			
Blue Mound	Shawn Fannan		x	x	x
Colleyville	Kenny Phillips	Planning Meeting 1 Planning Meeting 2	x	x	x
Crowley	Luke Thompson	Planning Meeting 1			

Jurisdiction	Participants	Planning Meetings Attended	Provided Jurisdiction Specific Hazard Information	Provided Jurisdiction Capabilities	Identified Mitigation Projects
		Planning Meeting 2 Planning Meeting 3			
	Pleasant Brooks		x	x	x
DFW	David McCurdy	Planning Meeting 1 Planning Meeting 2			
	Christina Wood	Planning Meeting 2			
	Sue Kunze	Planning Meeting 2			
	Matthew Miller		x	x	x
Euless	Joe Kraft	Planning Meeting 1 Planning Meeting 2 Planning Meeting 3	x	x	x
Forest Hill	Ed Henderson		x	x	x
Fort Worth	Keith Wells	Planning Meeting 1	x	x	x
	Carlos Gomez	Planning Meeting 2			
Grapevine	Carrie Little	Planning Meeting 1 Planning Meeting 2	x	x	x
	Brian Fuller	Planning Meeting 2			
Haltom City	Perry Bynum	Planning Meeting 1 Planning Meeting 2 Planning Meeting 3	x	x	x
Haslet	Kirt Mays		x	x	x
Hurst	David Palla	Planning Meeting 1	x	x	x
	Brent Craft	Planning Meeting 2 Planning Meeting 3			
Keller	David Jones	Planning Meeting 2	x	x	x

Jurisdiction	Participants	Planning Meetings Attended	Provided Jurisdiction Specific Hazard Information	Provided Jurisdiction Capabilities	Identified Mitigation Projects
		Planning Meeting 3			
Kennedale	Mike McCurry		x	x	x
Lake Worth	Mike Voorhies		x	x	x
Lakeside	Lee Pitt	Planning Meeting 1			
	Sean Hughes		x	x	x
NCTCOG	Francisco San Miguel	Planning Meeting 1	x	x	x
	Nicholas LaGrassa	Planning Meeting 1 Planning Meeting 2 Planning Meeting 3	x	x	x
	Andrea Wilson	Planning Meeting 2 Planning Meeting 3			
	Molly Thoerner	Planning Meeting 2 Planning Meeting 3			
	Melanie Devine	Planning Meeting 2			
	Angie Strickler	Planning Meeting 3			
North Richland Hills	Kirk Marcum	Planning Meeting 1	x	x	x
	Billy Owens	Planning Meeting 2 Planning Meeting 3	x	x	x
	Sean Hughes		x	x	x
Richland Hills	Bill Bell		x	x	x
Saginaw	Doug Spears		x	x	x
Southlake	Kyle Taylor	Planning Meeting 1 Planning Meeting 2	x	x	x
Tarrant County	William Wessel	Planning Meeting 1 Planning Meeting 2	x	x	x

Jurisdiction	Participants	Planning Meetings Attended	Provided Jurisdiction Specific Hazard Information	Provided Jurisdiction Capabilities	Identified Mitigation Projects
	James Taborsky	Planning Meeting 3			
	Mark Fulmer	Planning Meeting 1 Planning Meeting 2	x	x	x
	Stewart DeJarnett	Planning Meeting 1			
Watauga	Randy Barkley	Planning Meeting 1 Planning Meeting 2	x	x	x
Westlake	Jason Martin,	Public Meeting 1			
	Troy Crow	Public Meeting 1 Planning Meeting 2	x	x	x
Westworth Village	Brandy Barret	Planning Meeting 1 Planning Meeting 2 Planning Meeting 3	x	x	x

3.5 Review of Existing Technical/Planning Information

An important aspect of the planning process involved the review of existing federal, state, and local plans, studies, reports, and technical information as well as the ordinances, regulations, and resolutions of each participating jurisdiction for incorporation into the Tarrant County LMAP. Plans and documents reviewed by various members of the committee include:

State/Federal Data, Reports, and Plans Utilized

- 2010 United States Census Data
  - Information utilized throughout community profile section, jurisdiction profiles, and to understand the impact of certain hazards on vulnerable populations
- Texas Department of Natural Resources, water and land cover data
  - Incorporated into the plan through watershed information, flooding data, and expansive soils identification
- FEMA regulations and guidance
  - Utilized as planning guidance to ensure appropriate planning information, hazard and vulnerability analysis, and mitigation actions were incorporated into the plan per FEMA requirements
- State of Texas Hazard Mitigation Plan (HMP)

Requirement 44 CFR 201.6(b)(3)
An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include: (3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

  - Incorporated hazard information identified in the State of Texas HMP throughout the Tarrant County LMAP, including information on hazard vulnerabilities
  - Ensured mitigation actions identified in Tarrant County LMAP aligned with State mitigation priorities

County/Regional Plans, Ordinances, Data Utilized

- Fort Worth Hazard Mitigation Action Plan
  - Reviewed for information pertinent to the newly developed Tarrant County LMAP, including planning partners, stakeholders, identified hazards, and previous mitigation actions.
- City of Arlington Hazard Identification and Risk Assessment
  - Utilized information for description and profile of technological hazards
- Dallas Fort Worth Urban Area Security Initiative Threat and Hazard Identification and Risk Assessment (THIRA)
  - Utilized information for description and profile of technological hazards
- North Central Texas Council of Governments (NCTCOG) GIS User Group Data

- Incorporated into the plan via maps of critical infrastructure located in the County and individual jurisdictions, identified hazard vulnerabilities, and mitigation action impacts

These documents provided valuable guidance in the planning process. Some served to acquaint committee members with the many roles of emergency management. Planning guides helped to tie together the phases of mitigation planning for committee members from a broad range of backgrounds outside mitigation and emergency management.

State and federal response and homeland security documents were referenced to ensure Tarrant County's goals supported these plans and promoted compliance with requirements. The State of

Requirement 44 CFR 201.6(b)(1)
An open public involvement process is essential to the development of an effective plan. 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.

Texas Hazard Mitigation Plan (HMP) formed the basis for identifying and analyzing the natural hazards and technological hazards that could affect Tarrant County and participating jurisdictions.

3.6 Public Involvement

To be an effective plan, input from the public is vital. The LMAPC recognizes the valuable input that the public can provide on the plan. Additionally, public input builds support, ensures a strong base for future mitigation activities, and allows Tarrant County citizens the opportunity to have their interests included in the plan. The public was invited to participate in the development of this plan via the internet and press releases by the NCTCOG as well as press releases by participating jurisdictions. Each participating jurisdiction conducted public outreach as identified in the Table 3-6. Although outreach efforts were extensive, no public feedback was received by Tarrant County or the participating jurisdictions and therefore no information was incorporated into the Tarrant County LMAP.

Table 3-6
Jurisdiction Outreach Methods

Jurisdiction	Event	Outreach Method	Distribution	Date of Contact
Arlington	Public Meetings #2 and #3	E-mail	Sent to stakeholders which included citizens	Unknown
Azle	Public Meeting #1	Press Release	Posted to City of Azle website	5/5/2013
Azle	Kick off Meeting	US Mail	Sent by mail to residents on water bill	9/12/2012
Bedford	Public Meeting #3	Press Release	Posted to Tarrant County website	5/12/2013
Bedford	Public Meeting #2	Public Notice	Posted on City website	9/5/2013
Blue Mound	N/A	Did not attempt outreach	N/A	N/A
Colleyville	Public Meeting	Press release	Colleyville website, e-mail, posted at city hall	8/27/2013

Jurisdiction	Event	Outreach Method	Distribution	Date of Contact
Colleyville	Public Meeting	Press release	Colleyville website, e-mail, posted at City Hall	2/20/2013
Crowley	N/A	Did not attempt outreach	N/A	N/A
DFW Airport	N/A	Did not attempt outreach	N/A	N/A
Euless	Public Notice	Internet Posting	Posted to City of Euless website	5/20/2013
Euless	Public Meeting	Press Release	Advertised by NCTCOG	10/3/2013
Forest Hill	Public Notifications	New Articles	City of Forest Hill	Unknown
Forest Hill	Public Notifications	Auto Dialing System	City of Forest Hill	Unknown
Fort Worth	Public Meeting #1	Press Release	Unknown	5/13/2013
Fort Worth	Public Meeting #2	Press Release	Posted to City website and calendar	9/5/2013
Fort Worth	Public Meeting #3	Press Release	Posted to City website	10/3/2013
Fort Worth	Public Meeting #4	Press Release	Posted to City website	12/16/2013
Fort Worth	Public Survey	E-mail	Website/Internet	Unknown
Grapevine	Planning Process Initiation	Announcement	Posted to City of Grapevine website	5/7/2013
Grapevine	Public Meeting #2	Announcement	Posted to City of Grapevine website and social media	8/30/2013
Grapevine	Public Meeting #3	Announcement	Posted to City of Grapevine website and social media	9/30/2013
Haltom City	Public Meeting #3	Press Release	Posted to Tarrant County Website	9/20/2013
Haltom City	Public Survey	Meetings	CERT monthly meeting third Monday of each month.	2/1/2013
Haltom City	NCTCOG	Meetings/Web site	Posted on the NCTCOG website	8/1/2013
Haslet	Public Inquiry	Online Posting	Posted on Haslet FD website	Oct - Dec 2013
Hurst	Public Survey	E-mail	Link to Tarrant County website	5/14/2013
Hurst	Public Meeting	Press Release	Posted to City website	9/5/2013
Hurst	Public Survey	Press Release	Posted to City website	9/13/2013 (and currently ongoing)
Keller	N/A	Did not attempt outreach	N/A	N/A
Kennedale	Emergency Notification Service Registration	Opt-In Portal	Posted to Kennedale website	4/5/2014
Kennedale	Emergency Notification Service Registration	News Letter	Sent to Water Service customers	4/25/2014
Lake Worth	Public Meeting #1	Press Release	Posted to the City website and City Hall Public Board	1/21/2014

Jurisdiction	Event	Outreach Method	Distribution	Date of Contact
	Public Meeting #2	Press Release	Posted to the City website and City Hall Public Board	1/30/2014
	Tarrant County Pre Plan	Website	Currently on Tarrant County website	
Lakeside	N/A	Did not attempt outreach	N/A	N/A
NCTCOG	Public Meeting #1	Press Release	Distributed to Fort Worth Star Telegram	5/1/2013
NCTCOG	Public Meeting #2	Press Release	Distributed to Fort Worth Star Telegram	8/29/2013
NCTCOG	Public Meeting #3	Press Release	Distributed to Fort Worth Star Telegram	10/26/2013
North Richland Hills	N/A	Did not attempt outreach	N/A	N/A
Richland Hills	N/A	Did not attempt outreach	N/A	N/A
Saginaw	Public Inquiry	Online Posting	Posted on City of Saginaw website	Apr - Jul, 2013
Southlake	Hazard Mitigation Plan Public Meeting	Web Posting	Posted to City of Southlake website	8/13/2014
Southlake	Hazard Mitigation Plan Public Meeting	Web Posting	Posted to City of Southlake website	9/13/2014
Tarrant County	Public Meeting #3	Press Release	Posted to Tarrant County website	9/20/2013
Tarrant County	Public Meeting #2	E-mail	Distributed on the Tarrant County Listserv	9/4/2013
Tarrant County	Kick Off Meeting	E-mail	Distributed on the Tarrant County Listserv	5/10/2013
Watauga	Public meeting #1	Press Release	City website and newsletter	7/26/2013
Watauga	Public Meeting #2	Press Release	City website and newsletter	9/5/2013
Watauga	Public Meeting #3	Press Release	City website and newsletter	10/3/2013
Westlake	Public Meeting #1 / #2	Press Releases	Newspaper of record (FWST)	Prior to Meeting Dates
Westlake	Twice monthly e-mail communique.		All citizens	Future
Westlake	ECN / Notification Network		All citizens	Future
Westworth Village	Public Survey	Press Release	Posted to City website	5/14/2013
Westworth Village	Public Survey	Press Release	Posted to Police Department website	5/14/2013
Westworth Village	Public Survey	Monthly City Luncheon	Announced to 50+ attendees at monthly town hall style luncheon	5/14/2013
Westworth Village	Public Meeting	Press Release	Posted to City website	9/30/2013

Public Meetings

The main activity for public involvement was invitation to public meetings where they could learn about the hazard mitigation planning process and contribute ideas about Tarrant County's risks, vulnerabilities, and mitigation strategies, to the plan.

The first public meeting was held on May 13, 2013. The meeting introduced the hazard mitigation planning process, including the Disaster Mitigation Act of 2000, the importance of public participation, and the overall approach to planning. Complete meeting notes, rosters, and notices can be found in Appendix D.

The second meeting was held on September 5, 2013 and was an opportunity for attendees to review all hazard profiles, vulnerabilities, and mitigation strategy recommendations. Complete meeting notes, rosters, and notices can be found in Appendix D.

A third meeting was held on October 3, 2013 prior to the approval of this plan to present an overview to county residents and solicit input to the final draft. The complete meeting notes, rosters, and notices for this meeting can be found in Appendix D.

A fourth meeting will be held on August 5, 2014 to present the approved Tarrant County LMAP to the public. The complete meeting notes, rosters, and notices for this meeting can be found in Appendix D.

Public Survey

A public survey was created that included 10 questions and asked residents about their concerns regarding the hazards faced in the community, family and home disaster preparedness, and actions Tarrant County and municipalities can take to make the community safer.

Below is an example of a survey question. Several of the questions used a matrix of responses, giving a range of options for response. Many of the questions also allowed open-ended responses, allowing for explanation of their answers.

Unfortunately, despite extensive outreach efforts, minimal responses were received. As a result, this information could not be incorporated into the Tarrant County LMAP.

Figure 3-1
Example of Tarrant County LMAP Survey

2. The following hazards have been identified as having a potential to affect Tarrant County. Please mark the three hazards that are of most concern to your neighborhood or home.

Create Chart | Download

	Response Percent	Response Count
Dam/levee failure	2.5%	2
Drought	37.0%	30
Health alert/epidemic	27.2%	22
Flood	16.0%	13
Wildfire	12.3%	10
Tornado	**80.2%**	**65**
Hazardous materials release	23.5%	19
Terrorist threat	8.6%	7
Natural gas shortage	6.2%	5
Power outage	49.4%	40
Thunderstorm	40.7%	33
Winter storm	14.8%	12
Tropical Storm/Hurricane	3.7%	3
	Other (please specify) Show Responses	2
	answered question	81
	skipped question	19

Section 4
RISK AND VULNERABILITY ASSESSMENT

Requirement 44 CFR 201.6(c) (2) (i)
The risk assessment shall include a description of the type, 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.

Requirement 44 CFR 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.

To develop effective hazard mitigation strategies, it is first necessary to identify and profile all hazards facing the community. The Tarrant County Local Mitigation Action Planning Committee (LMAPC) conducted a risk assessment of the hazards faced in the community. A risk assessment measures the potential loss of life, personal injury, economic injury, and property damage resulting from natural and technological hazards by assessing the vulnerability of people, buildings, and infrastructure to natural and technological disasters. Several methods were used to identify risks to the community. These methods included evaluating historical data from scientific and news media sources, soliciting opinions and experiences from participating jurisdictions and Tarrant County residents, and surveying risks identified in the State of Texas Hazard Mitigation Plan that were pertinent to Tarrant County.

Following the risk assessment, a vulnerability assessment was conducted by the Tarrant County LMAPC. The vulnerability assessment predicts the extent of damage that may result from a hazard of a given intensity in a given area on the existing and future build environment. Determining the community's vulnerability involved identifying the threats posed to people, property, and the environment. This also included identifying critical facilities that could be affected by each hazard.

The table below shows the natural and technological hazards identified in the LMAP.

Table 4-1
Hazards Included in the Risk and Vulnerability Assessment

Hazard	Justification for Inclusion
Tornadoes	Frequency, previous incidents, countywide hazard
Power failure	Frequency, previous incidents, countywide hazard
Flooding	Frequency, previous incidents
Severe thunderstorms and high winds	Frequency, previous incidents, countywide hazard
Hail	Countywide hazard
Infectious disease outbreak	Previous incidents, potential adverse impact
Lightning	Frequency, countywide hazard
Hazardous materials spills	Frequency, potential adverse impact

Hazard	Justification for Inclusion
Terrorism	Potential adverse impact
Winter storms	Frequency, previous incidents, countywide hazard
Dam failure	Potential adverse impact
Drought	Previous incidents, countywide hazard
Wildfires	Frequency, potential adverse impact
Extreme temperatures	Frequency, countywide hazard
Expansive soils	Potential adverse impact

The hazards listed in the table below were not profiled due to geographic location, low occurrence, or low potential for damage.

Table 4-2
Hazards Not Included in the Risk and Vulnerability Assessment

Hazard	Justification for Omission
Avalanche	Geographic proximity
Civil disturbance	Low occurrence, low vulnerability
Coastal erosion	Geographic proximity
Earthquakes	Low occurrence, low vulnerability
Hurricane/tropical storms	Geographic proximity
Karst topography	Low occurrence
Landslides	Low occurrence
Sinkholes	Low vulnerability
Tsunami	Geographic proximity
Volcano	Geographic proximity

The following information was included in each hazard profile:

- **Hazard Definition.** Definition of the hazard will include a description of the hazard and the general threats that they pose. All hazards were identified using statistical data and records from a variety of sources, including presidential disaster declarations, National Weather Service data, maps, and hazmat response data. The lists of hazards are based on frequency, severity, probability, potential loss, vulnerability, and large-scale effects on Tarrant County.
- **Hazard Identification.** Each hazard will be profiled to explain how it will affect or has affected Tarrant County. This will include areas prone to specific hazards and the effects that they have had on Tarrant County infrastructure. It also includes previous incidents that have affected Tarrant County.
- **Assets Exposed to Hazard.** The risk and vulnerability analysis compares identified hazards with the inventory of affected critical facilities and the effects on the population that is exposed to each hazard. This section will also include a vulnerability assessment for future development, such as schools, water, and waste treatment facilities and other critical infrastructure.
- **Vulnerability.** The county's vulnerability to each hazard will be summarized based on a common set of definitions and classifications used to estimate vulnerability and rank hazards.

Figure 4-1 identifies classifications of vulnerability. Each profile was analyzed on the criteria for frequency of occurrence, the amount of warning time prior to the hazard occurring, the amount of area potentially affected by the hazard, and the severity of impact should the hazard occur.

Figure 4-1
Vulnerability Classifications

Frequency of Occurrence: Probability
1 = Unlikely <1% probability of occurrence in the next 100 years
2 = Occasionally 1–10% probability of occurrence per year, or at least one chance in next 100 years
3 = Likely >10% but <100% probability per year, at least 1 chance in next 10 years
4 = Highly Likely100% probable in a year

Warning Time: Amount of time generally given to alert people to hazard
1 = More than 12 hours
2 = 6–12 hours
3 = 3–6 hours
4 = None–Minimal

Geographic Extent: How large an area would likely be affected?
1 = Localized
2 = Community-wide
3 = Countywide

Potential Impact: Severity and extent of damage and disruption

1 = Negligible	Isolated occurrences of minor property damage, minor disruption of critical facilities and infrastructure, and potential for minor injuries
2 = Minor	Isolated occurrences of moderate to severe property damage, brief disruption of critical facilities and infrastructure, and potential for injuries
3 = Moderate	Severe property damage on a neighborhood scale, temporary shutdown of critical facilities, and/or injuries or fatalities
4 = Major	Severe property damage on a metropolitan or regional scale, shutdown of critical facilities, and/or multiple injuries or fatalities

- **Multijurisdictional Concerns.** This component of the hazard profile will identify what areas of Tarrant County are most vulnerable to effects of the hazard.
- **Land Use and Development Trends.** This component of the risk and vulnerability analysis will identify land use trends, identify Tarrant County's land use and development plans, and reference current plans and regulations in place regarding land use plans and trends that could prevent the impact of the disaster.
- **Hazard Summary.** A summary of the hazard profile will be provided.

44 CFR Requirement 201.6 (c)(2)(iii)
For multijurisdictional plans, the risk assessment section must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

44 CFR Requirement 201.6 (c)(2)(ii)(C)
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.

The process of developing the Tarrant County LMAP began with a review of the hazards faced in the community. The below ranking of hazards was conducted by assigning a score to each hazard based on the frequency of the hazard, impact potential, severity of damage, and overall

economic disruption. Several hazards received the same score. The Tarrant County Local Mitigation Action Planning Committee (LMAPC) discussed those hazards in which the score was tied and determined the order in which the hazards should be ranked. These decisions were based on collective knowledge of past events, jurisdictional capabilities, and potential impact.

Upon review of the hazard ranking, the Tarrant County LMAPC determined that due to the low impact and the level of experience that Tarrant County jurisdictions have handling hazardous materials incidents, the hazard should be ranked lower than the given score of 13. Following discussion, the hazardous materials release hazards was ranked #8, following lightning strikes.

Table 4-3
Tarrant County Local Mitigation Action Plan Hazard Ranking

Ranking	Hazard	Frequency of Occurrence	Warning Time	Geographic Extent	Potential Impact	Hazard Score	Vulnerable Critical Facilities	Economic Disruption
1	Tornadoes	Likely	None-Minimal	Community-wide	Major	13	Communications, schools, medical care facilities, hospital, water/sewer/electric, transportation infrastructure, businesses, residential homes	Utility lines down, medical care disruption, transportation routes impaired, business and residential impact
2	Power Failure	Highly Likely	None-Minimal	Localized - Countywide	Minor	13	Communications infrastructure, transportation infrastructure, medical care facilities, hospitals, schools, businesses, residential homes	Business and residential impact
3	Flooding*	Likely	3-6 hours	Community-wide	Major	12	Communications infrastructure, transportation infrastructure, medical care facilities, hospitals, schools, businesses, residential homes	Businesses, roads damaged/closed, utilities affected, transportation routes impaired, evacuations
4	Severe Thunderstorms and High Winds**	Highly Likely	3-6 hours	Community-wide	Moderate	12	Communications, schools, medical care facilities, hospital, water/sewer/electric, transportation infrastructure	Utility systems disrupted, business and residential impact, hail damage to crops, roads damaged/closed
5	Hail***	Highly Likely	3-6 hours	Community-wide	Moderate	12	Communications, schools, medical care facilities, hospital, water/sewer/electric, transportation infrastructure	Utility systems disrupted, business and residential impact, hail damage to crops, roads damaged/closed
6	Infectious Disease Outbreak	Highly Likely	More than 12 hours	Countywide	Negligible - Major	12	Communications infrastructure, transportation infrastructure, medical care facilities, hospitals, schools, businesses, residential homes	Business/industry impact, health care system impact, and communications impact
7	Lightning	Highly Likely	None - Minimal	Localized	Minor	11	Communications, schools, medical care facilities, hospital, water/sewer/electric, transportation infrastructure	Utility systems disrupted, business and residential impact, roads damaged/closed
8	Hazardous Materials Release	Highly Likely	None-Minimal	Localized - Community-wide	Moderate	13	Communications infrastructure, transportation infrastructure, medical care facilities, hospitals, schools, businesses, residential homes	Business/industry and residential impact, evacuation, environmental impact, transportation routes impaired
9	Terrorism	Unlikely	None-Minimal	Community-wide	Major	11	Communications infrastructure, transportation	Utility systems disrupted, business and

Ranking	Hazard	Frequency of Occurrence	Warning Time	Geographic Extent	Potential Impact	Hazard Score	Vulnerable Critical Facilities	Economic Disruption
							infrastructure, medical care facilities, hospitals, schools, businesses, residential homes	residential impact, evacuations, roads damaged/closed
10	Winter storms	Likely	More than 12 hours	Countywide	Moderate	10	Communications infrastructure, transportation infrastructure, medical care facilities, hospitals, schools, businesses, residential homes	Utility lines down, livestock threatened
11	Dam Failure	Unlikely	3-6 hours	Community-wide	Major	10	Communications infrastructure, transportation infrastructure, medical care facilities, hospitals, schools, businesses, residential homes	Businesses, roads damaged/closed, utilities affected, evacuations
12	Drought	Likely	More than 12 hours	Countywide	Minor	9	Agri-business	Agriculture, business and residential impact, fire suppression
13	Wildfires	Likely	6-12 hours	Localized	Minor	8	Communications infrastructure, transportation infrastructure, medical care facilities, hospitals, schools, businesses, residential homes	Agricultural, residential impact, road closures, utility impacts, evacuations
14	Extreme Temperatures	Likely	More than 12 hours	Countywide	Minor	8	Medical care facilities, elderly care facilities	Businesses, roads damaged/closed, utilities affected
15	Expansive Soils	Likely	More than 12 hours	Localized	Negligible	6	Pipelines, sewers, and pavements.	Businesses, roads damaged/closed, utilities affected

*For the purposes of the hazard flooding, “forecast warning” is defined as the amount of time necessary to determine whether severe weather has the potential to impact a jurisdiction. This should not be confused with the National Weather Service’s definition or use of the term “warning”.
** For the purposes of the hazard Severe Thunderstorms and High Winds, “forecast warning” is defined as the amount of time necessary to determine whether severe weather has the potential to impact a jurisdiction. This should not be confused with the National Weather Service’s definition or use of the term “warning”.

*** For the purposes of the hazard Hail, “forecast warning” is defined as the amount of time necessary to determine whether severe weather has the potential to impact a jurisdiction. This should not be confused with the National Weather Service’s definition or use of the term “warning”.

4.1 Natural Hazards

Natural hazards such as floods, tornadoes, winter storms, and the like are an enduring condition around the human environment. Natural hazards become disasters when they intersect with the human environment. In Texas, natural disasters have had devastating effects on human lives, property, the economy, and the community.

4.1.1 Tornadoes

Hazard Definition

The Tarrant County Local Mitigation Action Plan Committee (LMAPC) reviewed historical data from both SHELDUS and the National Climatic Data Center (NCDC) in researching the past events and effects of tornadoes in the Tarrant County. A tornado is a violently rotating column of air extending from a thunderstorm to the ground. The most violent tornadoes are capable of tremendous destruction with wind speeds of 250 mph or more. Damage paths can be in excess of one mile wide and 50 miles long. Tornado season in Texas runs ordinarily from March through August; however, tornadoes can strike at any time of the year if the essential conditions are

present[6]. The state of Texas averaged 155 annual tornadoes over the past 20 years.

The tornado tracks and population risk nationwide are depicted in Figure 4-2. Figure 4-3 depicts the average number of tornadoes per state in the United States between 1991 and 2010.

Figure 4-2
Tornado Tracks (1950-2011) and Population Density (2010)

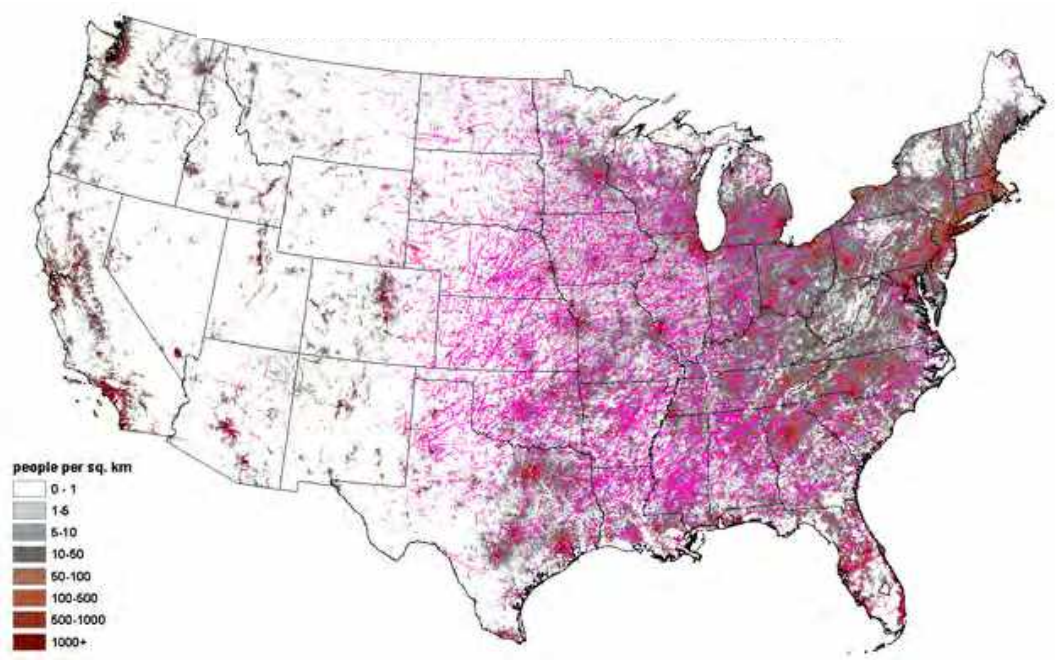
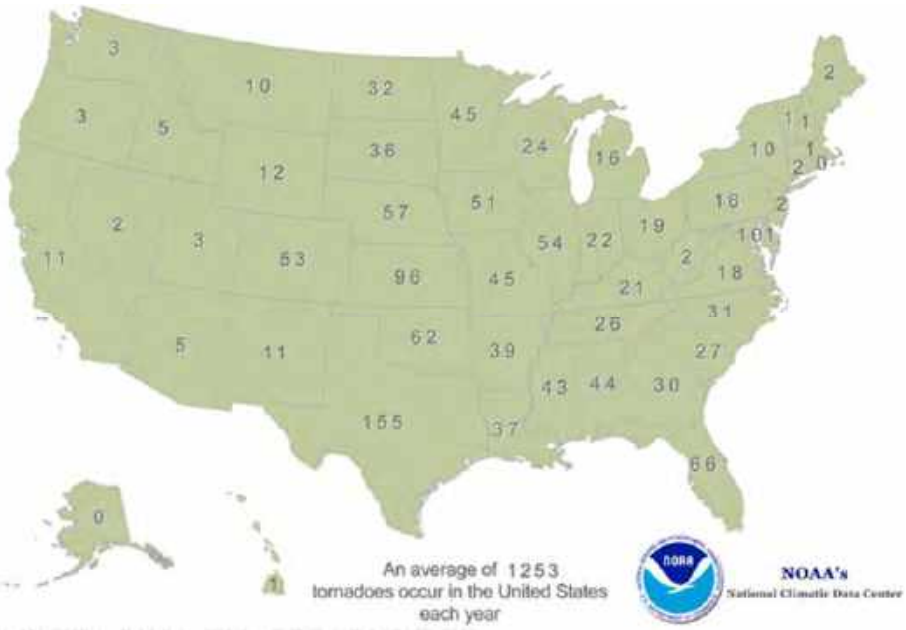


Figure 4-3
Average Annual Number of Tornadoes
Averaging Period: 1991 - 1990



[6] Source: National Weather Service, http://www.nws.noaa.gov

The National Oceanic Atmospheric Agency (NOAA) National Weather Service (NWS) utilizes the recently updated Enhanced Fujita (EF) Scale to rate the severity of tornadoes. In terms of extent, Tarrant County and the participating jurisdictions may experience tornadoes ranging from EF0 (65-85 mph) to EF4 (166-200 mph). The table below describes the EF Scale and associated wind speed categories.

Table 4-4
EF Scale[7]

Fujita Scale			Derived EF Scale		Operational EF Scale	
F Number	Fastest ¼ 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

Hazard Identification

In the past 50 years, 55 tornadoes have touched down in Tarrant County. History shows that Tarrant County and the participating jurisdictions will potentially experience several tornadoes in one year, although they have not had a tornado touch down every year. Trend analysis indicates that a tornado will touch down in Tarrant County every other year. This equates to a 50 percent chance of a tornado touching down in Tarrant County or the participating jurisdictions in any given year. Figure 4-4 shows a sample of tornado touchdowns in Tarrant County since 1957. Due to the large amount of tornado activity, not all tornadoes are visible on the map, but it serves the purpose

[7] The Enhanced Fujita Scale still is a set of wind estimates (not measurements) based on damage. It uses 3-second gusts estimated at the point of damage based on a judgment of levels of damage to various indicators. These estimates vary with height and exposure. The 3-second gust is not the same wind as in standard surface observations. Standard measurements are taken by weather stations in open exposures, using a directly measured "1-minute mile" speed.

of illustrating the wide distribution of tornado activity in the region. The numbers seen on the map indicate the intensity of the tornado according to its classification on the EF scale.

Figure 4-4
Tornado Touchdowns in Tarrant County[8]

Tornadoes in Tarrant County come in a wide range of sizes, ranging from those reported but not confirmed to those measuring up to an EF3.

The City of Fort Worth experienced tornadoes in March of 2000 and April of 2002. The March 28, 2000 tornado was rated as an F3 (designated using the Fujita Scale) as it moved across the west side of Fort Worth and into downtown causing 2 deaths, 103 injuries, and estimated $500 million in damage. A major disaster declaration was made for the event. Several high-rise buildings were struck by the tornado. One of the high-rise buildings has since been imploded and replaced with a parking lot and another required all infrastructures to be removed and rebuilt. The April 16, 2002 tornado was rated as an F3. It touched down in the Carver Heights neighborhood east of Loop 820 and moved north into the Handley neighborhood. The tornado caused no deaths, 7 injuries, and an estimated $5 million in damage.

Haltom City reported a tornado in April 2007 that killed 1 person, injured 30 people, damaged 35 homes, and caused $485,000 in damage. North Richmond Hills reported an EF0 tornado in April 2003 that caused $20,000 of damage. Watauga reported a tornado in 2011 that damaged homes and uprooted trees.

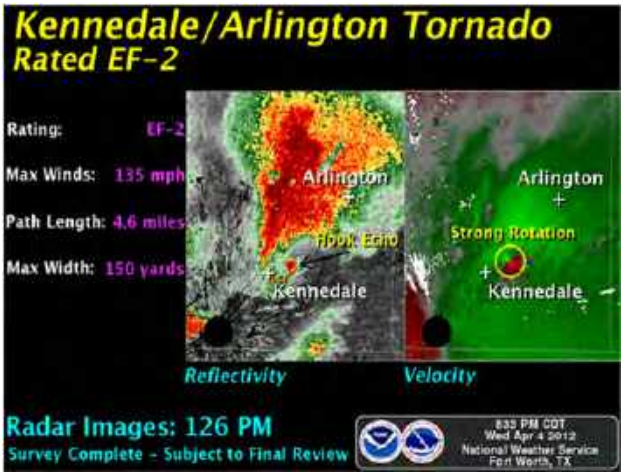
[8] http://www.tornadohistoryproject.com/tornado/Texas/Tarrant/map

On February 11, 2009, the City of Colleyville was impacted by an EF1 tornado that struck the center of the City. The tornado measured 100 yards wide and traveled ½ miles on the ground. Fortunately, only 10 structures were damaged, mostly from damaged roofs and downed fences.

The City of Saginaw has experienced several tornadoes. In February 2001, a tornado with 70 mph winds injured two people, damaged 20 structures, and caused an estimated $750,000 in damages. Another tornado caused in excess of $1 million when, in April 2008, it damaged 15 structures in a heavy industrial and commercial area.

Grapevine has also experienced several tornadoes over the years, with F0 tornadoes 1957 and 1976, and an F1 tornado in 1981. These tornadoes have injured 2 people and caused over $30,000 in damage.

Arlington has not been spared the damage of tornadoes either. A tornado in March 2000 initially damaged a restaurant, but as the F3 tornado moved east, it struck the Arlington Airport before it paralleled I-20, crossing the interstate about 1 mile west of Highway 360. The tornado then moved northeast, causing F2 damage to a neighborhood just northeast of Grand Prairie Airport. In spite of the damage, there were no deaths or serious injuries in Arlington or Grand Prairie.



One of the most devastating tornado events in North Texas history occurred on April 3, 2012. 22 tornadoes were confirmed in what was an outburst of tornado activity. It is estimated that at least 1,100 homes in the Dallas/Fort Worth metropolitan area were damaged, including at least 350 that were destroyed. No deaths were reported, but 29 injuries occurred.

In Tarrant County, Kennedale and Arlington were primarily impacted. The tornado damaged 500 homes in the City of Arlington, with 8 injuries reported and costs totaling $1.2 million. In Kennedale, the EF2 tornado destroyed 3 mobile homes, 2 masonry workshops, and 133 homes, and damaged 23 businesses. The City of Kennedale municipal water tower was damaged by a 40-foot long steel bar joist that was ripped from a warehouse and deposited on top of the 125-foot high water tower. It took 5 days for volunteers and City staff to clear all debris from the neighborhoods. Governor Rick Perry issued a disaster declaration for Tarrant County as a result of the storm.

Tarrant County reported that tornadoes caused 3 fatalities and 89 injuries since 1996. The table below lists reported tornadoes in Tarrant County and participating jurisdictions since 1980.

Table 4-5[9]
Confirmed Tornadoes in Tarrant County

Location[10]	Date	Time	Time Zone	Type	Magnitude	Deaths	Injuries	Property Damage Estimate	Crop Damage Estimate
TARRANT CO.	4/2/1980	17:30	CST	Tornado	F0	0	0	0.00K	0.00K
TARRANT CO.	10/13/1981	13:30	CST	Tornado	F1	0	2	25.00K	0.00K
TARRANT CO.	4/28/1982	17:00	CST	Tornado	F1	0	0	250.00K	0.00K
TARRANT CO.	6/3/1983	17:47	CST	Tornado	F0	0	0	0.03K	0.00K
TARRANT CO.	3/18/1984	17:13	CST	Tornado	F0	0	0	0.25K	0.00K
TARRANT CO.	6/7/1989	15:00	CST	Tornado	F1	0	0	0.00K	0.00K
TARRANT CO.	4/5/1990	20:33	CST	Tornado	F2	0	0	2.500M	0.00K
Mansfield	9/13/1993	7:10	CST	Tornado	F2	0	0	5.000M	0.00K
Arlington	9/13/1993	7:37	CST	Tornado	F2	0	5	5.000M	0.00K
Edgecliff Village	4/25/1994	18:42	CST	Tornado	F0	0	0	0.00K	0.00K
Fort Worth	11/20/1994	6:00	CST	Tornado	F0	0	0	500.00K	0.00K
Fort Worth	4/19/1995	19:40	CST	Tornado	F2	0	0	4.000M	0.00K
North Richland Hills-	5/7/1995	21:15	CST	Tornado	F1	0	4	3.300M	0.00K
BENBROOK	2/20/1997	12:00	CST	Tornado	F0	0	0	0.00K	0.00K
FT WORTH	3/28/2000	18:18	CST	Tornado	F3	2	80	0.00K	0.00K
ARLINGTON	3/28/2000	19:05	CST	Tornado	F3	0	0	0.00K	0.00K
MANSFIELD	5/4/2001	20:43	CST	Tornado	F1	0	2	5.000M	0.00K
EVERMAN	4/16/2002	16:42	CST	Tornado	F0	0	0	15.00K	0.00K
FT WORTH	4/16/2002	16:49	CST	Tornado	F0	0	0	2.00K	0.00K
FT WORTH	4/16/2002	16:52	CST	Tornado	F0	0	0	5.00K	0.00K
FT WORTH	4/16/2002	16:59	CST	Tornado	F3	0	0	250.00K	0.00K
NORTH RICHLAND HILLS	4/5/2003	20:05	CST	Tornado	F0	0	0	20.00K	2.00K
EULESS	4/5/2003	20:19	CST	Tornado	F0	0	0	1.00K	0.00K
KELLER	4/23/2004	19:18	CST	Tornado	F0	0	0	0.00K	0.00K

[9] Source: National Climatic Data Center, http://www.ncdc.noaa.gov/oa/ncdc.html
[10] Information on each event may be found by clicking on location link.

Location[10]	Date	Time	Time Zone	Type	Magnitude	Deaths	Injuries	Property Damage Estimate	Crop Damage Estimate
ARLINGTON	6/1/2004	20:07	CST	Tornado	F0	0	0	0.00K	0.00K
RICHLAND HILLS	6/1/2004	20:12	CST	Tornado	F0	0	0	0.00K	0.00K
FT WORTH	4/25/2005	15:14	CST	Tornado	F0	0	0	0.00K	0.00K
MANSFIELD	4/25/2005	15:30	CST	Tornado	F0	0	0	1.00K	0.00K
DALWORTHINGTON	4/3/2007	19:20	CST-6	Tornado	EF0	0	0	100.00K	0.00K
BENBROOK	4/13/2007	16:55	CST-6	Tornado	EF0	0	0	150.00K	0.00K
FT WORTH	4/13/2007	17:09	CST-6	Tornado	EF1	1	0	2.000M	0.00K
HASLET	4/17/2007	17:30	CST-6	Tornado	EF0	0	0	15.00K	0.00K
BIRDS	4/23/2008	20:35	CST-6	Tornado	EF2	0	0	1.000M	0.00K
GRAPEVINE S LAKE ARP	2/10/2009	21:15	CST-6	Tornado	EF1	0	0	750.00K	0.00K
BENBROOK LAKE	9/7/2010	13:56	CST-6	Tornado	EF0	0	0	0.00K	0.00K
RICHLAND HILLS	10/23/2010	11:55	CST-6	Tornado	EF0	0	0	15.00K	0.00K
(FWH)CARSWELL AFB FT	5/11/2011	12:55	CST-6	Tornado	EF0	0	0	30.00K	0.00K
EAGLE MTN LAKE	5/24/2011	18:45	CST-6	Tornado	EF0	0	0	1.00K	0.00K
KENNEDALE	4/3/2012	12:21	CST-6	Tornado	EF2	0	7	200.000M	0.00K
TARRANT	4/3/2012	12:58	CST-6	Tornado	EF0	0	0	55.00K	0.00K
Totals:						3	100	229.985M	2.00K

Assets Exposed to Hazard

- **Property Risk/Vulnerability.** It can be assumed that all structures and facilities within Tarrant County could be damaged by a tornado because tornadoes are among the most unpredictable of weather phenomena and are indiscriminate as to when or where they strike.
- **People Risk/Vulnerability.** It was determined that risk/vulnerability includes the entire population of Tarrant County because there is no way to determine the impact/magnitude of a tornado and no way to predict when or where a tornado will occur. People are vulnerable to the effects of tornadoes, including power outages, disruption to transportation routes, damage to shelter, flying debris, etc. There is a 50 percent chance of a tornado occurring in any given year in Tarrant County.
- **Environment Risk/Vulnerability.** Risks to the environment can be significant. Environmental risks can include flying debris and destruction of critical infrastructure that damage and affect water supply and contamination of potable water for public consumption.

The risk and vulnerability to tornadoes for each participating jurisdiction is detailed below. It should be noted that the North Central Texas Council of Governments (NCTCOG) is an

association of local governments that works to assist in planning and coordination efforts of 16 counties in North Central Texas. It is a government authority but does not hold or own any land or property, nor does it have any constituents. Therefore, there is minimal vulnerability to the NCTCOG.

Vulnerability to Tornadoes	
City of Arlington	
Critical Asset Vulnerability	The City of Arlington is home to critical facilities that would be vulnerable to the effects of a tornado. This includes city facilities worth approximately 8.5 million, the Dallas Cowboys Stadium worth $1.6 billion dollars, as well as many U.S. Government office facilities, public schools, a university, a large theme park, and privately-owned facilities that employ a significant number of residents. Power, water and sewer treatment systems could also be affected as a result of a tornado.
Vulnerable Populations	As of 2010, 8% of the population in Arlington consists of individuals who were 65 years or older. In addition, approximately 16% of Arlington families live below the poverty line. While a tornado poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a tornado threat or relocate after a tornado has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a tornado could result in serious environmental impacts to the city of Arlington. Such impacts could include contamination of soil, waterways, and reservoirs.
City of Azle	
Critical Asset Vulnerability	The City of Azle is home to critical facilities that would be vulnerable to the effects of a tornado. This includes city structures worth approximately 63.5 million, and public school facilities worth 96 million.
Vulnerable Populations	As of 2010, 12.8% of the population in Azle consists of individuals who were 65 years or older. In addition, approximately 6.9% of Azle families live below the poverty line. While a tornado poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a tornado threat or relocate after a tornado has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a tornado could result in serious environmental impacts to the city of Azle. Such impacts could include contamination of soil, waterways, and reservoirs.
City of Bedford	
Critical Asset Vulnerability	The City of Bedford is home to critical facilities that would be vulnerable to the effects of a tornado. This includes city facilities, schools, and hospitals. In addition, the city is home to employers including Walmart, Transamerica, and Heartland that employ residents of the City of Bedford.
Vulnerable Populations	As of 2010, 8.7% of the population in Bedford consists of individuals who were 65 years or older. In addition, approximately 3.7% of Bedford families live below the poverty line. While a tornado poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a tornado threat or relocate after a tornado has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a tornado could result in serious environmental impacts to the city of Bedford. Such impacts could include contamination of soil, waterways, and reservoirs.
City of Blue Mound	
Critical Asset Vulnerability	The City of Blue Mound is home to critical facilities that would be vulnerable to the effects of a tornado. This includes city facilities valued at 250,000, a school, and water production facilities that serve the residents of Blue Mound.

Vulnerability to Tornadoes	
Vulnerable Populations	Approximately 7.2% of the population in Bedford consists of individuals who are 65 years or older. In addition, approximately 5.9 % of Blue Mound families live below the poverty line. While a tornado poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a tornado threat or relocate after a tornado has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a tornado could result in serious environmental impacts to the city of Blue Mound. Such impacts could include contamination of soil, and water systems.
City of Colleyville	
Critical Asset Vulnerability	The City of Colleyville is home to critical facilities that would be vulnerable to the effects of a tornado. This includes city facilities valued at 11.7 million, and school facilities valued at 36 million.
Vulnerable Populations	Approximately 5.3% of the population in Colleyville consists of individuals who are 65 years or older. In addition, approximately 1.2 % of Colleyville families live below the poverty line. While a tornado poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a tornado threat or relocate after a tornado has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a tornado could result in serious environmental impacts to the city of Colleyville. Such impacts could include contamination of soil, and water systems.
City of Crowley	
Critical Asset Vulnerability	The City of Crowley is home to critical facilities that would be vulnerable to the effects of a tornado. This includes city facilities valued at 10.2 million.
Vulnerable Populations	Approximately 8.3% of the population in Crowley consists of individuals who are 65 years or older. In addition, approximately 4.3 % of Crowley families live below the poverty line. While a tornado poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a tornado threat or relocate after a tornado has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a tornado could result in serious environmental impacts to the city of Crowley. Such impacts could include contamination of soil, and water systems.
Dallas Fort Worth International Airport	
Critical Asset Vulnerability	The Dallas Fort Worth International Airport is home to critical facilities that would be vulnerable to the effects of a tornado. This includes airport towers, terminals, utilities plants, fuel facilities, water treatment facilities, storage facilities, as well as aircraft.
Vulnerable Populations	Vulnerable populations within the airport would consist of those individuals working in the airport as well as airline customers who happen to be at the airport during a tornado incident. Should the airport be impacted by a tornado, efforts must be aimed at safeguarding these individuals from harm and restoring flight systems as quickly as possible.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a tornado could result in serious environmental impacts. Damage to fuel storage tanks could impact soil, and water systems.
City of Euless	
Critical Asset Vulnerability	The City of Euless is home to critical facilities that would be vulnerable to the effects of a tornado. This includes city facilities and public schools.
Vulnerable Populations	Approximately 5.8% of the population in Crowley consists of individuals who are 65 years or older. In addition, approximately 5.7 % of Euless families live below the poverty line. While a tornado poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a tornado threat or relocate after a tornado has occurred.

Vulnerability to Tornadoes	
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a tornado could result in environmental impacts to the city of Euless. Such impacts could include contamination of soil, and water systems.
City of Forest Hill	
Critical Asset Vulnerability	The City of Forest Hill is home to critical facilities that would be vulnerable to the effects of a tornado. This includes city facilities valued at $875,220.
Vulnerable Populations	Approximately 9.1% of the population in Forest Hill consists of individuals who are 65 years or older. In addition, approximately 16.0 % of Forest Hill families live below the poverty line. While a tornado poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a tornado threat or relocate after a tornado has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a tornado could result in environmental impacts to the city of Forest Hill. Such impacts could include contamination of soil, and water systems.
City of Fort Worth	
Critical Asset Vulnerability	The City of Fort Worth is home to critical facilities that would be vulnerable to the effects of a tornado. This includes city buildings, water pumps stations, water storage facilities, water treatment facilities, convention facilities, and radio towers valued at $571 million. The City also has school facilities, hospitals, a naval air station, as well as employers that employ many of the residents of the city.
Vulnerable Populations	Approximately 8.2% of the population in Fort Worth consists of individuals who are 65 years or older and approximately 18.7 % of individuals in Fort Worth live below the poverty line. In addition, there is a homeless population in in Fort Worth estimated at 2,000 individuals. While a tornado poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a tornado threat or relocate after a tornado has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a tornado could result in environmental impacts to the city of Fort Worth. Such impacts could include contamination of soil, and water systems.
City of Grapevine	
Critical Asset Vulnerability	The City of Grapevine is home to critical facilities that would be vulnerable to the effects of a tornado. This includes city buildings, water storage facilities, and water treatment facilities, valued at 33.4 million.
Vulnerable Populations	Approximately 7.9% of the population in Grapevine consists of individuals who are 65 years or older. In addition, approximately 7.9 % of individuals in Grapevine live below the poverty line. While a tornado poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a tornado threat or relocate after a tornado has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a tornado could result in environmental impacts to the city of Grapevine. Such impacts could include contamination of soil, and water systems.
City of Haltom City	
Critical Asset Vulnerability	The City of Haltom City is home to critical facilities that would be vulnerable to the effects of a tornado. This includes city buildings valued at 10.8 million.
Vulnerable Populations	Approximately 10.0% of the population in Grapevine consists of individuals who are 65 years or older. In addition, approximately 16.7 % of individuals in Haltom City live below the poverty line. While a tornado poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a tornado threat or relocate after a tornado has occurred.

Vulnerability to Tornadoes	
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a tornado could result in environmental impacts to the city of Haltom City. Such impacts could include contamination of soil, and water systems.
City of Haslet	
Critical Asset Vulnerability	The City of Haslet is home to critical facilities that would be vulnerable to the effects of a tornado. This includes a city building housing fire and emergency management, and an elementary school. The City also is home to an Amazon Incorporated distribution center that employs approximately 1500 people.
Vulnerable Populations	A breakdown of vulnerable populations was not available for the city of Haslet as of the writing of this document.
Environmental Vulnerability	There are multiple train tracks and distribution centers located in the city. Hazardous materials spills and leaks as a result of damage caused by a tornado could result in environmental impacts to the city of Haslet. Such impacts could include contamination of soil, and water systems.
City of Hurst	
Critical Asset Vulnerability	The City of Hurst is home to critical facilities that would be vulnerable to the effects of a tornado. This includes city buildings valued at 34.6 million and a children's medical center valued at 15 million. In addition, there is a Mall in Hurst whose property is valued at 155 million.
Vulnerable Populations	Approximately 12.4% of the population in Hurst consists of individuals who are 65 years or older. In addition, approximately 6.6 % of individuals in Hurst live below the poverty line. While a tornado poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a tornado threat or relocate after a tornado has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a tornado could result in environmental impacts to the city of Hurst. Such impacts could include contamination of soil, and water systems.
City of Keller	
Critical Asset Vulnerability	The City of Keller is home to critical facilities that would be vulnerable to the effects of a tornado. This includes city buildings valued at 46.7 million, and school facilities valued at approximately 84.1 million.
Vulnerable Populations	Approximately 8.6% of the population in Keller consists of individuals who are 65 years or older. In addition, approximately 3.9 % of individuals in Keller live below the poverty line. While a tornado poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a tornado threat or relocate after a tornado has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a tornado could result in environmental impacts to the city of Keller. Such impacts could include contamination of soil, and water systems.
City of Kennedale	
Critical Asset Vulnerability	The City of Kennedale is home to critical facilities that would be vulnerable to the effects of a tornado. This includes city buildings, water storage tanks, and well pumps valued at 36 million.
Vulnerable Populations	Approximately 10.5% of the population in Kennedale consists of individuals who are 65 years or older. In addition, approximately 8.1 % of individuals in Kennedale live below the poverty line. While a tornado poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a tornado threat or relocate after a tornado has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a tornado could result in environmental impacts to the city of Kennedale. Such impacts could include contamination of soil, and water systems.

Vulnerability to Tornadoes	
City of Lake Worth	
Critical Asset Vulnerability	The City of Lake Worth is home to critical facilities that would be vulnerable to the effects of a tornado. This includes city buildings valued at 4.1 million, schools valued at 58.4 million, and two nursing home facilities valued at 2.3 million.
Vulnerable Populations	Approximately 16.1% of the population in Lake Worth consists of individuals who are 65 years or older. In addition, approximately 9.4 % of individuals in Lake Worth live below the poverty line. While a tornado poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a tornado threat or relocate after a tornado has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a tornado could result in environmental impacts to the city of Lake Worth. Such impacts could include contamination of soil, and water systems.
City of Lakeside	
Critical Asset Vulnerability	The City of Lakeside is home to critical facilities that would be vulnerable to the effects of a tornado. This includes a city building, a water pump station, a waste water facility, and two gas wells.
Vulnerable Populations	Approximately 18.4% of the population in Lakeside consists of individuals who are 65 years or older. In addition, approximately 3.0 % of individuals in Lakeside live below the poverty line. While a tornado poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a tornado threat or relocate after a tornado has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a tornado could result in environmental impacts to the city of Lakeside. Such impacts could include contamination of soil, and water systems.
City of North Richland Hills	
Critical Asset Vulnerability	The City of North Richland Hills is home to critical facilities that would be vulnerable to the effects of a tornado. This includes city buildings, water storage facilities, sewage lift stations, pump stations and a hospital.
Vulnerable Populations	Approximately 12.3% of the population in North Richland Hills consists of individuals who are 65 years or older. In addition, approximately 7.5 % of individuals in North Richland Hills live below the poverty line. While a tornado poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a tornado threat or relocate after a tornado has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a tornado could result in environmental impacts to the city of North Richland Hills. Such impacts could include contamination of soil, and water systems.
City of Richland Hills	
Critical Asset Vulnerability	The City of Richland Hills is home to critical facilities that would be vulnerable to the effects of a tornado. This includes city buildings, water storage facilities, sewage lift stations, pump stations and a hospital.
Vulnerable Populations	Approximately 18.4% of the population in Richland Hills consists of individuals who are 65 years or older. In addition, approximately 7.8 % of individuals in Richland Hills live below the poverty line. While a tornado poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a tornado threat or relocate after a tornado has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a tornado could result in environmental impacts to the city of Richland Hills. Such impacts could include contamination of soil, and water systems.

Vulnerability to Tornadoes	
City of Saginaw	
Critical Asset Vulnerability	The City of Saginaw is home to critical facilities that would be vulnerable to the effects of a tornado. This includes a city building and a county fire alarm center. The city is also home to several food processing and industrial facilities.
Vulnerable Populations	Approximately 6.8% of the population in Saginaw consists of individuals who are 65 years or older. In addition, approximately 4.2 % of individuals in Saginaw live below the poverty line. While a tornado poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a tornado threat or relocate after a tornado has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a tornado could result in environmental impacts to the city of Saginaw. Such impacts could include contamination of soil, and water systems.
City of Southlake	
Critical Asset Vulnerability	The City of Southlake is home to critical facilities that would be vulnerable to the effects of a tornado. This includes a city buildings valued at 15.2 million, a hospital valued at 10.3 million, and school facilities valued at 284 million. In addition, there are two nursing facilities valued at 16.3 million, as well as several major employers.
Vulnerable Populations	Approximately 5.9% of the population in Southlake consists of individuals who are 65 years or older. In addition, approximately 3.3 % of individuals in Southlake live below the poverty line. While a tornado poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a tornado threat or relocate after a tornado has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a tornado could result in environmental impacts to the city of Southlake. Such impacts could include contamination of soil, and water systems.
Tarrant County	
Critical Asset Vulnerability	Tarrant County is home to critical facilities that would be vulnerable to the effects of a tornado. This includes county buildings valued at 628.2 million, school district facilities, Dallas Fort Worth International Airport, and healthcare facilities.
Vulnerable Populations	Approximately 9.9% of the population in Tarrant County consists of individuals who are 65 years or older. In addition, approximately 14.7 % of individuals in Tarrant County live below the poverty line. While a tornado poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a tornado threat or relocate after a tornado has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a tornado could result in environmental impacts to Tarrant County. Such impacts could include contamination of soil, water ways, and water systems.
City of Watauga	
Critical Asset Vulnerability	The city of Watauga is home to critical facilities that would be vulnerable to the effects of a tornado. This includes city buildings valued at 18.1 million.
Vulnerable Populations	Approximately 7.4% of the population in Watauga consists of individuals who are 65 years or older. In addition, approximately 8.1 % of individuals in Watauga live below the poverty line. While a tornado poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a tornado threat or relocate after a tornado has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a tornado could result in environmental impacts to the city of Watauga. Such impacts could include contamination of soil, water ways, and water systems.
City of Westlake	

Vulnerability to Tornadoes	
Critical Asset Vulnerability	The city of Westlake is home to critical facilities that would be vulnerable to the effects of a tornado. This includes a water pump station valued at 4 million, a fire station valued at $300,000, a charter school, and a university. There are also two large employers in the city, Fidelity Investments and the Solana Business Complex.
Vulnerable Populations	Approximately 11.6% of the population in Westlake consists of individuals who are 65 years or older. In addition, approximately 2.7 % of individuals in Westlake live below the poverty line. While a tornado poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a tornado threat or relocate after a tornado has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a tornado could result in environmental impacts to the city of Westlake. Such impacts could include contamination of soil, water ways, and water systems.
City of Westworth Village	
Critical Asset Vulnerability	The city of Westworth Village is home to critical facilities that would be vulnerable to the effects of a tornado. This includes two city facilities valued at 4.9 million, as well as a school.
Vulnerable Populations	Approximately 11.5% of the population in Westworth Village consists of individuals who are 65 years or older. In addition, approximately 9.1 % of individuals in Westworth Village live below the poverty line. While a tornado poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a tornado threat or relocate after a tornado has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a tornado could result in environmental impacts to the city of Westworth Village. Such impacts could include contamination of soil and water systems.

Vulnerability

The following chart provides the potential impact of tornadoes for all participating jurisdictions. Potential losses should a tornado impact each jurisdiction are provided in Appendix G where the value of each piece of critical infrastructure is detailed for building and contents losses.

Tornadoes

Frequency of Occurrence	Likely
Warning Time	None-Minimal
Geographic Extent	Community-wide
Potential Impact	Major

Multijurisdictional Concerns

There is not sufficient data to identify a preferred path that tornadoes seek in Tarrant County. All participating jurisdictions are vulnerable to the effects of a tornado and no participating jurisdiction is more or less vulnerable than the next. All mitigation projects will consider a countywide approach. Tarrant County and its municipalities use the International Building Code and enforcement policy.

Land Use and Development Trends

Continued development in Tarrant County will result in an increase in the potential for damage from tornadoes. Tarrant County and its cities and towns have a land use plan that clearly identifies future development. Tarrant County enforces the Texas State Building Code, which requires

structures to be designed and constructed for wind loads. The use and enforcement of these codes provides reasonable protection from most natural hazards, including tornadoes. Updating building codes and the adoption of these codes will reduce vulnerability and damage from tornadoes.

New technology allows for high wind-resistant windows, either by directly installing windows capable of withstanding high winds or applying a film that protects the window. This reduces property damage by reducing the number of broken windows and reduces injuries and deaths by reducing broken glass. Although Tarrant County currently has no regulatory capabilities regarding this technology, it is advised that new developments include high wind-resistant windows.

Hazard Summary

Overall, Tarrant County has high exposure to potential damage from tornadoes. Should a tornado hit certain portions of Tarrant County that are highly concentrated with homes or any of the critical facilities identified, depending upon the strength and duration of the event, significant damage could occur. Due to the destructive nature of tornadoes, it is imperative that pre-disaster mitigation measures be identified.

4.1.2 Flooding

Hazard Definition

Overflow of rivers and streams due to severe storms or torrential rains may result in significant flooding. Different variables impact flooding, including topography, ground saturation, previous rainfall, soil types, drainage, basin size, drainage patterns of streams, and vegetative cover. Flooding may occur slowly or become a flash flood, such as in the case of a dam failure. Urban areas experience flash flooding as storm drainage systems and sewers become overwhelmed, pouring water onto streets and into homes and businesses. The Tarrant County LMAPC researched historical data from the NCDC, the NWS, Federal Emergency Management Agency (FEMA), and the National Flood Insurance Program (NFIP) as well as information from past newspaper articles relating to flooding in Tarrant County. When flooding occurs, jurisdictions in the planning area can expect to see flooding that ranges from minor street flooding to water levels up to seven feet in low-lying areas.

Hazard Identification

There are two types of flooding that can occur almost anywhere. The first is general flooding, which is defined by the NWS as, “an overflow of water onto normally dry land. The inundation of a normally dry area caused by rising water in an existing waterway, such as a river, stream, or drainage ditch; ponding of water at or near the point where the rain fell.” The second type is flash flooding, which is defined as, “a flood caused by heavy or excessive rainfall in a short period of time, generally less than 6 hours.” Flash flooding can also be caused by a levee or dam failure. Typically, general flooding is a longer term event, whereas flash flooding is usually shorter in duration. Flash flooding does not have the warning time of general flooding, and therefore poses a greater risk to Tarrant County citizens.

Flood-related damages due to historic events within Tarrant County occur due to flash flooding from severe thunderstorms or the remnants of Gulf hurricanes and tropical storms. One of the primary factors affecting mitigation actions in Tarrant County and the participating jurisdictions is the issue of stream bank erosion. Stream bank erosion is in and of itself not a threat or hazard to

the citizens of the LMAP participating jurisdictions; however, when stream banks are not properly built and protected, flooding will cause them to quickly erode and cause debris flow. This is a primary factor in losses and damages sustained. Therefore, to prevent the impacts of flooding, many jurisdictions recognize the importance of stream bank changes to correct drainage flow and will complete mitigation projects to address the issue.

Tarrant County and its participating jurisdictions experience flooding events on a regular basis. The corresponding table below combines major flooding events over the last 22 years. The NCDC lists 172 flooding events in Tarrant County and its participating jurisdictions since 1990 and additional events have been reported by the jurisdictions as well. The economic impact of each flooding event varies greatly. The flooding incidents in Tarrant County range from costing a few hundred dollars up to millions of dollars. A flooding event in 2007 cost an estimated $2 million to Haltom City. This flood destroyed or majorly damaged 156 homes, including numerous manufactured homes. The floodwaters caused 1 death and 30 people were injured.

Haltom City is not the only jurisdiction to be severely impacted by flooding in Tarrant County. On September 9, 2010, the remnants of Hurricane Hermine tracked across North Texas, dropping almost 7 inches of rain on Southlake in less than 24 hours. Southlake experienced 14 road closures during this time. The most severe road closure occurred at 3400 N. White Chapel, where a small creek flooded and washed the pavement off the bridge spanning the creek. The bridge was the only property affected during this incident. After being examined by an engineer, it was determined that the bridge was structurally sound and was re-paved and reopened within the week. This also impacted Colleyville, who shares the bridge as a transportation route.

The City of Colleyville also experienced a flooding event in 2004. On July 28, 2004, a front came through the DFW area with up to 5 inches of rain. The rain caused the low water crossing to be closed because of the high water. Two cars got stuck in the crossings before they could be closed. The fire department had to go out to the scene and rescue the occupants of the cars.

Flooding events in 2002 and 2007 impacted the City of Saginaw. Five different flooding events, two in 2002 and three in 2007, caused stormwater flooding, closed roadways, and damaged buildings. Attempting to deal with the overwhelmed stormwater and drainage system taxes the City's Public Works department, racking up overtime costs as well as equipment and repair costs. Schools and businesses were either closed or delayed, and first responders were taxed by the calls for help.

The City of Watauga was fortunate to escape without any fatalities or injuries when floods impacted the City in 1990 and 2007. Heavy rains brought by severe thunderstorms damaged roadways and homes, causing an estimated $432,302 in costs for the city.

The Town of Westlake is not prone to serious flooding but does have some areas that are of concern. The Town of Westlake is located near Turner Lake, located on Circle T Ranch. In heavy rains, Turner Lake commonly overflows the spillway, sending water downstream through Trophy Club and eventually to Lake Grapevine. The result of these issues is an almost 100 percent chance that the Town of Westlake will experience flash flooding in a given year.

The City of Keller faced significant floods in 1935, 1942, 1949, 1957, 1962, 1964, and 1966. More recently, a flood in July 2004 caused damage to several homes along Big Bear Creek. A June 2007 flood caused damage to 20 homes along Big Bear Creek. To address these issues, drainage

improvement projects were implemented, and Keller has identified other mitigation projects to decrease or eliminate flooding in the area.

The Valley View Branch above Highway 10 in Hurst has a rich history of flooding. Localized flash flooding in the area in 2000 damaged several homes. Flooding occurred at a later date in which 10 apartments in a small apartment complex were damaged. As a result of these flooding events, Hurst removed a bridge to increase water flow in the channel and several homeowners in the area participated in the FEMA Hazard Mitigation Grant Program buyout program to return their lots to green space. Although the State of Texas did install a new bridge in this location, the Trinity Railway Express bridge was unable to be moved, which forced the State of Texas to keep constructed culverts under the bridge closed and caused flooding.

The City of Arlington has experienced its fair share of flooding events. A flooding event occurred on July 29, 2004, when flooding resulted in 27 high water rescues, 12 streets closed, and 7 homes evacuated. One man drowned when his SUV was swept down Rush Creek by high water. Another flooding event in occurred in Arlington on September 8, 2010 when remnants of Tropical Storm Hermine caused widespread flooding, submerging many low-lying pockets under several feet of water. Firefighters had to use ladders and boats to reach stranded residents and over 20 roadways, including several arterial streets, were flooded and closed due to hazardous conditions. The flooding caused intermittent power outages, temporary road closures, evacuations, contaminated water supplies in some areas, and hazardous post flood conditions. Approximately 250 homes were flooded or left uninhabitable throughout the City.

Fort Worth has also not been immune to flooding events. In early June 2000, very heavy rains of up to 11 inches fell in just a few hours over the far west side of Fort Worth. Flash flooding occurred along Farmer's Branch Creek. Streets, homes, and businesses were damaged by the floodwaters. The event resulted in a Small Business Administration Disaster Declaration.

In late June 2004, significant flooding occurred in many parts of the City of Fort Worth following heavy rains. Homes, businesses, the zoo, and utilities were affected by the flooding. Some portions of Tarrant County received two separate "500-Year" rain events. A local state of disaster was declared on June 9 and again on August 2 primarily due to widespread flooding. Following the 2004 storms, the City of Fort Worth created a Storm Water Management Utility as a division of the Transportation and Public Works Department. The Storm Water Management Utility has been very active in improving drainage through an aggressive program of system maintenance and capital projects.

In May 2007, heavy rains caused flooding that damaged or destroyed several homes in Fort Worth. Parking lots were flooded and a creek was out of its banks near the intersection of Highways 121 and 360. Water was reported to be 8–10 inches deep on Interstate 20 near Hulen Mall in Fort Worth. Multiple vehicles were stalled in high water, and officials estimate about 50 people had to be rescued.

The City of Fort Worth received the remnants of Tropical Storm Hermine in September 2010 as it moved through the western portions of North Central Texas dropping up to 12 inches of rain in some locations and producing 8 tornadoes. Significant flash flooding occurred during the late evening hours of September 7 through September 8. Numerous high water rescues and evacuations were conducted. Floodwaters damaged streets, homes, and businesses. This storm was also experienced in the City of Kennedale, where heavy rains flooded mobile homes and businesses.

The City of Bedford experienced flooding as a result of Tropical Storm Ike in 2010, causing $500,000 in structural damage.

Dallas Fort Worth International Airport has experienced flooding on several occasions between 2006 and 2012 at Bear, Grapevine, and Hackberry Creek. Flash flooding caused road closures on each of these occasions. Information on these occurrences may be found in Table 4-6.

There are no flooding events on record for the cities of Haslet, Lakeside or Westworth Village but there is still risk related to flooding, as identified in the vulnerability section of this hazard profile. The North Central Texas Council of Governments is located within the city of Arlington but has not experienced a flood at their facility.

The table below lists the significant flooding events in Tarrant County and its participating jurisdictions from 2000 to 2012.

Table 4-6
Significant Floods Events in Tarrant County

Location	Date	Time	Time Zone	Type	Deaths	Injuries	Property Damage Estimate	Crop Damage Estimate
GRAND PRAIRIE	2/22/2000	21:19	CST	Flash Flood	0	0	0.00K	0.00K
FT WORTH	3/28/2000	19:15	CST	Flash Flood	2	0	0.00K	0.00K
FT WORTH	4/11/2000	18:40	CST	Flash Flood	0	0	0.00K	0.00K
ARLINGTON	4/16/2000	1:05	CST	Flash Flood	0	0	0.00K	0.00K
WHITE SETTLEMENT	4/30/2000	22:15	CST	Flash Flood	0	0	0.00K	0.00K
FT WORTH	6/3/2000	23:45	CST	Flash Flood	0	0	0.00K	0.00K
WHITE SETTLEMENT	6/3/2000	23:45	CST	Flash Flood	0	0	2.000M	0.00K
BENBROOK	6/4/2000	2:50	CST	Flash Flood	0	0	0.00K	0.00K
MANSFIELD	6/4/2000	2:50	CST	Flash Flood	0	0	700.00K	0.00K
CROWLEY	6/4/2000	4:50	CST	Flash Flood	0	0	0.00K	0.00K
FT WORTH	6/4/2000	8:45	CST	Flash Flood	0	0	25.00K	0.00K
FT WORTH	6/4/2000	12:10	CST	Flash Flood	0	0	100.00K	0.00K
BLUE MOUND	6/11/2000	14:40	CST	Flash Flood	0	0	0.00K	0.00K
FT WORTH	6/14/2000	20:12	CST	Flash Flood	0	0	0.00K	0.00K
FT WORTH	6/14/2000	20:30	CST	Flash Flood	0	0	0.00K	0.00K
FT WORTH	6/17/2000	13:10	CST	Flash Flood	0	0	0.00K	0.00K

Location	Date	Time	Time Zone	Type	Deaths	Injuries	Property Damage Estimate	Crop Damage Estimate
AZLE	2/12/2001	10:00	CST	Flash Flood	0	0	0.00K	0.00K
FT WORTH	2/15/2001	11:30	CST	Flash Flood	0	0	0.00K	0.00K
FT WORTH	2/15/2001	11:30	CST	Flash Flood	0	0	5.00K	0.00K
FT WORTH	2/15/2001	19:00	CST	Flash Flood	0	0	0.00K	0.00K
FT WORTH	2/27/2001	15:35	CST	Flash Flood	0	0	0.00K	0.00K
FT WORTH	2/27/2001	16:00	CST	Flash Flood	0	0	0.00K	0.00K
FT WORTH	3/11/2001	23:40	CST	Flash Flood	0	0	0.00K	0.00K
KELLER	5/6/2001	0:00	CST	Flash Flood	0	0	0.00K	0.00K
EULESS	7/1/2001	6:00	CST	Flash Flood	0	0	5.00K	0.00K
FT WORTH	7/1/2001	6:40	CST	Flash Flood	0	0	2.00K	0.00K
ARLINGTON	7/1/2001	7:00	CST	Flash Flood	0	0	20.00K	0.00K
FT WORTH	7/1/2001	7:00	CST	Flash Flood	0	0	300.00K	0.00K
BENBROOK	7/1/2001	7:50	CST	Flash Flood	0	0	0.00K	0.00K
MANSFIELD	7/1/2001	8:00	CST	Flash Flood	0	0	0.00K	0.00K
MANSFIELD	8/31/2001	13:15	CST	Flash Flood	0	0	50.00K	0.00K
GRAND PRAIRIE	8/31/2001	13:29	CST	Flash Flood	0	0	0.00K	0.00K
FT WORTH	9/4/2001	15:50	CST	Flash Flood	0	0	0.00K	0.00K
FT WORTH	9/18/2001	18:40	CST	Flash Flood	0	0	0.00K	0.00K
FT WORTH	1/31/2002	1:54	CST	Flash Flood	0	0	0.00K	0.00K
FT WORTH	1/31/2002	6:12	CST	Flash Flood	0	0	0.00K	0.00K
HALTOM CITY	3/19/2002	16:30	CST	Flash Flood	0	0	0.00K	0.00K
FT WORTH	3/19/2002	16:40	CST	Flash Flood	0	0	0.00K	0.00K
EULESS	3/19/2002	17:00	CST	Flash Flood	0	0	0.00K	0.00K
FT WORTH	3/20/2002	6:00	CST	Flash Flood	1	0	0.00K	0.00K
FT WORTH	4/7/2002	13:00	CST	Flash Flood	0	0	0.00K	0.00K
HALTOM CITY	4/7/2002	16:30	CST	Flash Flood	0	0	0.00K	0.00K

Location	Date	Time	Time Zone	Type	Deaths	Injuries	Property Damage Estimate	Crop Damage Estimate
FT WORTH	5/5/2002	5:30	CST	Flash Flood	0	0	0.00K	0.00K
FT WORTH	5/9/2002	22:20	CST	Flash Flood	0	0	0.00K	0.00K
FT WORTH	10/18/2002	16:09	CST	Flash Flood	0	0	0.00K	0.00K
NORTH RICHLAND HILLS	9/11/2003	13:05	CST	Flash Flood	0	0	0.00K	0.00K
FT WORTH	9/11/2003	15:05	CST	Flash Flood	0	0	0.00K	0.00K
FT WORTH	9/18/2003	18:47	CST	Flash Flood	0	0	0.00K	0.00K
MANSFIELD	9/18/2003	19:00	CST	Flash Flood	0	0	10.00K	0.00K
FT WORTH	1/16/2004	19:40	CST	Flash Flood	0	0	0.00K	0.00K
FT WORTH	4/30/2004	20:45	CST	Flash Flood	3	0	0.00K	0.00K
FT WORTH	5/27/2004	18:44	CST	Flash Flood	0	0	0.00K	0.00K
PANTEGO	6/2/2004	22:15	CST	Flash Flood	0	0	0.00K	0.00K
COUNTYWIDE	6/6/2004	22:42	CST	Flash Flood	0	0	1.000M	0.00K
AZLE	6/9/2004	7:30	CST	Flash Flood	0	0	0.00K	0.00K
CROWLEY	6/9/2004	13:50	CST	Flash Flood	0	0	0.00K	0.00K
ARLINGTON	6/9/2004	17:10	CST	Flash Flood	0	0	0.00K	0.00K
ARLINGTON	6/15/2004	15:30	CST	Flash Flood	0	0	0.00K	0.00K
MANSFIELD	6/28/2004	9:36	CST	Flash Flood	0	0	0.00K	0.00K
FT WORTH	6/28/2004	11:00	CST	Flash Flood	0	0	100.00K	0.00K
ARLINGTON	6/28/2004	13:44	CST	Flash Flood	0	0	10.00K	0.00K
FT WORTH	6/29/2004	12:14	CST	Flash Flood	0	0	0.00K	0.00K
FT WORTH	7/28/2004	17:33	CST	Flash Flood	0	0	0.00K	0.00K
HALTOM CITY	7/28/2004	19:00	CST	Flash Flood	0	0	0.00K	0.00K
ARLINGTON	7/29/2004	4:00	CST	Flash Flood	1	0	15.00K	0.00K
ARLINGTON	7/29/2004	5:00	CST	Flash Flood	0	0	50.00K	0.00K
MANSFIELD	7/29/2004	5:55	CST	Flash Flood	0	0	0.00K	0.00K
KELLER	8/19/2004	5:45	CST	Flash Flood	0	0	0.00K	0.00K

Location	Date	Time	Time Zone	Type	Deaths	Injuries	Property Damage Estimate	Crop Damage Estimate
FT WORTH	8/19/2004	5:50	CST	Flash Flood	0	0	0.00K	0.00K
COUNTYWIDE	3/19/2006	12:53	CST	Flash Flood	0	0	300.00K	0.00K
KELLER	5/5/2006	2:35	CST	Flash Flood	0	0	0.00K	0.00K
COUNTYWIDE	7/5/2006	16:00	CST	Flash Flood	0	0	0.00K	0.00K
KELLER	9/11/2006	18:30	CST	Flood	0	0	0.00K	0.00K
RICHLAND HILLS	10/10/2006	7:00	CST-6	Flash Flood	0	0	5.00K	0.00K
FT WORTH	12/29/2006	16:50	CST-6	Flash Flood	0	0	0.00K	0.00K
FT WORTH	12/29/2006	19:02	CST-6	Flash Flood	0	0	0.00K	0.00K
ARLINGTON	1/12/2007	16:00	CST-6	Flash Flood	0	0	5.00K	0.00K
ARLINGTON	3/13/2007	15:20	CST-6	Flash Flood	0	0	0.00K	0.00K
SAGINAW	3/30/2007	19:32	CST-6	Flash Flood	1	0	250.00K	0.00K
HURST	4/24/2007	13:50	CST-6	Flash Flood	0	0	0.00K	0.00K
GRAPEVINE	5/2/2007	18:00	CST-6	Flash Flood	0	0	0.00K	0.00K
FT WORTH	5/2/2007	18:15	CST-6	Flash Flood	0	0	70.00K	0.00K
FT WORTH	5/7/2007	18:00	CST-6	Flash Flood	0	0	10.00K	0.00K
NORTH RICHLAND HILLS	5/8/2007	3:15	CST-6	Flash Flood	0	0	0.00K	0.00K
HALTOM CITY	5/24/2007	15:00	CST-6	Flash Flood	0	0	0.00K	0.00K
FT WORTH	5/30/2007	9:30	CST-6	Flash Flood	0	0	0.00K	0.00K
FT WORTH	5/30/2007	9:30	CST-6	Flash Flood	0	0	0.00K	0.00K
HALTOM CITY	6/17/2007	23:11	CST-6	Flash Flood	1	0	30.000M	0.00K
DFW AIRPORT	6/26/2007	18:50	CST-6	Flood	0	0	0.00K	0.00K
LAKE WORTH	6/26/2007	16:12	CST-6	Flash Flood	0	0	300.00K	0.00K
COLLEYVILLE	6/26/2007	18:50	CST-6	Flood	0	0	0.00K	0.00K
LAKE WORTH	6/27/2007	18:25	CST-6	Flash Flood	0	0	10.00K	0.00K
AZLE	6/30/2007	1:50	CST-6	Flash Flood	0	0	0.00K	0.00K
AZLE	6/30/2007	2:00	CST-6	Flash Flood	0	0	0.00K	0.00K

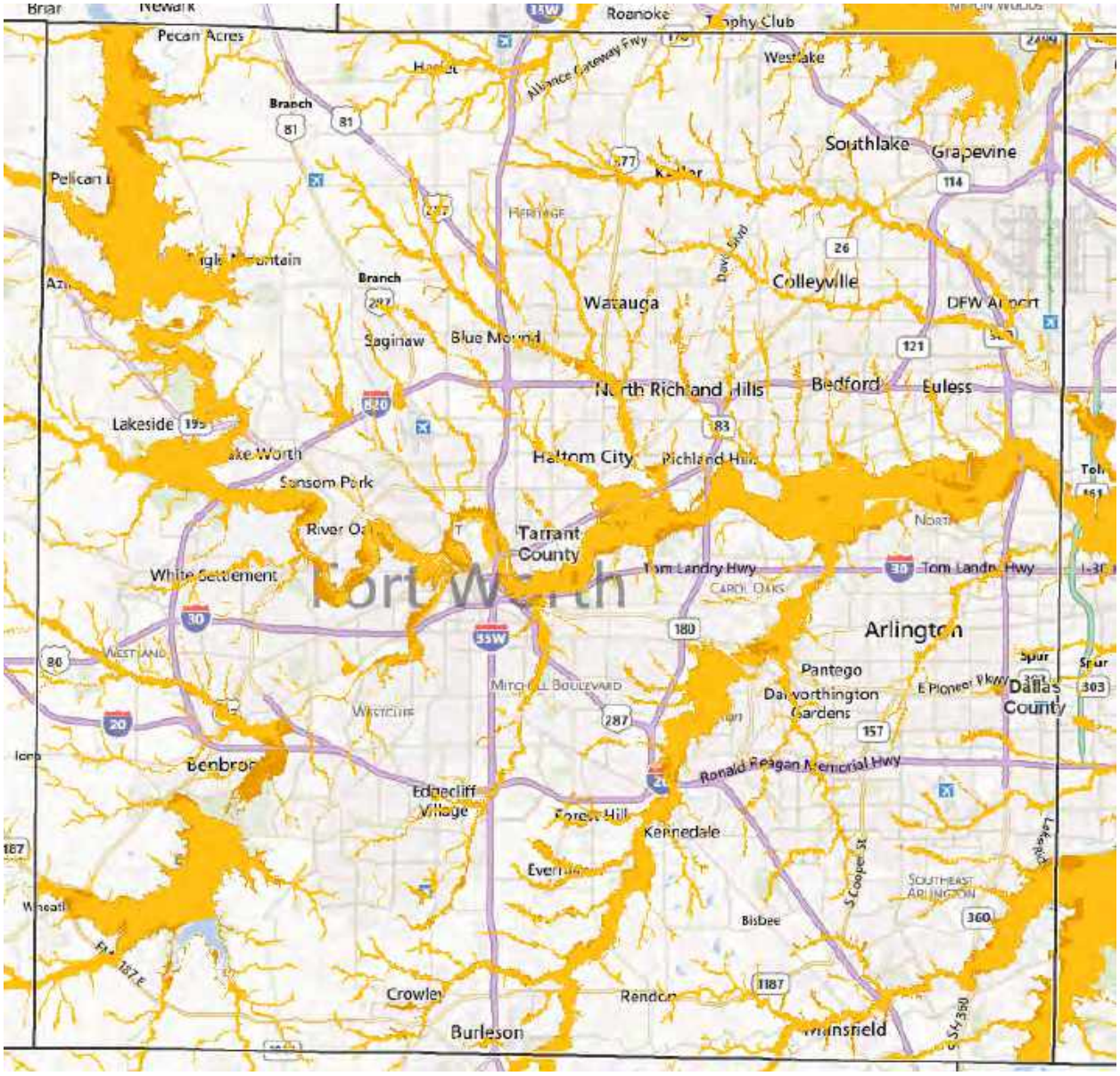
Location	Date	Time	Time Zone	Type	Deaths	Injuries	Property Damage Estimate	Crop Damage Estimate
SAGINAW	7/1/2007	15:00	CST-6	Flash Flood	0	0	0.00K	0.00K
ARLINGTON	7/2/2007	13:30	CST-6	Flood	0	3	0.00K	0.00K
FT WORTH	7/2/2007	16:10	CST-6	Flash Flood	0	0	20.00K	0.00K
NORTH RICHLAND HILLS	7/3/2007	16:30	CST-6	Flash Flood	0	0	450.00K	0.00K
FT WORTH	7/23/2007	18:02	CST-6	Flash Flood	0	0	4.00K	0.00K
DFW AIRPORT	7/23/2007	18:02	CST-6	Flash Flood	0	0	0.00K	0.00K
CROWLEY	9/9/2007	14:34	CST-6	Flash Flood	0	0	0.00K	0.00K
BENBROOK	4/17/2008	19:27	CST-6	Flash Flood	0	0	0.00K	0.00K
ARLINGTON	4/17/2008	19:30	CST-6	Flash Flood	0	0	0.00K	0.00K
WATAUGA	4/17/2008	19:40	CST-6	Flash Flood	0	0	0.00K	0.00K
MANSFIELD	4/17/2008	19:45	CST-6	Flash Flood	0	0	30.00K	0.00K
FT WORTH BLUE MND AR	6/25/2008	20:13	CST-6	Flash Flood	0	0	0.00K	0.00K
RIVER OAKS	11/10/2008	19:39	CST-6	Flash Flood	0	0	15.00K	0.00K
ARLINGTON	11/10/2008	19:39	CST-6	Flash Flood	0	0	0.00K	0.00K
MANSFIELD	4/27/2009	6:36	CST-6	Flash Flood	0	0	10.00K	0.00K
POLTECHNIEC	5/2/2009	16:59	CST-6	Flash Flood	0	0	2.00K	0.00K
DFW AIRPORT	5/2/2009	16:59	CST-6	Flash Flood	0	0	0.00K	0.00K
BENBROOK	6/10/2009	18:23	CST-6	Flash Flood	0	0	0.50K	0.00K
BLUE MOUND	6/11/2009	2:00	CST-6	Flash Flood	0	0	5.00K	0.00K
SAGINAW	6/11/2009	2:00	CST-6	Flash Flood	0	0	5.00K	0.00K
KELLER	6/11/2009	2:30	CST-6	Flash Flood	0	0	5.00K	0.00K
KELLER	6/11/2009	3:00	CST-6	Flood	0	0	1.00K	0.00K
GREATER SW INTL ARPT	6/11/2009	9:50	CST-6	Flash Flood	0	0	6.00K	0.00K
HURST	6/11/2009	10:15	CST-6	Flash Flood	0	0	25.00K	0.00K
GRAPEVINE	6/11/2009	10:24	CST-6	Flash Flood	0	0	1.00K	0.00K
DFW AIRPORT	6/11/2009	10:24	CST-6	Flash Flood	0	0	0.00K	0.00K

Location	Date	Time	Time Zone	Type	Deaths	Injuries	Property Damage Estimate	Crop Damage Estimate
HURST	7/26/2009	19:01	CST-6	Flood	0	0	8.00K	0.00K
GRAND PRAIRIE	9/13/2009	3:39	CST-6	Flash Flood	0	0	150.00K	0.00K
DFW AIRPORT	9/13/2009	3:39	CST-6	Flash Flood	0	0	0.00K	0.00K
HODGE	10/21/2009	17:01	CST-6	Flash Flood	0	0	15.00K	0.00K
NORTH RICHLAND HILLS	10/21/2009	17:23	CST-6	Flash Flood	0	0	0.25K	0.00K
AZLE	10/25/2009	21:07	CST-6	Flash Flood	0	0	5.00K	0.00K
FOREST HILL	5/17/2010	16:45	CST-6	Flash Flood	0	0	50.00K	0.00K
EAGLE	9/8/2010	8:30	CST-6	Flash Flood	0	0	20.000M	0.00K
AZLE	9/8/2010	13:00	CST-6	Flood	0	0	0.00K	0.00K
BEDFORD	9/8/2010	13:00	CST-6	Flood	0	0	500.00 K	250.00 K
DFW AIRPORT	9/8/2010	13:00	CST-6	Flood	0	0	0.00 K	0.00 K
KENNEDALE	9/8/2010	13:00	CST-6	Flood	0	0	0.00 K	0.00 K
WESTOVER HILLS	5/23/2011	9:50	CST-6	Flash Flood	0	0	0.00K	0.00K
EAGLE	1/25/2012	2:30	CST-6	Flood	0	0	100.00K	0.00K
RICHLAND HILLS	1/25/2012	6:30	CST-6	Flash Flood	0	0	30.00K	0.00K
DFW AIRPORT	1/25/2012	6:30	CST-6	Flash Flood	0	0	0.00K	0.00K
KELLER	8/18/2012	17:09	CST-6	Flash Flood	0	0	0.00K	0.00K
KELLER	8/18/2012	17:30	CST-6	Flash Flood	0	0	0.00K	0.00K
FT WORTH	8/18/2012	18:10	CST-6	Flash Flood	0	0	50.00K	0.00K
WESTLAND	8/18/2012	19:00	CST-6	Flood	1	0	0.00K	0.00K
DFW AIRPORT	8/18/2012	19:00	CST-6	Flood	0	0	0.00K	0.00K
TARRANT CO.	9/20/2013	6:30	CST-6	Flood	0	0	30.00K	0.00K
HURST	10/26/2013	20:20	CST-6	Flash Flood	0	0	50.00K	0.00K
FT WORTH BLUE MND AR	10/26/2013	20:22	CST-6	Flash Flood	0	0	0.00K	0.00K
Totals:					10	3	0	0

Although not every jurisdiction in Tarrant County is flooded every year, there is a 90% chance that Tarrant County or the participating jurisdictions will experience a flood event in any given

year. To better understand which areas are most vulnerable to flooding, Tarrant County works with the State of Texas and FEMA to map 100-year and 500-year flood zones in Tarrant County. Figure 4-5 shows Tarrant County and its participating jurisdictions flood zones. Maps identifying flood zones and high hazard flooding areas for each jurisdiction may be found in Appendix E.

Figure 4-5
Tarrant Flood Zones



Assets Exposed to Hazard

- **Property Risk/Vulnerability.** Tarrant County has identified flood zones within the county. All properties within a floodplain have an increased chance of flooding. The vulnerability of these structures is very high, depending on the probability of that area flooding within a 10-year or 100-year period. Many of the assets previously exposed to flooding have been mitigated through the FEMA Hazard Mitigation Grant Program (HMGP) buyouts or by implementing infrastructure changes such as widening culverts to better direct floodwaters.

- **People Risk/Vulnerability.** People living in and around identified floodplain areas are more vulnerable to a flooding incident than those who live/work out of floodplain areas, but these areas can still be affected depending on the severity of the flooding incident. There is a significant chance of a flooding incident occurring in any given year in Tarrant County.
- **Environment Risk/Vulnerability.** Risks to the environment are high for a flooding incident should one occur. Most of the environmental risks would be access to water and the effects floodwater has on public water supply. Flooding can affect and create contamination of potable water for public consumption.

The risk and vulnerability to flooding for each participating jurisdiction is detailed below. It should be noted that the North Central Texas Council of Governments (NCTCOG) is an association of local governments that works to assist in planning and coordination efforts of 16 counties in North Central Texas. It is a government authority but does not hold or own any land or property, nor does it have any constituents. Therefore, there is minimal vulnerability to the NCTCOG.

Vulnerability to Flooding	
City of Arlington	
Critical Asset Vulnerability	The City of Arlington is home to critical facilities that would be vulnerable to the effects of a flood. This includes city facilities worth approximately 8.5 million, the Dallas Cowboys Stadium worth $1.6 billion dollars, as well as many U.S. Government office facilities, public schools, a university, a large theme park, and privately-owned facilities that employ a significant number of residents. Power, water and sewer treatment systems could also be affected as a result of a flood.
Vulnerable Populations	As of 2010, 8% of the population in Arlington consists of individuals who were 65 years or older. In addition, approximately 16% of Arlington families live below the poverty line. While a flood poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a flood threat or relocate after a flood has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a flood could result in serious environmental impacts to the city of Arlington. Such impacts could include contamination of soil, waterways, and reservoirs.
City of Azle	
Critical Asset Vulnerability	The City of Azle is home to critical facilities that would be vulnerable to the effects of a flood. This includes city structures worth approximately 63.5 million, and public school facilities worth 96 million.
Vulnerable Populations	As of 2010, 12.8% of the population in Azle consists of individuals who were 65 years or older. In addition, approximately 6.9% of Azle families live below the poverty line. While a flood poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a flood threat or relocate after a flood has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a flood could result in serious environmental impacts to the city of Azle. Such impacts could include contamination of soil, waterways, and reservoirs.
City of Bedford	
Critical Asset Vulnerability	The City of Bedford is home to critical facilities that would be vulnerable to the effects of a flood. This includes city facilities, schools, and hospitals. In addition, the city is home to employers including Walmart, Transamerica, and Heartland that employ residents of the City of Bedford.
Vulnerable Populations	As of 2010, 8.7% of the population in Bedford consists of individuals who were 65 years or older. In addition, approximately 3.7% of Bedford families live below the poverty line. While a flood poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a flood threat or relocate after a flood has occurred.

Vulnerability to Flooding	
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a flood could result in serious environmental impacts to the city of Bedford. Such impacts could include contamination of soil, waterways, and reservoirs.
City of Blue Mound	
Critical Asset Vulnerability	The City of Blue Mound is home to critical facilities that would be vulnerable to the effects of a flood. This includes city facilities valued at 250,000, a school, and water production facilities that serve the residents of Blue Mound.
Vulnerable Populations	Approximately 7.2% of the population in Bedford consists of individuals who are 65 years or older. In addition, approximately 5.9 % of Blue Mound families live below the poverty line. While a flood poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a flood threat or relocate after a flood has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a flood could result in serious environmental impacts to the city of Blue Mound. Such impacts could include contamination of soil, and water systems.
City of Colleyville	
Critical Asset Vulnerability	The City of Colleyville is home to critical facilities that would be vulnerable to the effects of a flood. This includes city facilities valued at 11.7 million, and school facilities valued at 36 million.
Vulnerable Populations	Approximately 5.3% of the population in Colleyville consists of individuals who are 65 years or older. In addition, approximately 1.2 % of Colleyville families live below the poverty line. While a flood poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a flood threat or relocate after a flood has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a flood could result in serious environmental impacts to the city of Colleyville. Such impacts could include contamination of soil, and water systems.
City of Crowley	
Critical Asset Vulnerability	The City of Crowley is home to critical facilities that would be vulnerable to the effects of a flood. This includes city facilities valued at 10.2 million.
Vulnerable Populations	Approximately 8.3% of the population in Crowley consists of individuals who are 65 years or older. In addition, approximately 4.3 % of Crowley families live below the poverty line. While a flood poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a flood threat or relocate after a flood has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a flood could result in serious environmental impacts to the city of Crowley. Such impacts could include contamination of soil, and water systems.
Dallas Fort Worth International Airport	
Critical Asset Vulnerability	The Dallas Fort Worth International Airport is home to critical facilities that would be vulnerable to the effects of a flood. This includes airport towers, terminals, utilities plants, fuel facilities, water treatment facilities, storage facilities, as well as aircraft.
Vulnerable Populations	Vulnerable populations within the airport would consist of those individuals working in the airport as well as airline customers who happen to be at the airport during a flood incident. Should the airport be impacted by a flood, efforts must be aimed at safeguarding these individuals from harm and restoring flight systems as quickly as possible.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a flood could result in serious environmental impacts. Damage to fuel storage tanks could impact soil, and water systems.
City of Euless	
Critical Asset Vulnerability	The City of Euless is home to critical facilities that would be vulnerable to the effects of a flood. This includes city facilities and public schools.

Vulnerability to Flooding	
Vulnerable Populations	Approximately 5.8% of the population in Crowley consists of individuals who are 65 years or older. In addition, approximately 5.7 % of Euless families live below the poverty line. While a flood poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a flood threat or relocate after a flood has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a flood could result in environmental impacts to the city of Euless. Such impacts could include contamination of soil, and water systems.
City of Forest Hill	
Critical Asset Vulnerability	The City of Forest Hill is home to critical facilities that would be vulnerable to the effects of a flood. This includes city facilities valued at $875,220.
Vulnerable Populations	Approximately 9.1% of the population in Forest Hill consists of individuals who are 65 years or older. In addition, approximately 16.0 % of Forest Hill families live below the poverty line. While a flood poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a flood threat or relocate after a flood has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a flood could result in environmental impacts to the city of Forest Hill. Such impacts could include contamination of soil, and water systems.
City of Fort Worth	
Critical Asset Vulnerability	The City of Fort Worth is home to critical facilities that would be vulnerable to the effects of a flood. This includes city buildings, water pumps stations, water storage facilities, water treatment facilities, convention facilities, and radio towers valued at $571 million. The City also has school facilities, hospitals, a naval air station, as well as employers that employ many of the residents of the city.
Vulnerable Populations	Approximately 8.2% of the population in Fort Worth consists of individuals who are 65 years or older and approximately 18.7 % of individuals in Fort Worth live below the poverty line. In addition, there is a homeless population in in Fort Worth estimated at 2,000 individuals. While a flood poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a flood threat or relocate after a flood has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a flood could result in environmental impacts to the city of Fort Worth. Such impacts could include contamination of soil, and water systems.
City of Grapevine	
Critical Asset Vulnerability	The City of Grapevine is home to critical facilities that would be vulnerable to the effects of a flood. This includes city buildings, water storage facilities, and water treatment facilities, valued at 33.4 million.
Vulnerable Populations	Approximately 7.9% of the population in Grapevine consists of individuals who are 65 years or older. In addition, approximately 7.9 % of individuals in Grapevine live below the poverty line. While a flood poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a flood threat or relocate after a flood has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a flood could result in environmental impacts to the city of Grapevine. Such impacts could include contamination of soil, and water systems.
City of Haltom City	
Critical Asset Vulnerability	The City of Haltom City is home to critical facilities that would be vulnerable to the effects of a flood. This includes city buildings valued at 10.8 million.
Vulnerable Populations	Approximately 10.0% of the population in Grapevine consists of individuals who are 65 years or older. In addition, approximately 16.7 % of individuals in Haltom City live below the poverty line. While a flood poses a serious threat to any population, issues with mobility could make it

Vulnerability to Flooding	
	difficult for these populations to evacuate ahead of a flood threat or relocate after a flood has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a flood could result in environmental impacts to the city of Haltom City. Such impacts could include contamination of soil, and water systems.
City of Haslet	
Critical Asset Vulnerability	The City of Haslet is home to critical facilities that would be vulnerable to the effects of a flood. This includes a city building housing fire and emergency management, and an elementary school. The City also is home to an Amazon Incorporated distribution center that employs approximately 1500 people.
Vulnerable Populations	A breakdown of vulnerable populations was not available for the city of Haslet as of the writing of this document.
Environmental Vulnerability	There are multiple train tracks and distribution centers located in the city. Hazardous materials spills and leaks as a result of damage caused by a flood could result in environmental impacts to the city of Haslet. Such impacts could include contamination of soil, and water systems.
City of Hurst	
Critical Asset Vulnerability	The City of Hurst is home to critical facilities that would be vulnerable to the effects of a flood. This includes city buildings valued at 34.6 million and a children's medical center valued at 15 million. In addition, there is a Mall in Hurst whose property is valued at 155 million.
Vulnerable Populations	Approximately 12.4% of the population in Hurst consists of individuals who are 65 years or older. In addition, approximately 6.6 % of individuals in Hurst live below the poverty line. While a flood poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a flood threat or relocate after a flood has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a flood could result in environmental impacts to the city of Hurst. Such impacts could include contamination of soil, and water systems.
City of Keller	
Critical Asset Vulnerability	The City of Keller is home to critical facilities that would be vulnerable to the effects of a flood. This includes city buildings valued at 46.7 million, and school facilities valued at approximately 84.1 million.
Vulnerable Populations	Approximately 8.6% of the population in Keller consists of individuals who are 65 years or older. In addition, approximately 3.9 % of individuals in Keller live below the poverty line. While a flood poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a flood threat or relocate after a flood has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a flood could result in environmental impacts to the city of Keller. Such impacts could include contamination of soil, and water systems.
City of Kennedale	
Critical Asset Vulnerability	The City of Kennedale is home to critical facilities that would be vulnerable to the effects of a flood. This includes city buildings, water storage tanks, and well pumps valued at 36 million.
Vulnerable Populations	Approximately 10.5% of the population in Kennedale consists of individuals who are 65 years or older. In addition, approximately 8.1 % of individuals in Kennedale live below the poverty line. While a flood poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a flood threat or relocate after a flood has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a flood could result in environmental impacts to the city of Kennedale. Such impacts could include contamination of soil, and water systems.
City of Lake Worth	

Vulnerability to Flooding	
Critical Asset Vulnerability	The City of Lake Worth is home to critical facilities that would be vulnerable to the effects of a flood. This includes city buildings valued at 4.1 million, schools valued at 58.4 million, and two nursing home facilities valued at 2.3 million.
Vulnerable Populations	Approximately 16.1% of the population in Lake Worth consists of individuals who are 65 years or older. In addition, approximately 9.4 % of individuals in Lake Worth live below the poverty line. While a flood poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a flood threat or relocate after a flood has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a flood could result in environmental impacts to the city of Lake Worth. Such impacts could include contamination of soil, and water systems.
City of Lakeside	
Critical Asset Vulnerability	The City of Lakeside is home to critical facilities that would be vulnerable to the effects of a flood. This includes a city building, a water pump station, a waste water facility, and two gas wells.
Vulnerable Populations	Approximately 18.4% of the population in Lakeside consists of individuals who are 65 years or older. In addition, approximately 3.0 % of individuals in Lakeside live below the poverty line. While a flood poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a flood threat or relocate after a flood has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a flood could result in environmental impacts to the city of Lakeside. Such impacts could include contamination of soil, and water systems.
City of North Richland Hills	
Critical Asset Vulnerability	The City of North Richland Hills is home to critical facilities that would be vulnerable to the effects of a flood. This includes city buildings, water storage facilities, sewage lift stations, pump stations and a hospital.
Vulnerable Populations	Approximately 12.3% of the population in North Richland Hills consists of individuals who are 65 years or older. In addition, approximately 7.5 % of individuals in North Richland Hills live below the poverty line. While a flood poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a flood threat or relocate after a flood has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a flood could result in environmental impacts to the city of North Richland Hills. Such impacts could include contamination of soil, and water systems.
City of Richland Hills	
Critical Asset Vulnerability	The City of Richland Hills is home to critical facilities that would be vulnerable to the effects of a flood. This includes city buildings, water storage facilities, sewage lift stations, pump stations and a hospital.
Vulnerable Populations	Approximately 18.4% of the population in Richland Hills consists of individuals who are 65 years or older. In addition, approximately 7.8% of individuals in Richland Hills live below the poverty line. While a flood poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a flood threat or relocate after a flood has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a flood could result in environmental impacts to the city of Richland Hills. Such impacts could include contamination of soil, and water systems.
City of Saginaw	

Vulnerability to Flooding	
Critical Asset Vulnerability	The City of Saginaw is home to critical facilities that would be vulnerable to the effects of a flood. This includes a city building and a county fire alarm center. The city is also home to several food processing and industrial facilities.
Vulnerable Populations	Approximately 6.8% of the population in Saginaw consists of individuals who are 65 years or older. In addition, approximately 4.2 % of individuals in Saginaw live below the poverty line. While a flood poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a flood threat or relocate after a flood has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a flood could result in environmental impacts to the city of Saginaw. Such impacts could include contamination of soil, and water systems.
City of Southlake	
Critical Asset Vulnerability	The City of Southlake is home to critical facilities that would be vulnerable to the effects of a flood. This includes a city buildings valued at 15.2 million, a hospital valued at 10.3 million, and school facilities valued at 284 million. In addition, there are two nursing facilities valued at 16.3 million, as well as several major employers.
Vulnerable Populations	Approximately 5.9% of the population in Southlake consists of individuals who are 65 years or older. In addition, approximately 3.3 % of individuals in Southlake live below the poverty line. While a flood poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a flood threat or relocate after a flood has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a flood could result in environmental impacts to the city of Southlake. Such impacts could include contamination of soil, and water systems.
Tarrant County	
Critical Asset Vulnerability	Tarrant County is home to critical facilities that would be vulnerable to the effects of a flood. This includes county buildings valued at 628.2 million, school district facilities, Dallas Fort Worth International Airport, and healthcare facilities.
Vulnerable Populations	Approximately 9.9% of the population in Tarrant County consists of individuals who are 65 years or older. In addition, approximately 14.7 % of individuals in Tarrant County live below the poverty line. While a flood poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a flood threat or relocate after a flood has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a flood could result in environmental impacts to Tarrant County. Such impacts could include contamination of soil, water ways, and water systems.
City of Watauga	
Critical Asset Vulnerability	The city of Watauga is home to critical facilities that would be vulnerable to the effects of a flood. This includes city buildings valued at 18.1 million.
Vulnerable Populations	Approximately 7.4% of the population in Watauga consists of individuals who are 65 years or older. In addition, approximately 8.1 % of individuals in Watauga live below the poverty line. While a flood poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a flood threat or relocate after a flood has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a flood could result in environmental impacts to the city of Watauga. Such impacts could include contamination of soil, water ways, and water systems.
City of Westlake	
Critical Asset Vulnerability	The city of Westlake is home to critical facilities that would be vulnerable to the effects of a flood. This includes a water pump station valued at 4 million, a fire station valued at $300,000,

Vulnerability to Flooding	
	a charter school, and a university. There are also two large employers in the city, Fidelity Investments and the Solana Business Complex.
Vulnerable Populations	Approximately 11.6% of the population in Westlake consists of individuals who are 65 years or older. In addition, approximately 2.7 % of individuals in Westlake live below the poverty line. While a flood poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a flood threat or relocate after a flood has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a flood could result in environmental impacts to the city of Westlake. Such impacts could include contamination of soil, water ways, and water systems.
City of Westworth Village	
Critical Asset Vulnerability	The city of Westworth Village is home to critical facilities that would be vulnerable to the effects of a flood. This includes two city facilities valued at 4.9 million, as well as a school.
Vulnerable Populations	Approximately 11.5% of the population in Westworth Village consists of individuals who are 65 years or older. In addition, approximately 9.1 % of individuals in Westworth Village live below the poverty line. While a flood poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of a flood threat or relocate after a flood has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by a flood could result in environmental impacts to the city of Westworth Village. Such impacts could include contamination of soil and water systems.

Vulnerability

The following chart provides the potential impact of flooding for all participating jurisdictions. Potential losses should flooding impact each jurisdiction are provided in Appendix G where the value of each piece of critical infrastructure is detailed for building and contents losses.

Flooding

44 CFR Requirement 201.6 (c)(2)(ii)
The risk assessment **must** also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged by floods.

Frequency of Occurrence	Likely
Warning Time*	3-6 Hours**
Geographic Extent	Community-wide
Potential Impact	Major

*For the purposes of the hazard Flooding, "forecast warning" is defined as the amount of time necessary to determine whether severe weather has the potential to impact a jurisdiction. This should not be confused with the National Weather Service's definition or use of the term "warning".
**The warning time for flash flooding likely will be minimal to zero.

Multijurisdictional Concerns

Previous mitigation measures have occurred at the local and county level, some of which were identified in the hazard identification section of this hazard profile. Tarrant County participates in the NFIP of the FEMA. As a participating community, Tarrant County has adopted floodplain management practices through several ordinances that severely limit the development allowed in 100-year floodplains (the area inundated by a storm that has a 1 percent chance of happening in any year). Tarrant County prohibits new construction within the regulatory flood protection

elevation. No structures are permitted within the floodway. In the flood fringe district, only structures that are a minimum of 1 foot above the regulatory flood protection elevation are permitted.

To provide a sense of the flood risk in a community, it is also beneficial to summarize the policies in force and claims statistics from the 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. Tarrant County has been a member of the NFIP since 1974.

All eligible participating jurisdictions participate in the NFIP. Dallas Fort Worth International Airport and the NCTCOG are not eligible and therefore do not participate. They actively work with other jurisdictions to ensure awareness of floodplain issues and compliance programs. The table below identifies the Community Identification number and map dates for each eligible participating jurisdiction.

Table 4-7
Tarrant County Communities Participating in the NFIP

CID	Community Name	County	Initial Flood Hazard Boundary Map Identified	Initial Flood Insurance Rate Map Identified	Current Effective Map Date
485454 #	Arlington, City of	Tarrant County	8/7/1970	12/31/1974	9/25/2009
480584 #	Azle, City of	Parker County/Tarrant County	3/8/1974	10/15/1985	9/25/2009
480585 #	Bedford, City of	Tarrant County	12/28/1973	7/18/1977	9/25/2009
480587 #	Blue Mound, City of	Tarrant County	12/17/1973	7/16/1980	9/25/2009
480590 #	Colleyville, City of	Tarrant County	5/10/1974	12/1/1982	9/25/2009
480591 #	Crowley, City of	Tarrant County	5/15/1979	4/15/1981	9/25/2009
480593 #	Euless, City of	Tarrant County	3/22/1974	4/3/1985	9/25/2009
480595 #	Forest Hill, City of	Tarrant County	1/23/1974	8/1/1978	9/25/2009
480596 #	Fort Worth, City of	Denton County/Tarrant County	9/17/1971	6/4/1980	4/18/2011
480598 #	Grapevine, City of	Denton County/ Dallas County/ Tarrant County	06/28/1974	11/17/1982	04/18/2011
480599 #	Haltom City, City of	Tarrant County	6/28/1974	2/1/1978	9/25/2009

CID	Community Name	County	Initial Flood Hazard Boundary Map Identified	Initial Flood Insurance Rate Map Identified	Current Effective Map Date
480600 #	Haslet, City of	Denton County/Tarrant County	11/1/1974	10/15/1985	(NSFHA)
480601 #	Hurst, City of	Tarrant County	6/14/1974	10/15/1985	9/25/2009
480602 #	Keller, City of	Tarrant County	11/19/1976	9/30/1982	9/25/2009
480603 #	Kennedale, City of	Tarrant County	2/1/1974	11/15/1984	9/25/2009
480605 #	Lake Worth, City of	Tarrant County	11/19/1976	1/6/1993	9/25/2009
480604 #	Lakeside, City of	Tarrant County	4/13/1973	8/23/2000	(NSFHA)
480607 #	North Richland Hills, City of	Tarrant County	6/28/1974	4/1/1981	9/25/2009
480608 #	Richland Hills, City of	Tarrant County	3/15/1974	2/16/1977	9/25/2009
480610 #	Saginaw, City of	Tarrant County	3/8/1974	9/17/1980	9/25/2009
480612 #	Southlake, City of	Denton County/Tarrant County	2/15/1974	7/5/1982	4/18/2011
480582 #	Tarrant County	Tarrant County	2/7/1975	8/4/1987	9/25/2009
480613 #	Watauga, City of	Tarrant County	3/8/1974	6/1/1982	9/25/2009
480614 #	Westlake, Town of	Denton County/Tarrant	12/10/1976	6/2/1993	4/18/2011
480616 #	Westworth Village, City of	Tarrant County	3/8/1974	6/3/1986	9/25/2009

Tarrant County and its participating jurisdictions are actively involved in ensuring compliance with the NFIP program. As a result, they manage and provide floodplain management programs to provide awareness to their citizens as well as mitigate against future flooding. The table below lists the programs currently in progress and planned for each participating jurisdiction for compliance in the NFIP program.

Table 4-8
NFIP Compliance Activities

Jurisdiction	NFIP Compliance Activity	Activity Details
Arlington	Conducting NFIP community workshops to provide information and incentives for property owners to acquire flood insurance	The Storm Water Department frequently goes into the community to educate citizens about and the benefits of flood insurance.
	Completing and maintaining FEMA elevation certificates for pre-FIRM and or post-FIRM buildings	The Storm Water Division, part of Public Works and Transportation, is responsible for issuing floodplain permits.
	Requiring and maintaining FEMA elevation certificates for all new and improved buildings located in floodplains	The Land Use Department is responsible for issuing floodplain permits.

Jurisdiction	NFIP Compliance Activity	Activity Details
	Implementing damage reduction measures for existing buildings such as acquisition, relocation, retrofitting, and maintenance of drainage ways and retention basins	85 properties were acquired in 2010 through the HMGP program.
	Taking action to minimize the effects of flooding on people, property, and building contents through measures including flood warning, emergency response, and evacuation planning	Created a public education campaign for citizens.
Azle	Completing and maintaining FEMA elevation certificates for pre-FIRM and or post-FIRM buildings	The Land Use Department is responsible for issuing floodplain permits.
	Requiring and maintaining FEMA elevation certificates for all new and improved buildings located in floodplains	The Land Use Department is responsible for issuing floodplain permits.
	Taking action to minimize the effects of flooding on people, property, and building contents through measures including flood warning, emergency response, and evacuation planning	Storm water management policy and public outreach of storm water.
Bedford	Completing and maintaining FEMA elevation certificates for pre-FIRM and or post-FIRM buildings	The Public Works Department's Flood Plain Administrator is responsible for issuing floodplain permits after review of: (1) LOMR's approved by FEMA, and (2) elevation certificates prepared by registered surveyors.
	Requiring and maintaining FEMA elevation certificates for all new and improved buildings located in floodplains	The Public Works Department's Flood Plain Administrator is responsible for issuing floodplain permits after elevation certificates have been prepared by registered surveyors.
	Implementing damage reduction measures for existing buildings such as acquisition, relocation, retrofitting, and maintenance of drainage ways and retention basins	Seven properties were acquired in 2012 through the HMGP program. Public Works Department provides an ongoing program of maintenance of drainage channels and storm drainage systems.
	Taking action to minimize the effects of flooding on people, property, and building contents through measures including flood warning, emergency response, and evacuation planning	Flood warning, emergency response, and evacuation planning are all implemented through City's website and emergency phone notifications.
Blue Mound		
Colleyville	Completing and maintaining FEMA elevation certificates for pre-FIRM and or post-FIRM buildings	The Engineering Department is responsible for issuing floodplain permits.
	Requiring and maintaining FEMA elevation certificates for all new and improved buildings located in floodplains	The Engineering Department is responsible for issuing floodplain permits.
	Implementing damage reduction measures for existing buildings such as acquisition, relocation, retrofitting, and maintenance of drainage ways and retention basins	Improved the drainage system around home that have flooded.
	Taking action to minimize the effects of flooding on people, property, and building contents through measures including flood	Placed a high water warning system in the creek that floods our roads. Updated codes to require retention ponds in new development/

Jurisdiction	NFIP Compliance Activity	Activity Details
	warning, emergency response, and evacuation planning	
Crowley	Completing and maintaining FEMA elevation certificates for pre-FIRM and or post-FIRM buildings	The Building Official is responsible for issuing floodplain permits.
	Requiring and maintaining FEMA elevation certificates for all new and improved buildings located in floodplains	The Building Official is responsible for issuing floodplain permits.
	Implementing damage reduction measures for existing buildings such as acquisition, relocation, retrofitting, and maintenance of drainage ways and retention basins	Maintenance of drainage ways and retention basins. Installation of retention basins on new construction.
	Taking action to minimize the effects of flooding on people, property, and building contents through measures including flood warning, emergency response, and evacuation planning	Flood warning by way of existing public notification systems, emergency response, and evacuation planning.
DFW	DFW is not eligible to participate in the NFIP program	
Euless	Completing and maintaining FEMA elevation certificates for pre-FIRM and or post-FIRM buildings	The Building Department is responsible for issuing floodplain permits.
	Requiring and maintaining FEMA elevation certificates for all new and improved buildings located in floodplains	The Building Department is responsible for issuing floodplain permits.
	Implementing damage reduction measures for existing buildings such as acquisition, relocation, retrofitting, and maintenance of drainage ways and retention basins	Acquired 1 property in 2003 to remove from the floodplain. Maintenance of drainage ways is conducted regularly.
Forest Hill	Taking action to minimize the effects of flooding on people, property, and building contents through measures including flood warning, emergency response, and evacuation planning	Areas are monitored during flooding conditions and citizens notified through our automatic phone system if and when necessary.
Fort Worth	Conducting NFIP community workshops to provide information and incentives for property owners to acquire flood insurance	City Floodplain Administrator provides insurance information to all residents annually by direct mail. Also sends annual letters to all properties in Repetitive Loss Areas and to Repetitive Loss Structures. Also works with NFIP outreach staff to host and conduct periodic flood insurance workshops for lenders and insurance agents.
	Completing and maintaining FEMA elevation certificates for pre-FIRM and or post-FIRM buildings	City Floodplain Administrator maintains copies of all elevation certificates available for pre-FIRM and post-FIRM structures.
	Requiring and maintaining FEMA elevation certificates for all new and improved buildings located in floodplains	City Floodplain Administrator maintains copies of all new and improved buildings located in floodplains.
	Implementing damage reduction measures for existing buildings such as acquisition, relocation, retrofitting, and maintenance of drainage ways and retention basins	Purchased 163 properties in the floodplain with City funds, and 12 properties in the floodplain with FEMA grant funds.
	Taking action to minimize the effects of flooding on people, property, and building contents through measures including flood	High Water Warning System is deployed at 53 roadway crossings prone to overtopping during

Jurisdiction	NFIP Compliance Activity	Activity Details
	warning, emergency response, and evacuation planning	storm events. City is presently evaluating an active Flood Early Warning System.
Grapevine	Completing and maintaining FEMA elevation certificates for pre-FIRM and or post-FIRM buildings	The Land Use Department is responsible for issuing floodplain permits.
	Requiring and maintaining FEMA elevation certificates for all new and improved buildings located in floodplains	The Land Use Department is responsible for issuing floodplain permits.
	Implementing damage reduction measures for existing buildings such as acquisition, relocation, retrofitting, and maintenance of drainage ways and retention basins	Acquired 3 properties in 2012 through the HMGP program.
	Taking action to minimize the effects of flooding on people, property, and building contents through measures including flood warning, emergency response, and evacuation planning	Rain gauge warning system in place.
Haltom City	Conducting NFIP community workshops to provide information and incentives for property owners to acquire flood insurance	Community outreach through our City Cross roads publications. Flood plain awareness campaigns.
	Completing and maintaining FEMA elevation certificates for pre-FIRM and or post-FIRM buildings	The Planning & Development Department is responsible for issuing floodplain permits.
	Requiring and maintaining FEMA elevation certificates for all new and improved buildings located in floodplains	The Public Works Department is responsible for issuing floodplain permits.
	Implementing damage reduction measures for existing buildings such as acquisition, relocation, retrofitting, and maintenance of drainage ways and retention basins	Acquired multiple properties in 2010 & 2011 through the HMGP program.
	Taking action to minimize the effects of flooding on people, property, and building contents through measures including flood warning, emergency response, and evacuation planning	Made efforts to identify areas within our city where the potential for ponding and areas that may be prone to flash flooding. These areas do receive some early response to warn the public of the potential of flooding.
Haslet	Completing and maintaining FEMA elevation certificates for pre-FIRM and or post-FIRM buildings	The Land Use Department is responsible for issuing floodplain permits.
	Requiring and maintaining FEMA elevation certificates for all new and improved buildings located in floodplains	The Land Use Department is responsible for issuing floodplain permits.
Hurst	Requiring and maintaining FEMA elevation certificates for all new and improved buildings located in floodplains	
	Implementing damage reduction measures for existing buildings such as acquisition, relocation, retrofitting, and maintenance of drainage ways and retention basins	
	Taking action to minimize the effects of flooding on people, property, and building contents through measures including flood warning, emergency response, and evacuation planning	

Jurisdiction	NFIP Compliance Activity	Activity Details
Keller	Completing and maintaining FEMA elevation certificates for pre-FIRM and or post-FIRM buildings	Elevation certificates records are on file for properties with the City.
	Requiring and maintaining FEMA elevation certificates for all new and improved buildings located in floodplains	No new construction is allowed in a FEMA designated SFHA. Improved buildings within a SFHA are required to be in compliance with the City's Flood plain ordinance.
	Implementing damage reduction measures for existing buildings such as acquisition, relocation, retrofitting, and maintenance of drainage ways and retention basins	Conducted (Drainage Improvements)
	Taking action to minimize the effects of flooding on people, property, and building contents through measures including flood warning, emergency response, and evacuation planning	Low Water Crossing Signs are in place.
Kennedale	Completing and maintaining FEMA elevation certificates for pre-FIRM and or post-FIRM buildings	Floodplain certificate required if in floodplain.
	Requiring and maintaining FEMA elevation certificates for all new and improved buildings located in floodplains	Floodplain certificate required if in floodplain.
	Implementing damage reduction measures for existing buildings such as acquisition, relocation, retrofitting, and maintenance of drainage ways and retention basins	Maintenance is ongoing for existing buildings within Kennedale.
	Taking action to minimize the effects of flooding on people, property, and building contents through measures including flood warning, emergency response, and evacuation planning	Flood warning and emergency notifications are made through the City of Kennedale's emergency notification system.
Lake Worth	Completing and maintaining FEMA elevation certificates for pre-FIRM and or post-FIRM buildings	In 2009, City of Lake Worth Ord #920 adopted the FEMA Standards to Flood Damage Prevention.
	Implementing damage reduction measures for existing buildings such as acquisition, relocation, retrofitting, and maintenance of drainage ways and retention basins	City acquired multiple properties in the flood plain several years ago.
	Taking action to minimize the effects of flooding on people, property, and building contents through measures including flood warning, emergency response, and evacuation planning	Monitored by FD/PD/PW and appropriate actions are taken to mitigate and respond to flooding events. Telephonic alert system in place to assist in warning the public.
Lakeside	Lakeside participates in programs managed by Tarrant County. Please see Tarrant County information for details on NFIP compliance programs.	
NCTCOG	NCTCOG is not eligible for participation in the NFIP program.	
North Richland Hills	Completing and maintaining FEMA elevation certificates for pre-FIRM and or post-FIRM buildings	Public Works is responsible for issuing floodplain permits.

Jurisdiction	NFIP Compliance Activity	Activity Details
	Requiring and maintaining FEMA elevation certificates for all new and improved buildings located in floodplains	Public Works is responsible for issuing floodplain permits.
Richland Hills	Conducting NFIP community workshops to provide information and incentives for property owners to acquire flood insurance	Information is provided on city's website. Questions are answered by City's Engineer in Public Works who maintains log of inquiries and questions.
	Completing and maintaining FEMA elevation certificates for pre-FIRM and or post-FIRM buildings	Richland Hills Public Works/City Engineer is responsible for issuing floodplain permits. Issued with change of ownership.
	Requiring and maintaining FEMA elevation certificates for all new and improved buildings located in floodplains	Richland Hills Public Works / City Engineer t is responsible for issuing floodplain permits.
	Implementing damage reduction measures for existing buildings such as acquisition, relocation, retrofitting, and maintenance of drainage ways and retention basins	Acquired 1 property in 2012 through the HMGP program.
	Taking action to minimize the effects of flooding on people, property, and building contents through measures including flood warning, emergency response, and evacuation planning	With the levee system in place in Richland Hills a pump fail / loss warning system has been installed to notify personnel if pumps fail signaling potential flooding.
Saginaw	Saginaw participates in programs managed by Tarrant County. Please see Tarrant County information for details on NFIP compliance programs.	
Southlake	Completing and maintaining FEMA elevation certificates for pre-FIRM and or post-FIRM buildings	For structures on lots in floodplain
	Requiring and maintaining FEMA elevation certificates for all new and improved buildings located in floodplains	We do not allow construction within floodplain; E.G. if a portion of the lot is in the floodplain.
	Taking action to minimize the effects of flooding on people, property, and building contents through measures including flood warning, emergency response, and evacuation planning	Areas that have a history of flooding are well known and documented. The Comprehensive Emergency Management Plan accounts for the warning, response, and evacuation functions that would be utilized during a response to any hazard, including a flooding event.
Tarrant County	Completing and maintaining FEMA elevation certificates for pre-FIRM and or post-FIRM buildings	The Tarrant County Transportation Department is responsible for issuing floodplain permits.
	Requiring and maintaining FEMA elevation certificates for all new and improved buildings located in floodplains	The Tarrant County Transportation Department is responsible for issuing floodplain permits.
	Implementing damage reduction measures for existing buildings such as acquisition, relocation, retrofitting, and maintenance of drainage ways and retention basins	Acquired 1 property in 2007 through the HMGP program and 1 property in 2012 through the LPDM program.
	Taking action to minimize the effects of flooding on people, property, and building contents through measures including flood warning, emergency response, and evacuation planning	Rain gauge warning system in place.

Jurisdiction	NFIP Compliance Activity	Activity Details
Watauga	Implementing damage reduction measures for existing buildings such as acquisition, relocation, retrofitting, and maintenance of drainage ways and retention basins	Maintain flood channel
	Taking action to minimize the effects of flooding on people, property, and building contents through measures including flood warning, emergency response, and evacuation planning	Rain gauge warning system in place.
Westlake	Completing and maintaining FEMA elevation certificates for pre-FIRM and or post-FIRM buildings	Town Engineer
	Requiring and maintaining FEMA elevation certificates for all new and improved buildings located in floodplains	Contracted Town Engineer.
	Implementing damage reduction measures for existing buildings such as acquisition, relocation, retrofitting, and maintenance of drainage ways and retention basins	Acquired 3 properties in 2012 through the HMGP program.
	Taking action to minimize the effects of flooding on people, property, and building contents through measures including flood warning, emergency response, and evacuation planning	Accomplished via close monitoring of watershed and groundwater flow/ Overflow conditions.
Westworth Village	Completing and maintaining FEMA elevation certificates for pre-FIRM and or post-FIRM buildings	The Code Compliance Department is responsible for issuing & reviewing floodplain permits.
	Requiring and maintaining FEMA elevation certificates for all new and improved buildings located in floodplains	The Code Compliance Department is responsible for issuing & reviewing floodplain permits.
	Taking action to minimize the effects of flooding on people, property, and building contents through measures including flood warning, emergency response, and evacuation planning	Our Public Works & Police Departments monitor area creeks and roads to ensure barricade, flow issue, and evacuations are made as needed.

Participation in the NFIP implies a level of floodplain compliance and enforcement as well. The following table details each NFIP participating community's floodplain activities.

Jurisdiction	Floodplain Manager	Floodplain ordinances	Floodplain Ordinance Enforcement
Arlington	Stormwater Executive Manager, Department of Public Works & Transportation	Flood Damage Prevention, Ordinance No. 10-011	The City of Arlington uses permitting processes, fines and legal suits to enforce floodplain ordinances.
Azle	Storm Water Manager	Stormwater 821-01-02	Voluntary correction, fines or fees
Bedford	Bedford has a contacted Flood Manager - Dick Perkins - (dick.perkins@sbcglobal.net)	Ordinances Chapter 62 Sections 62-1 thru 62-30	Through - Variances, Fines, Fee's

Jurisdiction	Floodplain Manager	Floodplain ordinances	Floodplain Ordinance Enforcement
Blue Mound	Blue Mound does not have a floodplain manager	There are no floodplain ordinances in place.	There are no floodplain ordinances to enforce.
Colleyville	City Engineer	Flood Damage Prevention Ordinance, Chapter 50 of the Code of Ordinances	Regulated through permitting, building inspections and code enforcement
Crowley	Building Official	082009-97	Permits and Fees
DFW	List the position that acts as Floodplain Manager.	Our floodplain manager coordinates all floodplain issues with the local jurisdiction that coincides with the given area of the Airport.	All ordinances, including enforcement, from Coppel, Euless, Grapevine and Irving remain in place and are enforced by those organizations.
Euless	Civil Engineer	Chapter 38 of Euless Municipal Ordinances	Fines
Forest Hill	Public Works Director	Flood Hazard Prevention Ordinance	No permit issuance if application in conflict with ordinance; Stop Orders; Ordinance Violation Citation; Fine up to $2,000 per ordinance violation offense
Fort Worth	City of Fort Worth Floodplain Manager	#18816-09-2009 Floodplain Provisions Ordinance Chapter 7 Articles VIII	Building permitting requirements, Code Compliance personnel, fees and fines, boards and commissions.
Grapevine	Public Works Engineer	Grapevine Code of Ordinances ARTICLE X. - FLOOD DAMAGE PREVENTION, Section 7	Fees and Fines
Haltom City	City Engineer	Chapter 38 - FLOOD PROTECTION AND PREVENTION of the Haltom City Code of Ordinances	Regulated through permitting, building inspections and code enforcement
Haslet	Public Works Director	Section 11 - 210 Flood Plain District, Permit Fee 3.02.004	Floodplain development fee is $500.
Hurst	City Engineer	Ordinances Numbers - 1086, 1183, 1274, 1499, 2058 (current)	Building Permits are required and projects are reviewed before permits are issued to ensure compliance. A violation of this ordinance is subject to assessment of civil penalties between $100 to $2,000 per day the offense continues.
Keller	Public Works Director	Flood Hazard Prevention Ordinance (2009)	No permit issuance if application in conflict with ordinance; Stop Orders; Ordinance Violation Citation;Fine up to $2,000 per ordinance violation offense
Kennedale	Building Inspector is a State Certified Floodplain Manager	Ord. No. 230, § 1, 03/14/2002	Application for new development won't be approved without assessment of impact fees pursuant to this article, and no water and wastewater tap shall be issued and no building permit shall be issued unless the applicant or builder has paid the impact fees calculated and imposed hereunder.

Jurisdiction	Floodplain Manager	Floodplain ordinances	Floodplain Ordinance Enforcement
Lake Worth	City Manager	Ordinance 920 adopted 7/14/2009	Fine structure is listed in Ordinance 920.
Lakeside	Town Administrator	Ordinance 302	Fine: $2,000 for each violation plus court costs.
North Richland Hills	City Engineer	Chapter 102- Floods and Stormwater Management, Article II- Flood Damage Prevention	Regulated through permitting, building inspections and code enforcement
Richland Hills	Per City Ordinance the City Manager or their designee is the Floodplain Administrator. The City Manager has assigned the position of Floodplain Manager to the City Engineer.	Richland Hills Code of Ordinances, Chapter 42 - Floods, Article II. Flood Damage Prevention, Sections 42-31 thru 42.110	Flood prevention is enforced through the use of ordinances, permit fees and plan reviews, and fines assigned by City Judge if necessary
Saginaw	Economic Development/Public Works Director in coordination with the City Engineer	Flood Damage Prevention Ordinance 2009-09. Article 1 Chapter 38 of City Code of Ordinances.	Issuance of permits for work approved after review and no issuance of permits not meeting or in direct conflict of codes, ordinances and/or safety requirements. Issuance of Stop Orders and citations. Fines of $200 to $2000 per ordinance violation, per day.
Southlake	Civil Engineer/ Floodplain Manager	Ordinance 641-A	The ordinance allows for fines, however, we typically do not assess fines. We work with the property owner to mitigation any violations.
Tarrant County	County Engineer / Floodplain Administrator	Tarrant County participates in the National Flood Insurance Program (NFIP) through Court Order #: 111021, was approved by Commissioners Court on 8/23/2011. This allows our County Engineer, in coordination with the District Attorney, to enforce flood plain regulations as set forth in the CFR 44, parts 59-78. Continued compliance is difficult with our lack of authority to impose building codes and/or zoning in the unincorporated areas of Tarrant County. Despite our ability to enforce building codes, etc., we do have several mechanisms in place which triggers checks by the County Engineer to ensure development within the unincorporated areas are done so according to not only our Court Order and the CFR 44, but also according to best management practices within the	

Jurisdiction	Floodplain Manager	Floodplain ordinances	Floodplain Ordinance Enforcement
		16 county COG regions. Driveway permits, septic tank permits, platting, fire code inspections are a few of the items which trigger further investigation to ensure development is properly permitted and constructed. In addition, any infrastructure work that occurs within the unincorporated areas are signed and sealed by the County Engineer and as part of the requirements set forth by the Court Order and CFR 44, designs are done according to those standards as well.	
Watauga	Public Works Director - Keith Miertschin	City of Watauga Code of Ordinances; Subpart B - Land Development; Chapter 105 Enviormental Protection;	Sec. 105-25. - Enforcement. Suspension or revocation of permit; issuance of citation. In the event that any person holding a site development permit pursuant to this article violates the terms of the permit or implements site development in such a manner as to have a materially adverse effect on the health, welfare, or safety of persons residing or working in the neighborhood or development site so as to be materially detrimental to the public welfare or injurious to property or improvements in the neighborhood, the city may suspend or revoke the site development permit or issue citations for violations. Violations; penalty. No person shall construct, enlarge, alter, repair, or maintain any grading, excavation, or fill, or cause the same to be done, contrary to or in violation of any terms of this article. Any person, partnership or corporation violating any of the provisions of this article shall be deemed guilty of a misdemeanor, and each day during which any violation of any of the provisions of this article is committed, continued, or permitted shall constitute a separate offense. Upon conviction of any such violation, such person, partnership, or corporation shall be punished by

Jurisdiction	Floodplain Manager	Floodplain ordinances	Floodplain Ordinance Enforcement
			a fine in accordance with the general penalty provision in section 1-7. In addition to any other penalty authorized by this section, any person, partnership, or corporation convicted of violating any of the provisions of this article shall be required to bear the expense of such restoration.
Westlake	Graham Associates	Article II: Floodplain	Procedures are in place to penalize those without proper permits: Westlake Ordinances 42-37
Westworth Village	Mayor or Mayor's Designee	Article 3.06 FLOOD HAZARD PREVENTION 3.06.001 to 3.06.075	Included as part of the Ordinances, Class C MISD, fines not to exceed $2000 per incident per day

Tarrant County Repetitive Loss Information

Repetitive loss properties are a serious concern from a mitigation standpoint. A repetitive loss property is considered so when there are two or more flood insurance claims that were paid more than $1,000 for each loss. The losses must be within 10 years of each other and must be at least 10 days apart. A property is considered a severe repetitive loss property when there are at least four losses (each exceeding $5,000), or when there are two or more losses where the building payments exceed the property value.

Table 4-9
Repetitive Loss Properties in Tarrant County and Participating Jurisdictions

City	Type (Residential, Commercial, Industrial)	Location in Flood Plain (Floodway, SFHA, 500 year)
Arlington	Single Family	C
Arlington	Single Family	A04
Arlington	Resident	X
Arlington	Non-Resident	A04
Arlington	Non-Resident	X
Arlington	Single Family	B
Arlington	Non-Resident	X
Arlington	Non-Resident	AE
Arlington	Resident	X
Arlington	Non-Resident	AE
Arlington	Non-Resident	AE
Arlington	Resident	X
Arlington	Resident	AE
Arlington	Single Family	X
Arlington	Resident	AE
Arlington	Non-Resident	X
Arlington	Single Family	X
Arlington	Single Family	AE
Arlington	Single Family	AE
Arlington	Assmd Condo	X
Arlington	Non-Resident	AE
Arlington	Other Resident	AE
Arlington	2-4 Family	AE
Arlington	Single Family	AE
Arlington	Single Family	AE
Arlington	Single Family	AE

City	Type (Residential, Commercial, Industrial)	Location in Flood Plain (Floodway, SFHA, 500 year)
Arlington	Single Family	AE
Arlington	2-4 Family	AE
Arlington	2-4 Family	AE
Arlington	2-4 Family	AE
Arlington	2-4 Family	AE
Arlington	Resident	X
Arlington	Single Family	AE
Arlington	Single Family	X
Arlington	Single Family	C
Arlington	Single Family	X
Arlington	Single Family	X
Arlington	Single Family	A
Arlington	2-4 Family	C
Arlington	Resident	B
Arlington	Resident	A
Arlington	Non-Resident	B
Arlington	Single Family	C
Arlington	Single Family	C
Arlington	Non-Resident	B
Arlington	Non-Resident	B
Arlington	Non-Resident	B
Arlington	Resident	X
Arlington	Non-Resident	B
Arlington	Resident	X
Arlington	Single Family	X
Arlington	Resident	C
Arlington	Resident	AE

City	Type (Residential, Commercial, Industrial)	Location in Flood Plain (Floodway, SFHA, 500 year)
Arlington	Resident	AE
Arlington	Resident	AE
Arlington	Single Family	x
Arlington	Single Family	X
Arlington	Non-Resident	A06
Arlington	Single Family	X
Arlington	Single Family	X
Arlington	Single Family	X
Arlington	Single Family	AE
Arlington	Single Family	X
Arlington	Single Family	AE
Arlington	Single Family	AE
Arlington	Single Family	AE
Arlington	Single Family	AE
Arlington	Single Family	AE
Arlington	Single Family	AE
Arlington	Single Family	AE
Arlington	Single Family	A06
Arlington	Resident	X
Arlington	Single Family	AE (Floodway)
Arlington	Resident	AE
Arlington	Resident	X
Arlington	Resident	AE
Arlington	Single Family	AE (Floodway)
Arlington	Resident	C
Arlington	Resident	A
Arlington	Single Family	C

City	Type (Residential, Commercial, Industrial)	Location in Flood Plain (Floodway, SFHA, 500 year)
Arlington	Single Family	x
Arlington	Resident	X
Arlington	Single Family	A04
Arlington	Single Family	AE
Arlington	Single Family	X
Arlington	Single Family	C
Azle	Residential	Unincorporated County area
Azle	Residential	Unincorporated County area
Azle	Residential	Unincorporated County area
Azle	Residential	Zone A No base flood elevation
Azle	Residential	Unincorporated County area
Azle	Residential	Unincorporated County area
Azle	Residential	Unincorporated County area
Bedford	Residential	Zone X
Bedford	Residential	Zone X, AE
Bedford	Residential	No Flood Zone
Bedford	Residential	Zone X
Bedford	Residential	Zone X
Colleyville	Residential	500 year
Colleyville	Residential	Floodway
Colleyville	Residential	100 year
Colleyville	Residential	100 year
Colleyville	Residential	Floodway
Crowley	Unknown	Unincorporated Tarrant County
Crowley	Unknown	Unincorporated Tarrant County
Euless	Residential	AE
Euless	Residential	N/A

City	Type (Residential, Commercial, Industrial)	Location in Flood Plain (Floodway, SFHA, 500 year)
Euless	Residential	AE
Euless	Residential	AE
Euless	Residential	AE
Euless	Residential	AE
Euless	Residential	AE
Euless	Residential	AE
Euless	Residential	AE
Euless	Residential	AE
Euless	Residential	AE
Euless	Residential	AE
Euless	Residential	AE
Euless	Residential	AE
Euless	Residential	AE
Euless	Residential	AE
Fort Worth	RESIDENTIAL	X (UNSHADED)
Fort Worth	RESIDENTIAL	X (UNSHADED)
Haltom City	Commercial	AE (riverine)
Haltom City	Commercial	AE (riverine)
Haltom City	Commercial	AE (riverine)
Haltom City	Residential	AE
Haltom City	Residential	AE
Haltom City	Residential	AE
Haltom City	Residential	AE
Haltom City	Residential	A
Haltom City	Residential	A
Haltom City	Residential	X
Haltom City	Commercial	X
Haltom City	Commercial	AE (riverine)

City	Type (Residential, Commercial, Industrial)	Location in Flood Plain (Floodway, SFHA, 500 year)
Haltom City	Commercial	AE (riverine)
Haltom City	Commercial	AE
Hurst	Residential	Floodway in drainage ditch across west side of lot; house in SFHA
Hurst	Residential	Lot and House in SFHA
Hurst	FEMA Buyout 2000	N/A - no structures -
Hurst	FEMA Buyout 2000	N/A - no structures -
Hurst	Residential	Floodway in drainage ditch across west side of lot; house in SFHA
Hurst	Residential	Floodway in drainage ditch across west side of lot; house in SFHA
Hurst	FEMA Buyout 2000	N/A - no structures -
Hurst	FEMA Buyout 2000	N/A - no structures -
Hurst	FEMA Buyout 2000	N/A - no structures -
Hurst	Residential	Small portion o lot in SFHA; House not in SFHA.
Hurst	FEMA Buyout 2000	N/A - no structures -
Keller	Residential	Zone AE
Keller	Residential	Zone AE
Keller	Residential	Shaded Zone X
Keller	Residential	Zone X
Kennedale	Residential	Zone X
Kennedale	Residential	AE
North Richland Hills	Residential	Zone X
North Richland Hills	Residential	AE
North Richland Hills	Residential	AE
North Richland Hills	Residential	Zone X
North Richland Hills	Residential	Zone X
North Richland Hills	Residential	Zone X
North Richland Hills	Commercial	AE / Floodway
North Richland Hills		

City	Type (Residential, Commercial, Industrial)	Location in Flood Plain (Floodway, SFHA, 500 year)
Richland Hills	Residential	Floodway
Richland Hills	Park Land (previous residential)	SFHA / Floodway
Richland Hills	Park Land (previous residential)	SFHA / Floodway
Richland Hills	Park Land (previous residential)	SFHA / Floodway
Richland Hills	Park Land (previous residential)	SFHA / Floodway
Richland Hills	Park Land (previous residential)	SFHA / Floodway
Richland Hills	Residential	SFHA
Richland Hills	Residential	Floodway
Richland Hills	Residential	Floodway
Richland Hills	Residential	Floodway
Richland Hills	Residential	Floodway
Richland Hills	Residential	SFHA
Richland Hills	Residential	SFHA
Richland Hills	Park Land (previous residential)	SFHA / Floodway
Saginaw	Commercial - Government Bldg.	Floodway
Uninc.	Residential	AE (pool el)
Unincorporated Tarrant County	Residential	AE
Unincorporated Tarrant County	Residential	AE
Watauga	Residential	SFHA
Watauga	Residential	SFHA
Watauga	Residential	SFHA
Watauga	Residential	SFHA
Watauga	Residential	SFHA
Watauga	Residential	SFHA
Watauga	Residential	SFHA
Watauga	Residential	SFHA
Watauga	Residential	SFHA

City	Type (Residential, Commercial, Industrial)	Location in Flood Plain (Floodway, SFHA, 500 year)
Watauga	Residential	SFHA
Watauga	Residential	SFHA
Watauga	Residential	SFHA
Watauga	Residential	SFHA
Watauga	Residential	SFHA

The City of Arlington calculated potential losses based on the HAZUS model for flooding. The flood model was run using two scenarios: the 100-year and 500-year recurrence intervals. The potential damages of these storm events for the city are shown in the table below.

Table 4-10
Potential Losses from Flooding

Parameter	Value/Number 100-Year Event	Value/Number 500-Year Event
People Displaced	4,319	5,102
Housing Units	1,080	1,328
Residential	$145.3 million	$182.8 million
Commercial	$26.2 million	$34.0 million
Other Facility	$11.5 million	$15.6 million
Total	$183.0 million	$232.4 million

Land Use and Development Trends

Portions of the Tarrant County Subdivision Regulations and Land Use Regulations regulate not only how land in designated floodplain areas may be used or altered, but the location and types of structures that are permitted in those areas. There are no zoning requirements in the unincorporated areas of Tarrant County.

Floodplain maps for Tarrant County and its jurisdictions have undergone the update process in recent years. The current effective map date for each jurisdiction may be found above in Table 4-7.

Hazard Summary

The risk for flooding in Tarrant County is moderate, due largely in part to previous mitigation measures. The Tarrant County LMAPC recognized the dangers posed by flooding and has identified specific mitigation actions that have been taken and would be considered in the future.

4.1.3 Severe Thunderstorms and High Winds

Hazard Definition

Severe thunderstorms include thunderstorms and winds associated with the thunderstorms. Thunderstorm winds are generally short in duration, involving straight-line winds and/or gusts in excess of 50 mph. Thunderstorm winds tend to affect areas of Tarrant County with significant tree stands as well as areas with exposed property and infrastructure and aboveground utilities. Thunderstorm winds can cause power outages, transportation and economic disruptions, and significant property damage, and pose a high risk for injuries and loss of life.

Thunderstorm winds are measured according to the Beaufort Wind Scale, provided below. Tarrant County and its participating jurisdictions can expect winds from the lower range of the wind scale to a force of 12 or wind speeds over 71 knots.

Table 4-11
Beaufort Wind Scale[11]

Force	Speed		Description	Specifications for use at sea
	(mph)	(knots)		Specifications for use on land
0	0-1	0-1	Calm	Sea like a mirror.
				Calm; smoke rises vertically.
1	1-3	1-3	Light Air	Ripples with the appearance of scales are formed, but without foam crests.
				Direction of wind shown by smoke drift, but not by wind vanes.
2	4-7	4-6	Light Breeze	Small wavelets, still short, but more pronounced. Crests have a glassy appearance and do not break.
				Wind felt on face; leaves rustle; ordinary vanes moved by wind.
3	8-12	7-10	Gentle Breeze	Large wavelets. Crests begin to break. Foam of glassy appearance. Perhaps scattered white horses.
				Leaves and small twigs in constant motion; wind extends light flag.
4	13-18	11-16	Moderate Breeze	Small waves, becoming larger; fairly frequent white horses.
				Raises dust and loose paper; small branches are moved.
5	19-24	17-21	Fresh Breeze	Moderate waves, taking a more pronounced long form; many white horses are formed.
				Small trees in leaf begin to sway; crested wavelets form on inland waters.
6	25-31	22-27	Strong Breeze	Large waves begin to form; the white foam crests are more extensive everywhere.
				Large branches in motion; whistling heard in telegraph wires; umbrellas used with difficulty.

[11] Source: National Weather Service, http://www.nws.noaa.gov/

Force	Speed		Description	Specifications for use at sea
	(mph)	(knots)		Specifications for use on land
7	32-38	28-33	Near Gale	Sea heaps up and white foam from breaking waves begins to be blown in streaks along the direction of the wind.
				Whole trees in motion; inconvenience felt when walking against the wind.
8	39-46	34-40	Gale	Moderately high waves of greater length; edges of crests begin to break into spindrift. The foam is blown in well-marked streaks along the direction of the wind.
				Breaks twigs off trees; generally impedes progress.
9	47-54	41-47	Severe Gale	High waves. Dense streaks of foam along the direction of the wind. Crests of waves begin to topple, tumble and roll over. Spray may affect visibility
				Slight structural damage occurs (chimney pots and slates removed)
10	55-63	48-55	Storm	Very high waves with long overhanging crests. The resulting foam, in great patches, is blown in dense white streaks along the direction of the wind. On the whole, the surface of the sea takes on a white appearance. The tumbling of the sea becomes heavy and shock-like. Visibility affected.
				Seldom experienced inland; trees uprooted; considerable structural damage occurs.
11	64-72	56-63	Violent Storm	Exceptionally high waves (small and medium-size ships might be for a time lost to view behind the waves). The sea is completely covered with long white patches of foam lying along the direction of the wind. Everywhere the edges of the wave crests are blown into froth. Visibility affected.
				Very rarely experienced; accompanied by widespread damage.
12	72-83	64-71	Hurricane	The air is filled with foam and spray. Sea completely white with driving spray; visibility very seriously affected.
				See Saffir-Simpson Hurricane Scale.

Hazard Identification

The most prevalent natural hazard event occurring in Tarrant County is severe thunderstorms and the winds from these thunderstorms. During the spring and summer months, Tarrant County typically experiences multiple thunderstorms, some with significant winds. Over the past 50 years, 306 severe thunderstorm or high wind events occurred within Tarrant County and its participating jurisdictions. A review of historical weather data indicates there is a very significant chance of severe summer thunderstorm winds affecting Tarrant County and the participating jurisdictions each year. Severe summer thunderstorm winds occur more frequently than any other natural hazard incident within Tarrant County and the participating jurisdictions.

Several severe thunderstorms of note have occurred in Tarrant County. The City of Colleyville reported a storm on June 2, 2004 with 70 mph winds, which knocked down fencing and caused power outages throughout the City. A severe thunderstorm in June 206 knocked down several

large tree branches near the intersection of State Highway 114 and FM 1709 in Southlake, causing traffic issues.

A high wind event, or derecho, struck North Texas during the evening hours of May 2, 2007. Damaging winds marched across much of North Texas, with several reports of 80 mph winds from the Metroplex eastward and recorded wind speed in Arlington was 60 mph. In Arlington, over 23,000 people lost power as power lines succumbed to the fierce winds. Numerous trees were downed, roofs and metal buildings sustained damage, and several trailers were rolled. A small line of thunderstorms, oriented west to east, developed out ahead of the thunderstorm complex approaching Dallas/Arlington/Fort Worth. These small thunderstorms quickly became mini-super cells, or rotating storms capable of producing tornadoes. Several reports of funnel clouds as well as a few reports of brief, weak tornadoes were reported near Cleburne and in northern portions of the Tarrant County. However, no damage was reported with these tornadoes.

Straight-line winds caused damage in the City of Hurst on April 10, 2008. City parks, residences, and many trees were damaged and some homes lost power for up to two weeks. To mitigate further damage, the City of Hurst hired a private utility to trim trees in power line right of ways. Within the City of Euless, 79 structures were damaged due to the straight-line winds.

A major wind event occurred in Southlake in June 2009, downing tree limbs and causing power outages. The Streets Department responded to over 20 calls for down tree limbs and power was lost to 7 of Southlake's 13 sewage lift stations. The City of Grapevine reported $75,000 in damage from high winds blowing tractor trailers off highways and power outages that lasted up to 9 days. The same storm severely impacted the City of Fort Worth as the Fort Worth Fire Department responded to a total of 7 structure fires resulting from the storm and costing approximately $1 million in damage.

A 2011 severe thunderstorm caused strong winds, hail, and possible tornado damage to homes in the City of Watauga. This same storm produced damaging hail and heavy rainfall that localized flooding in the City of Fort Worth. The economic impact to the City of Fort Worth for the two-day storm was approximately $350,000; the most costly day being May 24, 2011 with $200,000 in damage on that day alone.

Tarrant County records show that since 1996 alone, damage from high winds and severe thunderstorms has cost Tarrant County and the participating jurisdictions approximately $60,000,000. A list of high-wind events that have impacted participating jurisdictions since 2005 is provided in the table below.

Table 4-12
Severe Thunderstorm and High Winds[12]

Location	Date	Time	Time Zone	Type	Magnitude	Deaths	Injuries	Property Damage Estimate	Crop Damage Estimate
MANSFIELD	4/25/2005	15:15	CST	Thunderstorm Wind	50 kts. ES	0	0	10.00K	0.00K
FT WORTH	6/1/2005	12:19	CST	Thunderstorm Wind	52 kts. MS	0	0	0.00K	0.00K

[12] Source: National Climatic Data Center: http://www.ncdc.noaa.gov/oa/ncdc.html

Location	Date	Time	Time Zone	Type	Magnitude	Deaths	Injuries	Property Damage Estimate	Crop Damage Estimate
KELLER	6/1/2005	12:22	CST	Thunderstorm Wind	58 kts. MS	0	0	0.00K	0.00K
KELLER	7/7/2005	8:45	CST	Thunderstorm Wind	50 kts. ES	0	0	5.00K	0.00K
FT WORTH	8/5/2005	12:50	CST	Thunderstorm Wind	52 kts. ES	0	0	20.00K	0.00K
FT WORTH	8/5/2005	13:45	CST	Thunderstorm Wind	50 kts. ES	0	0	3.00K	0.00K
ARLINGTON	8/6/2005	16:50	CST	Thunderstorm Wind	50 kts. ES	0	0	3.00K	0.00K
TARRANT (ZONE)	2/16/2006	14:00	CST	Strong Wind	40 kts. ES	0	0	1.00K	0.00K
TARRANT (ZONE)	4/7/2006	17:00	CST	Strong Wind	44 kts. MS	0	0	20.00K	0.00K
KELLER	4/19/2006	23:42	CST	Thunderstorm Wind	67 kts. MS	0	0	10.00K	0.00K
TARRANT (ZONE)	5/3/2006	1:55	CST	High Wind	60 kts. ES	0	0	200.00K	0.00K
TARRANT (ZONE)	5/3/2006	1:57	CST	High Wind	60 kts. MS	0	0	0.00K	0.00K
BENBROOK	5/5/2006	2:10	CST	Thunderstorm Wind	50 kts. ES	0	0	0.00K	0.00K
COUNTYWIDE	7/5/2006	15:25	CST	Thunderstorm Wind	52 kts. ES	0	0	20.00K	0.00K
SOUTHLAKE	8/12/2006	17:15	CST	Thunderstorm Wind	50 kts. ES	0	0	0.00K	0.00K
NORTH RICHLAND HILLS	8/12/2006	17:45	CST	Thunderstorm Wind	50 kts. ES	0	0	10.00K	0.00K
HASLET	8/22/2006	17:15	CST	Thunderstorm Wind	65 kts. ES	0	0	10.00K	0.00K
NORTH RICHLAND HILLS	8/23/2006	18:09	CST	Thunderstorm Wind	50 kts. ES	0	0	0.00K	0.00K
CENTRAL PORTION	8/27/2006	15:00	CST	Thunderstorm Wind	50 kts. ES	0	0	5.00K	0.00K
FT WORTH	8/27/2006	15:13	CST	Thunderstorm Wind	54 kts. MS	0	0	0.00K	0.00K
TARRANT (ZONE)	11/15/2006	9:00	CST-6	Strong Wind	47 kts. MG	0	1	35.00K	0.00K
TARRANT (ZONE)	1/11/2007	10:00	CST-6	Strong Wind	35 kts. EG	0	0	25.00K	0.00K
TARRANT (ZONE)	2/24/2007	12:00	CST-6	High Wind	50 kts. MG	0	2	225.00K	0.00K
FT WORTH	4/3/2007	19:30	CST-6	Thunderstorm Wind	50 kts. EG	0	0	10.00K	0.00K
JOHNSONS STATION	4/13/2007	17:29	CST-6	Thunderstorm Wind	61 kts. MG	0	0	0.00K	0.00K
AZLE	4/24/2007	13:00	CST-6	Thunderstorm Wind	50 kts. EG	0	0	2.00K	0.00K
PEDEN	4/24/2007	18:00	CST-6	Thunderstorm Wind	50 kts. EG	0	0	5.00K	0.00K

Location	Date	Time	Time Zone	Type	Magnitude	Deaths	Injuries	Property Damage Estimate	Crop Damage Estimate
RIVER OAKS	4/24/2007	20:12	CST-6	Thunderstorm Wind	52 kts. MG	0	0	0.00K	0.00K
FT WORTH	5/2/2007	17:00	CST-6	Thunderstorm Wind	50 kts. EG	0	0	5.00K	0.00K
FT WORTH	5/2/2007	17:15	CST-6	Thunderstorm Wind	65 kts. EG	0	0	200.00K	0.00K
BENBROOK	5/2/2007	17:20	CST-6	Thunderstorm Wind	65 kts. MG	0	0	0.00K	0.00K
KELLER	5/2/2007	17:45	CST-6	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
JOHNSONS STATION	5/2/2007	17:51	CST-6	Thunderstorm Wind	52 kts. MG	0	0	50.00K	0.00K
BEDFORD	5/2/2007	17:55	CST-6	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
GRAPEVINE	5/2/2007	18:00	CST-6	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
MANSFIELD	5/2/2007	18:30	CST-6	Thunderstorm Wind	56 kts. EG	0	0	40.00K	0.00K
ARLINGTON	5/10/2007	17:00	CST-6	Thunderstorm Wind	56 kts. EG	0	0	30.00K	0.00K
HURST	6/3/2007	7:00	CST-6	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
KELLER	6/3/2007	7:15	CST-6	Thunderstorm Wind	50 kts. EG	0	0	5.00K	0.00K
BEDFORD	6/3/2007	7:20	CST-6	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
GRAPEVINE	6/4/2007	18:45	CST-6	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
ARLINGTON	8/29/2007	16:00	CST-6	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
FT WORTH	10/14/2007	21:00	CST-6	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
RICHLAND HILLS	10/15/2007	6:18	CST-6	Thunderstorm Wind	50 kts. EG	0	0	35.00K	0.00K
KELLER	10/15/2007	6:30	CST-6	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
TARRANT (ZONE)	1/29/2008	10:30	CST-6	High Wind	36 kts. MS	0	0	0.00K	0.00K
WESTWORTH	4/10/2008	2:16	CST-6	Thunderstorm Wind	52 kts. MG	0	0	0.00K	0.00K
SAGINAW	4/10/2008	2:17	CST-6	Thunderstorm Wind	56 kts. EG	0	0	25.00K	0.00K
SAGINAW	4/10/2008	2:20	CST-6	Thunderstorm Wind	65 kts. EG	0	0	650.00K	0.00K
(FTW)MEACHAM ARPT FT	4/10/2008	2:21	CST-6	Thunderstorm Wind	60 kts. MG	0	0	0.00K	0.00K
FT WORTH	4/10/2008	2:25	CST-6	Thunderstorm Wind	65 kts. EG	0	0	50.00K	0.00K
EULESS	4/10/2008	2:35	CST-6	Thunderstorm Wind	56 kts. EG	0	0	25.00K	0.00K

Location	Date	Time	Time Zone	Type	Magnitude	Deaths	Injuries	Property Damage Estimate	Crop Damage Estimate
GRAPEVINE	4/10/2008	2:40	CST-6	Thunderstorm Wind	65 kts. MG	0	0	0.00K	0.00K
SANSOME PARK VLG	4/17/2008	18:40	CST-6	Thunderstorm Wind	50 kts. EG	0	0	20.00K	0.00K
FT WORTH LUCK ARPT	4/17/2008	19:22	CST-6	Thunderstorm Wind	52 kts. MG	0	0	0.00K	0.00K
HASLET	4/17/2008	19:24	CST-6	Thunderstorm Wind	56 kts. MG	0	0	0.00K	0.00K
HALTOM CITY	4/17/2008	19:25	CST-6	Thunderstorm Wind	50 kts. EG	0	0	25.00K	0.00K
MANSFIELD	4/17/2008	19:25	CST-6	Thunderstorm Wind	65 kts. EG	0	0	30.00K	0.00K
KENNEDALE	4/23/2008	20:00	CST-6	Thunderstorm Wind	50 kts. EG	0	0	1.00K	0.00K
TARRANT (ZONE)	4/23/2008	22:42	CST-6	High Wind	52 kts. EG	0	0	0.00K	0.00K
HURST	6/17/2008	10:40	CST-6	Thunderstorm Wind	52 kts. EG	0	0	20.00K	0.00K
POLTECHNIEC	6/17/2008	10:43	CST-6	Thunderstorm Wind	61 kts. MG	0	0	0.00K	0.00K
HANDLEY	6/17/2008	11:05	CST-6	Thunderstorm Wind	50 kts. EG	0	0	3.00K	0.00K
AZLE	6/19/2008	6:04	CST-6	Thunderstorm Wind	56 kts. EG	0	0	35.00K	0.00K
MANSFIELD	6/19/2008	6:20	CST-6	Thunderstorm Wind	50 kts. EG	0	0	15.00K	0.00K
NORTH RICHLAND HILLS	6/25/2008	19:38	CST-6	Thunderstorm Wind	50 kts. EG	0	0	3.00K	0.00K
BEDFORD	8/23/2008	18:15	CST-6	Thunderstorm Wind	50 kts. EG	0	0	35.00K	0.00K
POLTECHNIEC	12/27/2008	8:30	CST-6	Thunderstorm Wind	50 kts. EG	0	0	1.00K	0.00K
HICKS	2/9/2009	3:10	CST-6	Thunderstorm Wind	56 kts. EG	0	0	0.00K	0.00K
HASLET	2/9/2009	3:20	CST-6	Thunderstorm Wind	62 kts. MG	0	0	0.00K	0.00K
EULESS	2/10/2009	21:15	CST-6	Thunderstorm Wind	56 kts. EG	0	0	0.00K	0.00K
TARRANT (ZONE)	4/2/2009	8:00	CST-6	Strong Wind	43 kts. MG	0	0	15.00K	0.00K
BENBROOK	5/2/2009	13:36	CST-6	Thunderstorm Wind	56 kts. MG	0	0	5.00K	0.00K
FT WORTH RUSSELL ARP	5/2/2009	13:46	CST-6	Thunderstorm Wind	52 kts. EG	0	0	5.00K	0.00K
AZLE	5/26/2009	23:50	CST-6	Thunderstorm Wind	52 kts. MG	0	0	6.00K	0.00K
KELLER	5/27/2009	0:08	CST-6	Thunderstorm Wind	56 kts. EG	0	0	6.00K	0.00K
AZLE	6/10/2009	17:25	CST-6	Thunderstorm Wind	65 kts. MG	0	0	7.00K	0.00K

Location	Date	Time	Time Zone	Type	Magnitude	Deaths	Injuries	Property Damage Estimate	Crop Damage Estimate
EAGLE MTN ACRES	6/10/2009	17:25	CST-6	Thunderstorm Wind	65 kts. EG	0	0	3.000M	0.00K
LAKE WORTH	6/10/2009	17:37	CST-6	Thunderstorm Wind	65 kts. MG	0	0	8.00K	0.00K
FT WORTH BLUE MND AR	6/10/2009	17:40	CST-6	Thunderstorm Wind	50 kts. MG	0	0	5.00K	0.00K
WATAUGA	6/10/2009	17:41	CST-6	Thunderstorm Wind	51 kts. MG	0	0	5.00K	0.00K
SOUTH LAKE	6/10/2009	17:41	CST-6	Thunderstorm Wind	61 kts. EG	0	0	10.00K	0.00K
KELLER GOODE ARPT	6/10/2009	17:50	CST-6	Thunderstorm Wind	56 kts. EG	0	0	7.00K	0.00K
GRAPEVINE	6/10/2009	17:55	CST-6	Thunderstorm Wind	70 kts. EG	0	0	12.00K	0.00K
FT WORTH OAK GRVE AR	6/10/2009	17:55	CST-6	Thunderstorm Wind	56 kts. MG	0	0	5.00K	0.00K
TATE SPGS	6/10/2009	18:00	CST-6	Thunderstorm Wind	65 kts. EG	0	0	6.00K	0.00K
EULESS	6/10/2009	18:05	CST-6	Thunderstorm Wind	65 kts. EG	0	0	40.00K	0.00K
EULESS	6/10/2009	18:05	CST-6	Thunderstorm Wind	65 kts. EG	0	0	60.00K	0.00K
MANSFIELD	6/10/2009	18:10	CST-6	Thunderstorm Wind	55 kts. MG	0	0	5.00K	0.00K
MANSFIELD	6/10/2009	18:15	CST-6	Thunderstorm Wind	52 kts. EG	0	0	1.50K	0.00K
ED PIT	6/11/2009	2:23	CST-6	Thunderstorm Wind	61 kts. EG	0	0	4.00K	0.00K
ARLINGTON	6/11/2009	8:30	CST-6	Thunderstorm Wind	50 kts. EG	0	0	2.00K	0.00K
EAGLE MTN LAKE	6/11/2009	9:51	CST-6	Thunderstorm Wind	50 kts. EG	0	0	1.00K	0.00K
KELLER	7/19/2009	15:01	CST-6	Thunderstorm Wind	52 kts. EG	0	0	2.00K	0.00K
(FWH)CARSWELL AFB FT	7/19/2009	16:15	CST-6	Thunderstorm Wind	53 kts. MG	0	0	3.00K	0.00K
NORTH RICHLAND HILLS	7/30/2009	4:15	CST-6	Thunderstorm Wind	56 kts. EG	0	0	15.00K	0.00K
RICHLAND HILLS	8/21/2009	6:30	CST-6	Thunderstorm Wind	50 kts. EG	0	0	10.00K	0.00K
WESTLAND	9/21/2009	18:36	CST-6	Thunderstorm Wind	60 kts. MG	0	0	1.00K	0.00K
FT WORTH OAK GRVE AR	10/1/2009	16:55	CST-6	Thunderstorm Wind	56 kts. EG	0	0	1.00K	0.00K
WHEATLAND	10/25/2009	20:53	CST-6	Thunderstorm Wind	56 kts. EG	0	0	1.00K	0.00K
FT WORTH SAGINAW ARP	5/14/2010	11:05	CST-6	Thunderstorm Wind	50 kts. EG	0	0	3.00K	0.00K
SEMINARY HILL	5/30/2010	16:40	CST-6	Thunderstorm Wind	50 kts. EG	0	0	45.00K	0.00K

Location	Date	Time	Time Zone	Type	Magnitude	Deaths	Injuries	Property Damage Estimate	Crop Damage Estimate
(FTW)MEACHAM ARPT FT	6/2/2010	18:53	CST-6	Thunderstorm Wind	52 kts. MG	0	0	0.00K	0.00K
TARRANT	7/6/2010	15:22	CST-6	Thunderstorm Wind	50 kts. EG	0	0	10.00K	0.00K
ARLINGTON	7/6/2010	15:30	CST-6	Thunderstorm Wind	61 kts. EG	0	5	50.00K	0.00K
RICHLAND HILLS	10/23/2010	11:48	CST-6	Thunderstorm Wind	56 kts. EG	0	0	2.00K	0.00K
POLTECHNIEC	10/23/2010	11:55	CST-6	Thunderstorm Wind	73 kts. EG	0	0	750.00K	0.00K
RICHLAND HILLS	10/23/2010	12:55	CST-6	Thunderstorm Wind	35 kts. EG	0	0	0.00K	0.00K
TARRANT (ZONE)	4/3/2011	16:00	CST-6	Strong Wind	35 kts. EG	0	0	0.00K	0.00K
CROWLEY	4/4/2011	4:40	CST-6	Thunderstorm Wind	52 kts. EG	0	0	1.00K	0.00K
HASLET	4/10/2011	22:55	CST-6	Thunderstorm Wind	56 kts. EG	0	0	0.00K	0.00K
HASLET	4/11/2011	0:00	CST-6	Thunderstorm Wind	56 kts. EG	0	0	20.00K	0.00K
WATAUGA	4/11/2011	0:11	CST-6	Thunderstorm Wind	56 kts. EG	0	0	0.00K	0.00K
KENNEDALE	4/11/2011	0:25	CST-6	Thunderstorm Wind	56 kts. EG	0	0	0.00K	0.00K
MANSFIELD	4/11/2011	0:32	CST-6	Thunderstorm Wind	53 kts. MG	0	0	0.00K	0.00K
TARRANT (ZONE)	4/14/2011	17:00	CST-6	Strong Wind	30 kts. EG	1	0	0.00K	0.00K
HASLET	4/23/2011	21:45	CST-6	Thunderstorm Wind	59 kts. MG	0	0	6.00K	0.00K
BEDFORD	4/23/2011	22:14	CST-6	Thunderstorm Wind	50 kts. EG	0	0	6.00K	0.00K
AZLE	4/24/2011	17:55	CST-6	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
BENBROOK	5/1/2011	8:05	CST-6	Thunderstorm Wind	56 kts. EG	0	0	5.00K	0.00K
BENBROOK	5/1/2011	8:16	CST-6	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
FT WORTH	5/11/2011	13:02	CST-6	Thunderstorm Wind	52 kts. MG	0	0	1.00K	0.00K
WATAUGA	5/11/2011	13:04	CST-6	Thunderstorm Wind	50 kts. MG	0	0	0.00K	0.00K
HASLET	5/22/2011	18:45	CST-6	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
BRIAR	5/24/2011	18:20	CST-6	Thunderstorm Wind	74 kts. EG	0	0	25.00K	0.00K
FT WORTH SAGINAW ARP	5/24/2011	18:50	CST-6	Thunderstorm Wind	52 kts. EG	0	0	7.00K	0.00K
FT WORTH SAGINAW ARP	5/24/2011	18:55	CST-6	Thunderstorm Wind	56 kts. EG	0	0	30.00K	0.00K

Location	Date	Time	Time Zone	Type	Magnitude	Deaths	Injuries	Property Damage Estimate	Crop Damage Estimate
HASLET	5/24/2011	18:55	CST-6	Thunderstorm Wind	70 kts. EG	0	0	55.00K	0.00K
KELLER	5/24/2011	18:56	CST-6	Thunderstorm Wind	61 kts. EG	0	0	10.00K	0.00K
HASLET	5/24/2011	18:57	CST-6	Thunderstorm Wind	52 kts. EG	0	0	3.00K	0.00K
WATAUGA	5/24/2011	19:06	CST-6	Thunderstorm Wind	58 kts. MG	0	0	50.00K	0.00K
WATAUGA	5/24/2011	19:11	CST-6	Thunderstorm Wind	65 kts. EG	0	0	200.00K	0.00K
PLEASANT GLADE	5/24/2011	19:17	CST-6	Thunderstorm Wind	61 kts. EG	0	0	12.00K	0.00K
HANDLEY	5/24/2011	19:45	CST-6	Thunderstorm Wind	61 kts. EG	0	0	6.00K	0.00K
ARLINGTON	5/24/2011	20:34	CST-6	Thunderstorm Wind	61 kts. MG	0	0	12.00K	0.00K
TARRANT CO.	6/18/2011	21:27	CST-6	Thunderstorm Wind	61 kts. MG	0	0	1.00K	0.00K
TARRANT CO.	6/21/2011	20:47	CST-6	Thunderstorm Wind	56 kts. EG	0	0	10.00K	0.00K
TARRANT CO.	6/21/2011	20:57	CST-6	Thunderstorm Wind	52 kts. MG	0	0	0.00K	0.00K
TARRANT CO.	6/21/2011	20:57	CST-6	Thunderstorm Wind	52 kts. EG	0	0	10.00K	0.00K
TARRANT CO.	6/21/2011	20:58	CST-6	Thunderstorm Wind	52 kts. EG	0	0	10.00K	0.00K
TARRANT CO.	6/21/2011	21:08	CST-6	Thunderstorm Wind	50 kts. MG	0	0	0.00K	0.00K
TARRANT CO.	6/21/2011	21:15	CST-6	Thunderstorm Wind	56 kts. EG	0	0	4.00K	0.00K
TARRANT CO.	6/21/2011	21:54	CST-6	Thunderstorm Wind	50 kts. MG	0	0	0.00K	0.00K
HASLET	9/29/2011	19:55	CST-6	Thunderstorm Wind	51 kts. MG	0	0	0.00K	0.00K
(FTW)MEACHAM ARPT FT	9/29/2011	20:09	CST-6	Thunderstorm Wind	53 kts. MG	0	0	0.00K	0.00K
RIVER OAKS	9/29/2011	20:12	CST-6	Thunderstorm Wind	61 kts. EG	0	0	50.00K	0.00K
BENBROOK LAKE	9/29/2011	20:30	CST-6	Thunderstorm Wind	52 kts. EG	0	0	30.00K	0.00K
FT WORTH MEECHAM ARP	10/17/2011	20:00	CST-6	Thunderstorm Wind	53 kts. MG	0	0	0.00K	0.00K
WATAUGA	10/17/2011	20:05	CST-6	Thunderstorm Wind	55 kts. MG	0	0	3.00K	0.00K
ARLINGTON	4/3/2012	12:49	CST-6	Thunderstorm Wind	65 kts. EG	0	0	25.00K	0.00K
FT WORTH LUCK ARPT	5/4/2012	19:22	CST-6	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
KELLER	5/11/2012	17:55	CST-6	Thunderstorm Wind	52 kts. EG	0	0	2.00K	0.00K

Location	Date	Time	Time Zone	Type	Magnitude	Deaths	Injuries	Property Damage Estimate	Crop Damage Estimate
KELLER ALTA VISTA AR	5/11/2012	18:01	CST-6	Thunderstorm Wind	56 kts. EG	0	0	2.00K	0.00K
CENTER PT	6/6/2012	13:15	CST-6	Thunderstorm Wind	65 kts. EG	0	0	50.00K	0.00K
SEMINARY HILL	6/6/2012	15:10	CST-6	Thunderstorm Wind	52 kts. EG	0	0	5.00K	0.00K
FT WORTH	6/6/2012	15:15	CST-6	Thunderstorm Wind	61 kts. EG	0	0	100.00K	0.00K
KENNEDALE	6/6/2012	15:38	CST-6	Thunderstorm Wind	56 kts. EG	0	0	5.00K	0.00K
GRAPEVINE	7/20/2012	16:27	CST-6	Thunderstorm Wind	56 kts. EG	0	0	80.00K	0.00K
EULESS	7/20/2012	16:55	CST-6	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
EAGLE MTN LAKE	8/12/2012	17:45	CST-6	Thunderstorm Wind	52 kts. EG	0	0	210.00K	0.00K
EAGLE MTN LAKE	8/12/2012	17:46	CST-6	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
SAGINAW	8/12/2012	17:56	CST-6	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
(FTW)MEACHAM ARPT FT	8/12/2012	18:00	CST-6	Thunderstorm Wind	52 kts. EG	0	0	5.00K	0.00K
(FTW)MEACHAM ARPT FT	8/12/2012	18:01	CST-6	Thunderstorm Wind	66 kts. MG	0	0	1.000M	0.00K
SAGINAW	8/12/2012	18:02	CST-6	Thunderstorm Wind	58 kts. MG	0	0	15.00K	0.00K
WESTOVER HILLS	8/12/2012	18:08	CST-6	Thunderstorm Wind	58 kts. MG	0	0	10.00K	0.00K
HODGE	8/12/2012	18:10	CST-6	Thunderstorm Wind	55 kts. EG	0	0	5.00K	0.00K
WATAUGA	8/12/2012	18:15	CST-6	Thunderstorm Wind	63 kts. MG	0	0	10.00K	0.00K
EAGLE MTN LAKE	2/10/2013	2:15	CST-6	Thunderstorm Wind	52 kts. EG	0	0	20.00K	0.00K
SAGINAW	2/10/2013	2:24	CST-6	Thunderstorm Wind	52 kts. EG	0	0	5.00K	0.00K
(FWH)CARSWELL AFB FT	2/10/2013	2:25	CST-6	Thunderstorm Wind	39 kts. EG	0	0	1.00K	0.00K
LAKE WORTH	2/10/2013	2:25	CST-6	Thunderstorm Wind	56 kts. MG	0	0	8.00K	0.00K
POLTECHNIEC	2/10/2013	2:49	CST-6	Thunderstorm Wind	57 kts. EG	0	0	8.00K	0.00K
TARRANT (ZONE)	2/26/2013	0:30	CST-6	Strong Wind	32 kts. MG	0	0	30.00K	0.00K
GRAPEVINE	5/15/2013	19:31	CST-6	Thunderstorm Wind	51 kts. MG	0	0	0.00K	0.00K
KENNEDALE	5/15/2013	22:30	CST-6	Thunderstorm Wind	60 kts. EG	0	0	100.00K	0.00K
HASLET	5/21/2013	12:55	CST-6	Thunderstorm Wind	52 kts. EG	0	0	20.00K	0.00K

Location	Date	Time	Time Zone	Type	Magnitude	Deaths	Injuries	Property Damage Estimate	Crop Damage Estimate
GRAPEVINE	5/21/2013	13:00	CST-6	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
TARRANT	5/29/2013	16:57	CST-6	Thunderstorm Wind	56 kts. EG	0	0	30.00K	0.00K
EULESS	5/29/2013	16:58	CST-6	Thunderstorm Wind	56 kts. EG	0	0	10.00K	0.00K
GRAND PRAIRIE	5/29/2013	17:04	CST-6	Thunderstorm Wind	48 kts. EG	0	0	5.00K	0.00K
GREATER SW INTL ARPT	5/29/2013	17:11	CST-6	Thunderstorm Wind	50 kts. MG	0	0	10.00K	0.00K
MANSFIELD	5/29/2013	17:19	CST-6	Thunderstorm Wind	52 kts. EG	0	0	20.00K	0.00K
FT WORTH	7/11/2013	15:45	CST-6	Thunderstorm Wind	43 kts. EG	0	0	20.00K	0.00K
GRAPEVINE	8/9/2013	19:11	CST-6	Thunderstorm Wind	52 kts. MG	0	0	10.00K	0.00K
SOUTH LAKE	8/13/2013	15:50	CST-6	Thunderstorm Wind	50 kts. EG	0	0	1.00K	0.00K
KELLER	10/26/2013	19:10	CST-6	Thunderstorm Wind	52 kts. EG	0	0	5.00K	0.00K
Totals:						1	8	8.674M	0.00K

Assets Exposed to Hazard

- **Property Risk/Vulnerability.** In evaluating assets that are vulnerable to severe thunderstorms, it was determined that all critical facilities as well as all public, private, and commercial property is vulnerable to severe thunderstorms.
- **People Risk/Vulnerability.** It was determined that risk/vulnerability includes the entire population of Tarrant County because there is no way to determine the impact/magnitude of a severe thunderstorm and no way to predict where a storm will occur. People are vulnerable to severe thunderstorms through power outages, effects on transportation routes, establishment of shelters, roofs blown off structures, etc. Severe thunderstorms occur frequently within Tarrant County.
- **Environment Risk/Vulnerability.** Risks to the environment are high for a severe thunderstorm. High winds can destroy trees and flooding from severe thunderstorms may destroy forestry and re-direct river flow.

The risk and vulnerability to severe thunderstorms and high winds for each participating jurisdiction are detailed below. It should be noted that the North Central Texas Council of Governments (NCTCOG) is an association of local governments that works to assist in planning and coordination efforts of 16 counties in North Central Texas. It is a government authority but does not hold or own any land or property, nor does it have any constituents. Therefore, there is minimal vulnerability to the NCTCOG.

Vulnerability to Severe Thunderstorms and High Winds	
City of Arlington	
Critical Asset Vulnerability	The City of Arlington is home to critical facilities that would be vulnerable to the effects of severe thunderstorms and high winds. This includes city facilities worth approximately 8.5 million, the Dallas Cowboys Stadium worth $1.6 billion dollars, as well as many U.S. Government office facilities, public schools, a university, a large theme park, and privately-owned facilities that employ a significant number of residents. Power, water and sewer treatment systems could also be affected as a result of severe thunderstorms and high winds.
Vulnerable Populations	As of 2010, 8% of the population in Arlington consists of individuals who were 65 years or older. In addition, approximately 16% of Arlington families live below the poverty line. While severe thunderstorms and high winds pose a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after severe thunderstorms and high winds has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by severe thunderstorms and high winds could result in serious environmental impacts to the city of Arlington. Such impacts could include contamination of soil, waterways, and reservoirs.
City of Azle	
Critical Asset Vulnerability	The City of Azle is home to critical facilities that would be vulnerable to the effects of severe thunderstorms and high winds. This includes city structures worth approximately 63.5 million, and public school facilities worth 96 million.
Vulnerable Populations	As of 2010, 12.8% of the population in Azle consists of individuals who were 65 years or older. In addition, approximately 6.9% of Azle families live below the poverty line. While severe thunderstorms and high winds pose a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after severe thunderstorms and high winds has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by severe thunderstorms and high winds could result in serious environmental impacts to the city of Azle. Such impacts could include contamination of soil, waterways, and reservoirs.
City of Bedford	
Critical Asset Vulnerability	The City of Bedford is home to critical facilities that would be vulnerable to the effects of severe thunderstorms and high winds. This includes city facilities, schools, and hospitals. In addition, the city is home to employers including Walmart, Transamerica, and Heartland that employ residents of the City of Bedford.
Vulnerable Populations	As of 2010, 8.7% of the population in Bedford consists of individuals who were 65 years or older. In addition, approximately 3.7% of Bedford families live below the poverty line. While severe thunderstorms and high winds pose a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after severe thunderstorms and high winds has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by severe thunderstorms and high winds could result in serious environmental impacts to the city of Bedford. Such impacts could include contamination of soil, waterways, and reservoirs.
City of Blue Mound	
Critical Asset Vulnerability	The City of Blue Mound is home to critical facilities that would be vulnerable to the effects of severe thunderstorms and high winds. This includes city facilities valued at 250,000, a school, and water production facilities that serve the residents of Blue Mound.
Vulnerable Populations	Approximately 7.2% of the population in Bedford consists of individuals who are 65 years or older. In addition, approximately 5.9 % of Blue Mound families live below the poverty line. While severe thunderstorms and high winds pose a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after severe thunderstorms and high winds has occurred.

Vulnerability to Severe Thunderstorms and High Winds	
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by severe thunderstorms and high winds could result in serious environmental impacts to the city of Blue Mound. Such impacts could include contamination of soil, and water systems.
City of Colleyville	
Critical Asset Vulnerability	The City of Colleyville is home to critical facilities that would be vulnerable to the effects of severe thunderstorms and high winds. This includes city facilities valued at 11.7 million, and school facilities valued at 36 million.
Vulnerable Populations	Approximately 5.3% of the population in Colleyville consists of individuals who are 65 years or older. In addition, approximately 1.2 % of Colleyville families live below the poverty line. While severe thunderstorms and high winds pose a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after severe thunderstorms and high winds has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by severe thunderstorms and high winds could result in serious environmental impacts to the city of Colleyville. Such impacts could include contamination of soil, and water systems.
City of Crowley	
Critical Asset Vulnerability	The City of Crowley is home to critical facilities that would be vulnerable to the effects of severe thunderstorms and high winds. This includes city facilities valued at 10.2 million.
Vulnerable Populations	Approximately 8.3% of the population in Crowley consists of individuals who are 65 years or older. In addition, approximately 4.3 % of Crowley families live below the poverty line. While severe thunderstorms and high winds pose a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after severe thunderstorms and high winds has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by severe thunderstorms and high winds could result in serious environmental impacts to the city of Crowley. Such impacts could include contamination of soil, and water systems.
Dallas Fort Worth International Airport	
Critical Asset Vulnerability	The Dallas Fort Worth International Airport is home to critical facilities that would be vulnerable to the effects of severe thunderstorms and high winds. This includes airport towers, terminals, utilities plants, fuel facilities, water treatment facilities, storage facilities, as well as aircraft.
Vulnerable Populations	Vulnerable populations within the airport would consist of those individuals working in the airport as well as airline customers who happen to be at the airport during severe thunderstorms and high winds incident. Should the airport be impacted by severe thunderstorms and high winds, efforts must be aimed at safeguarding these individuals from harm and restoring flight systems as quickly as possible.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by severe thunderstorms and high winds could result in serious environmental impacts. Damage to fuel storage tanks could impact soil, and water systems.
City of Euless	
Critical Asset Vulnerability	The City of Euless is home to critical facilities that would be vulnerable to the effects of severe thunderstorms and high winds. This includes city facilities and public schools.
Vulnerable Populations	Approximately 5.8% of the population in Crowley consists of individuals who are 65 years or older. In addition, approximately 5.7 % of Euless families live below the poverty line. While severe thunderstorms and high winds pose a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after severe thunderstorms and high winds has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by severe thunderstorms and high winds could result in environmental impacts to the city of Euless. Such impacts could include contamination of soil, and water systems.

Vulnerability to Severe Thunderstorms and High Winds	
City of Forest Hill	
Critical Asset Vulnerability	The City of Forest Hill is home to critical facilities that would be vulnerable to the effects of severe thunderstorms and high winds. This includes city facilities valued at $875,220.
Vulnerable Populations	Approximately 9.1% of the population in Forest Hill consists of individuals who are 65 years or older. In addition, approximately 16.0 % of Forest Hill families live below the poverty line. While severe thunderstorms and high winds pose a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after severe thunderstorms and high winds has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by severe thunderstorms and high winds could result in environmental impacts to the city of Forest Hill. Such impacts could include contamination of soil, and water systems.
City of Fort Worth	
Critical Asset Vulnerability	The City of Fort Worth is home to critical facilities that would be vulnerable to the effects of severe thunderstorms and high winds. This includes city buildings, water pumps stations, water storage facilities, water treatment facilities, convention facilities, and radio towers valued at $571 million. The City also has school facilities, hospitals, a naval air station, as well as employers that employ many of the residents of the city.
Vulnerable Populations	Approximately 8.2% of the population in Fort Worth consists of individuals who are 65 years or older and approximately 18.7 % of individuals in Fort Worth live below the poverty line. In addition, there is a homeless population in in Fort Worth estimated at 2,000 individuals. While severe thunderstorms and high winds pose a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after severe thunderstorms and high winds has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by severe thunderstorms and high winds could result in environmental impacts to the city of Fort Worth. Such impacts could include contamination of soil, and water systems.
City of Grapevine	
Critical Asset Vulnerability	The City of Grapevine is home to critical facilities that would be vulnerable to the effects of severe thunderstorms and high winds. This includes city buildings, water storage facilities, and water treatment facilities, valued at 33.4 million.
Vulnerable Populations	Approximately 7.9% of the population in Grapevine consists of individuals who are 65 years or older. In addition, approximately 7.9 % of individuals in Grapevine live below the poverty line. While severe thunderstorms and high winds pose a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after severe thunderstorms and high winds has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by severe thunderstorms and high winds could result in environmental impacts to the city of Grapevine. Such impacts could include contamination of soil, and water systems.
City of Haltom City	
Critical Asset Vulnerability	The City of Haltom City is home to critical facilities that would be vulnerable to the effects of severe thunderstorms and high winds. This includes city buildings valued at 10.8 million.
Vulnerable Populations	Approximately 10.0% of the population in Grapevine consists of individuals who are 65 years or older. In addition, approximately 16.7 % of individuals in Haltom City live below the poverty line. While severe thunderstorms and high winds pose a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after severe thunderstorms and high winds has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by severe thunderstorms and high winds could result in environmental impacts to the city of Haltom City. Such impacts could include contamination of soil, and water systems.

Vulnerability to Severe Thunderstorms and High Winds	
City of Haslet	
Critical Asset Vulnerability	The City of Haslet is home to critical facilities that would be vulnerable to the effects of severe thunderstorms and high winds. This includes a city building housing fire and emergency management, and an elementary school. The City also is home to an Amazon Incorporated distribution center that employs approximately 1500 people.
Vulnerable Populations	A breakdown of vulnerable populations was not available for the city of Haslet as of the writing of this document.
Environmental Vulnerability	There are multiple train tracks and distribution centers located in the city. Hazardous materials spills and leaks as a result of damage caused by severe thunderstorms and high winds could result in environmental impacts to the city of Haslet. Such impacts could include contamination of soil, and water systems.
City of Hurst	
Critical Asset Vulnerability	The City of Hurst is home to critical facilities that would be vulnerable to the effects of severe thunderstorms and high winds. This includes city buildings valued at 34.6 million and a children's medical center valued at 15 million. In addition, there is a Mall in Hurst whose property is valued at 155 million.
Vulnerable Populations	Approximately 12.4% of the population in Hurst consists of individuals who are 65 years or older. In addition, approximately 6.6 % of individuals in Hurst live below the poverty line. While severe thunderstorms and high winds pose a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after severe thunderstorms and high winds has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by severe thunderstorms and high winds could result in environmental impacts to the city of Hurst. Such impacts could include contamination of soil, and water systems.
City of Keller	
Critical Asset Vulnerability	The City of Keller is home to critical facilities that would be vulnerable to the effects of severe thunderstorms and high winds. This includes city buildings valued at 46.7 million, and school facilities valued at approximately 84.1 million.
Vulnerable Populations	Approximately 8.6% of the population in Keller consists of individuals who are 65 years or older. In addition, approximately 3.9 % of individuals in Keller live below the poverty line. While severe thunderstorms and high winds pose a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after severe thunderstorms and high winds has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by severe thunderstorms and high winds could result in environmental impacts to the city of Keller. Such impacts could include contamination of soil, and water systems.
City of Kennedale	
Critical Asset Vulnerability	The City of Kennedale is home to critical facilities that would be vulnerable to the effects of severe thunderstorms and high winds. This includes city buildings, water storage tanks, and well pumps valued at 36 million.
Vulnerable Populations	Approximately 10.5% of the population in Kennedale consists of individuals who are 65 years or older. In addition, approximately 8.1 % of individuals in Kennedale live below the poverty line. While severe thunderstorms and high winds pose a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after severe thunderstorms and high winds has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by severe thunderstorms and high winds could result in environmental impacts to the city of Kennedale. Such impacts could include contamination of soil, and water systems.
City of Lake Worth	

Vulnerability to Severe Thunderstorms and High Winds	
Critical Asset Vulnerability	The City of Lake Worth is home to critical facilities that would be vulnerable to the effects of severe thunderstorms and high winds. This includes city buildings valued at 4.1 million, schools valued at 58.4 million, and two nursing home facilities valued at 2.3 million.
Vulnerable Populations	Approximately 16.1% of the population in Lake Worth consists of individuals who are 65 years or older. In addition, approximately 9.4 % of individuals in Lake Worth live below the poverty line. While severe thunderstorms and high winds pose a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after severe thunderstorms and high winds has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by severe thunderstorms and high winds could result in environmental impacts to the city of Lake Worth. Such impacts could include contamination of soil, and water systems.
City of Lakeside	
Critical Asset Vulnerability	The City of Lakeside is home to critical facilities that would be vulnerable to the effects of severe thunderstorms and high winds. This includes a city building, a water pump station, a waste water facility, and two gas wells.
Vulnerable Populations	Approximately 18.4% of the population in Lakeside consists of individuals who are 65 years or older. In addition, approximately 3.0 % of individuals in Lakeside live below the poverty line. While severe thunderstorms and high winds pose a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after severe thunderstorms and high winds has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by severe thunderstorms and high winds could result in environmental impacts to the city of Lakeside. Such impacts could include contamination of soil, and water systems.
City of North Richland Hills	
Critical Asset Vulnerability	The City of North Richland Hills is home to critical facilities that would be vulnerable to the effects of severe thunderstorms and high winds. This includes city buildings, water storage facilities, sewage lift stations, pump stations and a hospital.
Vulnerable Populations	Approximately 12.3% of the population in North Richland Hills consists of individuals who are 65 years or older. In addition, approximately 7.5 % of individuals in North Richland Hills live below the poverty line. While severe thunderstorms and high winds pose a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after severe thunderstorms and high winds has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by severe thunderstorms and high winds could result in environmental impacts to the city of North Richland Hills. Such impacts could include contamination of soil, and water systems.
City of Richland Hills	
Critical Asset Vulnerability	The City of Richland Hills is home to critical facilities that would be vulnerable to the effects of severe thunderstorms and high winds. This includes city buildings, water storage facilities, sewage lift stations, pump stations and a hospital.
Vulnerable Populations	Approximately 18.4% of the population in Richland Hills consists of individuals who are 65 years or older. In addition, approximately 7.8% of individuals in Richland Hills live below the poverty line. While severe thunderstorms and high winds pose a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after severe thunderstorms and high winds has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by severe thunderstorms and high winds could result in environmental impacts to the city of Richland Hills. Such impacts could include contamination of soil, and water systems.
City of Saginaw	

Vulnerability to Severe Thunderstorms and High Winds	
Critical Asset Vulnerability	The City of Saginaw is home to critical facilities that would be vulnerable to the effects of severe thunderstorms and high winds. This includes a city building and a county fire alarm center. The city is also home to several food processing and industrial facilities.
Vulnerable Populations	Approximately 6.8% of the population in Saginaw consists of individuals who are 65 years or older. In addition, approximately 4.2 % of individuals in Saginaw live below the poverty line. While severe thunderstorms and high winds pose a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after severe thunderstorms and high winds has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by severe thunderstorms and high winds could result in environmental impacts to the city of Saginaw. Such impacts could include contamination of soil, and water systems.
City of Southlake	
Critical Asset Vulnerability	The City of Southlake is home to critical facilities that would be vulnerable to the effects of severe thunderstorms and high winds. This includes a city buildings valued at 15.2 million, a hospital valued at 10.3 million, and school facilities valued at 284 million. In addition, there are two nursing facilities valued at 16.3 million, as well as several major employers.
Vulnerable Populations	Approximately 5.9% of the population in Southlake consists of individuals who are 65 years or older. In addition, approximately 3.3 % of individuals in Southlake live below the poverty line. While severe thunderstorms and high winds pose a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after severe thunderstorms and high winds has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by severe thunderstorms and high winds could result in environmental impacts to the city of Southlake. Such impacts could include contamination of soil, and water systems.
Tarrant County	
Critical Asset Vulnerability	Tarrant County is home to critical facilities that would be vulnerable to the effects of severe thunderstorms and high winds. This includes county buildings valued at 628.2 million, school district facilities, Dallas Fort Worth International Airport, and healthcare facilities.
Vulnerable Populations	Approximately 9.9% of the population in Tarrant County consists of individuals who are 65 years or older. In addition, approximately 14.7 % of individuals in Tarrant County live below the poverty line. While severe thunderstorms and high winds pose a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after severe thunderstorms and high winds has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by severe thunderstorms and high winds could result in environmental impacts to Tarrant County. Such impacts could include contamination of soil, water ways, and water systems.
City of Watauga	
Critical Asset Vulnerability	The city of Watauga is home to critical facilities that would be vulnerable to the effects of severe thunderstorms and high winds. This includes city buildings valued at 18.1 million.
Vulnerable Populations	Approximately 7.4% of the population in Watauga consists of individuals who are 65 years or older. In addition, approximately 8.1 % of individuals in Watauga live below the poverty line. While severe thunderstorms and high winds pose a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after severe thunderstorms and high winds has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by severe thunderstorms and high winds could result in environmental impacts to the city of Watauga. Such impacts could include contamination of soil, water ways, and water systems.
City of Westlake	
Critical Asset Vulnerability	The city of Westlake is home to critical facilities that would be vulnerable to the effects of severe thunderstorms and high winds. This includes a water pump station valued at 4 million, a fire

Vulnerability to Severe Thunderstorms and High Winds	
	station valued at $300,000, a charter school, and a university. There are also two large employers in the city, Fidelity Investments and the Solana Business Complex.
Vulnerable Populations	Approximately 11.6% of the population in Westlake consists of individuals who are 65 years or older. In addition, approximately 2.7 % of individuals in Westlake live below the poverty line. While severe thunderstorms and high winds pose a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after severe thunderstorms and high winds has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by severe thunderstorms and high winds could result in environmental impacts to the city of Westlake. Such impacts could include contamination of soil, water ways, and water systems.
City of Westworth Village	
Critical Asset Vulnerability	The city of Westworth Village is home to critical facilities that would be vulnerable to the effects of severe thunderstorms and high winds. This includes two city facilities valued at 4.9 million, as well as a school.
Vulnerable Populations	Approximately 11.5% of the population in Westworth Village consists of individuals who are 65 years or older. In addition, approximately 9.1 % of individuals in Westworth Village live below the poverty line. While severe thunderstorms and high winds pose a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after severe thunderstorms and high winds has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by severe thunderstorms and high winds could result in environmental impacts to the city of Westworth Village. Such impacts could include contamination of soil and water systems.

Vulnerability

The following chart provides the potential impact of severe thunderstorms and high winds for all participating jurisdictions. Potential losses should severe thunderstorms and high winds impact each jurisdiction are provided in Appendix G where the value of each piece of critical infrastructure is detailed for building and contents losses.

Severe Thunderstorms and High Winds

Frequency of Occurrence	Highly Likely
Warning Time	3-6 hours
Geographic Extent	Community-wide
Potential Impact	Moderate

* For the purposes of the hazard Severe Thunderstorms and High Winds, "forecast warning" is defined as the amount of time necessary to determine whether severe weather has the potential to impact a jurisdiction. This should not be confused with the National Weather Service's definition or use of the term "warning".

Multijurisdictional Concerns

Tarrant County and its participating jurisdictions can be affected by severe thunderstorm and high winds. As a result, any mitigation steps taken related to severe thunderstorm winds should be undertaken on a countywide basis.

Land Use and Development Trends

New technology allows for high wind-resistant windows, either by directly installing windows capable of withstanding high winds or applying a film that protects the window. This reduces property damage by reducing the number of broken windows and reduces injuries and deaths by

reducing broken glass. Although Tarrant County currently has no regulatory capabilities regarding this technology, it is advised that new developments include high wind-resistant windows.

Hazard Summary

Overall, severe thunderstorms and high winds pose one of the greatest threats to Tarrant County in terms of property damage as well as injuries and loss of life. Severe thunderstorms and high winds are the most frequently occurring natural hazard in Tarrant County and have the greatest chance of affecting Tarrant County each year. Based on the frequency of this hazard as well as its ability to negatively affect Tarrant County, the mitigation measures identified in this plan should be aggressively pursued.

4.1.4 Hail

Hazard Definition

Hail is a form of precipitation composed of spherical lumps of ice. Known as hailstones, these ice balls typically range from 1/10 of an inch to 2 inches 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. Hailstones are classified by size according to the Tornado and Storm Research Organization (TORRO) Hail Storm Intensity Scale, provided in Table 4-13. Tarrant County and its participating jurisdictions can expect hail from an intensity of H0 to the highest intensity of H10.

Table 4-13
TORRO Hail Storm Intensity Scale

Intensity Category		Typical Hail Diameter (mm)*	Probable Kinetic Energy, J-m^2	Typical Damage Impacts
H0	Hard Hail	5	0-20	No damage
H1	Potentially Damaging	5-15	>20	Slight general damage to plants, crops
H2	Significant	10-20	>100	Significant damage to fruit, crops, vegetation
H3	Severe	20-30	>300	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Severe	25-40	>500	Widespread glass damage, vehicle bodywork damage
H5	Destructive	30-50	>800	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
H6	Destructive	40-60		Bodywork of grounded aircraft dented, brick walls pitted
H7	Destructive	50-75		Severe roof damage, risk of serious injuries
H8	Destructive	60-90		(Severest recorded in the British Isles) Severe damage to aircraft bodywork
H9	Super Hailstorms	75-100		Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
H10	Super Hailstorms	>100		Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

Hazard Identification

Tarrant County has experienced 95 costly hail events in the past 20 years. These storms have injured and killed people and caused over $450 million in property damage13. Hailstorms can cover a wide geographic area; therefore, all of Tarrant County and its participating jurisdictions are at risk for being struck by a hailstorm. Statistically, Tarrant County and its participating jurisdictions will experience a hailstorm at least once a year. Generally, there is a warning time of 3-6 hours with a hailstorm, and many severe thunderstorms have the potential to produce hail. The amount of damage that is caused by hail varies depending on its size, but certain property is more vulnerable than others. For example, vehicles that sit outdoors during a hailstorm may result in broken windows and dents in the car frame.

Every jurisdiction in Tarrant County has experienced the impacts of hail. Severe hail events that have occurred in the North Central Texas region include hailstorms with 5-inch diameters on April 27, 1968 and June 22, 1955. A hailstorm that occurred on October 21, 1996 with 4.5-inch hailstones caused property damage. A hailstorm with hailstones measuring 1.75-inches caused approximately $250,000 in property damage in the region on October 10, 2001.

On April 28, 1992, a severe thunderstorm outbreak rumbled across southern Oklahoma and through North Central Texas, producing a swath of hail damage in one of the costliest severe weather events ever for the region. Hail up to 4.5 inches in diameter was recorded during the event, which lasted several hours and ultimately resulted in losses of over $750 million.

On May 5, 1995, a devastating supercell produced softball-sized hail in Tarrant County, accompanied by flash flooding and high winds. Over 100 people, most of whom were attending the outdoor Mayfest celebration in downtown Fort Worth, were injured. Insured damage reached nearly $1.1 billion and reported cleanup costs ranged around $220 million, making it one of the insurance industry's most expensive thunderstorms in history.

On April 5, 2003, a severe thunderstorm rolled across the north central portions of the North Central Texas region. Hail accumulated in a series of eastward moving thunderstorms, originating in Tarrant County and training due east over one of the most densely populated and highly valued areas of the DFW Metroplex.

5,500 cars and 3,500 homes were damaged by hail in the City of Fort Worth on April 13, 2007. A strong surface low and dry line interacted with a very unstable atmosphere over North Texas. Large hail, damaging winds, and possible tornadoes were reported, causing $3 million in damage.

A list of the hail events that have occurred in Tarrant County since 2002 is provided in the table below.

Table 4-14
Hail Events[14]

Location	Date	Time	Time Zone	Type	Magnitude	Deaths	Injuries	Property Damage Estimate	Crop Damage Estimate
FT WORTH	3/30/2002	2:10	CST	Hail	2.00 in.	0	0	0.00K	0.00K

[13] Source: SHELDUS
[14] Source: National Climatic Data Center, http://www.ncdc.noaa.gov/oa/ncdc.html

Location	Date	Time	Time Zone	Type	Magnitude	Deaths	Injuries	Property Damage Estimate	Crop Damage Estimate
FT WORTH	4/16/2002	17:00	CST	Hail	1.75 in.	0	0	0.00K	0.00K
GRAPEVINE	4/16/2002	17:52	CST	Hail	1.50 in.	0	0	0.00K	0.00K
SAGINAW	4/5/2003	19:33	CST	Hail	1.75 in.	0	0	0.00K	0.00K
SAGINAW	4/5/2003	19:40	CST	Hail	2.75 in.	0	0	0.00K	0.00K
EAGLE MTN LAKE	4/5/2003	19:43	CST	Hail	1.75 in.	0	0	0.00K	0.00K
FT WORTH	4/5/2003	19:50	CST	Hail	2.75 in.	0	0	0.00K	0.00K
FT WORTH	4/5/2003	20:00	CST	Hail	1.75 in.	0	0	0.00K	0.00K
KELLER	4/5/2003	20:01	CST	Hail	1.75 in.	0	0	0.00K	0.00K
FT WORTH	4/5/2003	20:01	CST	Hail	1.75 in.	0	0	0.00K	0.00K
KELLER	4/5/2003	20:05	CST	Hail	3.00 in.	0	0	0.00K	0.00K
GRAPEVINE	4/5/2003	20:15	CST	Hail	2.00 in.	0	0	0.00K	0.00K
FT WORTH	5/1/2003	14:16	CST	Hail	2.50 in.	0	0	50.00K	0.00K
RICHLAND HILLS	5/1/2003	14:26	CST	Hail	1.50 in.	0	0	0.00K	0.00K
NORTH RICHLAND HILLS	5/1/2003	14:37	CST	Hail	3.50 in.	0	0	50.00K	0.00K
HALTOM CITY	5/2/2003	20:32	CST	Hail	2.00 in.	0	0	0.00K	0.00K
FT WORTH	7/22/2003	18:01	CST	Hail	1.50 in.	0	0	0.00K	0.00K
FT WORTH	7/22/2003	18:12	CST	Hail	1.75 in.	0	0	0.00K	0.00K
FT WORTH	8/11/2003	18:44	CST	Hail	1.75 in.	0	0	0.00K	0.00K
DALWORTHINGTON	8/11/2003	18:47	CST	Hail	1.75 in.	0	0	0.00K	0.00K
RENDON	8/11/2003	19:00	CST	Hail	1.75 in.	0	0	0.00K	0.00K
PANTEGO	4/30/2004	20:02	CST	Hail	2.00 in.	0	0	0.00K	0.00K
AZLE	6/1/2004	17:20	CST	Hail	1.75 in.	0	0	0.00K	0.00K
FT WORTH	4/25/2005	15:00	CST	Hail	1.75 in.	0	0	0.00K	0.00K
CROWLEY	4/3/2007	18:45	CST-6	Hail	2.50 in.	0	0	10.00K	0.00K
CROWLEY	4/3/2007	18:53	CST-6	Hail	2.00 in.	0	0	8.00K	0.00K
BENBROOK	4/3/2007	18:58	CST-6	Hail	2.75 in.	0	0	15.00K	0.00K
ARLINGTON	4/3/2007	19:15	CST-6	Hail	1.75 in.	0	0	10.00K	0.00K

Location	Date	Time	Time Zone	Type	Magnitude	Deaths	Injuries	Property Damage Estimate	Crop Damage Estimate
AZLE	4/13/2007	16:47	CST-6	Hail	1.50 in.	0	0	15.00K	0.00K
SAGINAW	4/13/2007	17:03	CST-6	Hail	2.50 in.	0	0	2.000M	0.00K
FT WORTH	4/13/2007	17:06	CST-6	Hail	2.75 in.	0	0	3.000M	0.00K
SAGINAW	4/13/2007	17:10	CST-6	Hail	2.50 in.	0	0	3.000M	0.00K
HURST	4/13/2007	17:15	CST-6	Hail	1.75 in.	0	0	40.00K	0.00K
COLLEYVILLE	4/13/2007	17:32	CST-6	Hail	3.00 in.	0	0	10.000M	0.00K
ARLINGTON	5/3/2007	17:30	CST-6	Hail	1.75 in.	0	0	5.00K	0.00K
FT WORTH	10/14/2007	20:52	CST-6	Hail	1.75 in.	0	0	10.00K	0.00K
CROWLEY	3/31/2008	14:00	CST-6	Hail	1.75 in.	0	0	10.00K	0.00K
BENBROOK	4/9/2008	1:15	CST-6	Hail	1.75 in.	0	0	5.00K	0.00K
RIVER OAKS	4/17/2008	19:04	CST-6	Hail	1.75 in.	0	0	10.000M	0.00K
FT WORTH	4/17/2008	19:07	CST-6	Hail	1.75 in.	0	0	10.00K	0.00K
HASLET	3/30/2009	21:21	CST-6	Hail	1.75 in.	0	0	250.00K	0.00K
KELLER ALTA VISTA AR	3/30/2009	21:25	CST-6	Hail	2.75 in.	0	0	1.000M	0.00K
KELLER	3/30/2009	21:26	CST-6	Hail	1.50 in.	0	0	1.000M	0.00K
KELLER ALTA VISTA AR	3/30/2009	21:26	CST-6	Hail	2.50 in.	0	0	5.000M	0.00K
KELLER ALTA VISTA AR	3/30/2009	21:30	CST-6	Hail	1.75 in.	0	0	2.000M	0.00K
HASLET	3/30/2009	21:30	CST-6	Hail	1.75 in.	0	0	1.000M	0.00K
KELLER	3/30/2009	21:31	CST-6	Hail	2.75 in.	0	0	25.000M	0.00K
KELLER	3/30/2009	21:32	CST-6	Hail	1.75 in.	0	0	20.00K	0.00K
KELLER	3/30/2009	21:33	CST-6	Hail	1.75 in.	0	0	3.000M	0.00K
KELLER ALTA VISTA AR	3/30/2009	21:33	CST-6	Hail	1.75 in.	0	0	5.000M	0.00K
KELLER GOODE ARPT	3/30/2009	21:36	CST-6	Hail	2.00 in.	0	0	5.000M	0.00K
SOUTH LAKE	3/30/2009	21:42	CST-6	Hail	1.75 in.	0	0	5.000M	0.00K
GRAPEVINE	3/30/2009	21:44	CST-6	Hail	1.75 in.	0	0	5.000M	0.00K
SOUTH LAKE	3/30/2009	21:45	CST-6	Hail	2.75 in.	0	0	35.000M	0.00K
HANDLEY	5/26/2009	19:00	CST-6	Hail	1.75 in.	0	0	10.00K	0.00K

Location	Date	Time	Time Zone	Type	Magnitude	Deaths	Injuries	Property Damage Estimate	Crop Damage Estimate
AVONDALE	6/2/2010	16:50	CST-6	Hail	1.75 in.	0	0	0.00K	0.00K
WATAUGA	4/4/2011	2:40	CST-6	Hail	1.50 in.	0	0	30.00K	0.00K
LAKE WORTH	4/10/2011	21:12	CST-6	Hail	1.75 in.	0	0	10.00K	0.00K
GRAPEVINE	4/19/2011	16:14	CST-6	Hail	1.75 in.	0	0	50.00K	0.00K
KELLER	4/19/2011	16:21	CST-6	Hail	1.75 in.	0	0	50.00K	0.00K
BEDFORD	4/19/2011	16:33	CST-6	Hail	2.00 in.	0	0	60.00K	0.00K
SEMINARY HILL	4/19/2011	16:42	CST-6	Hail	1.75 in.	0	0	40.00K	0.00K
MARA	4/19/2011	16:56	CST-6	Hail	1.75 in.	0	0	50.00K	0.00K
CROWLEY	4/19/2011	17:19	CST-6	Hail	1.75 in.	0	0	25.00K	0.00K
CROWLEY	4/19/2011	17:30	CST-6	Hail	1.50 in.	0	0	0.00K	0.00K
FT WORTH SYCAMORE AR	4/24/2011	20:22	CST-6	Hail	1.75 in.	0	0	50.00K	0.00K
EVERMAN	4/24/2011	20:24	CST-6	Hail	1.75 in.	0	0	50.00K	0.00K
EAGLE	4/25/2011	2:27	CST-6	Hail	1.75 in.	0	0	4.00K	0.00K
GRAPEVINE	4/25/2011	3:52	CST-6	Hail	1.75 in.	0	0	10.00K	0.00K
WEBB	5/1/2011	23:23	CST-6	Hail	1.75 in.	0	0	10.00K	0.00K
BENBROOK	5/2/2011	0:22	CST-6	Hail	1.75 in.	0	0	7.00K	0.00K
RIVER OAKS	5/2/2011	0:31	CST-6	Hail	1.50 in.	0	0	0.00K	0.00K
FT WORTH	5/23/2011	9:44	CST-6	Hail	1.75 in.	0	0	50.00K	0.00K
HASLET	5/24/2011	18:30	CST-6	Hail	2.00 in.	0	0	12.00K	0.00K
AVONDALE	5/24/2011	18:40	CST-6	Hail	4.50 in.	0	0	75.00K	0.00K
AVONDALE	5/24/2011	18:50	CST-6	Hail	4.50 in.	0	0	75.00K	0.00K
KELLER ALTA VISTA AR	5/24/2011	18:50	CST-6	Hail	1.75 in.	0	0	50.00K	0.00K
KELLER	5/24/2011	18:55	CST-6	Hail	2.75 in.	0	0	25.00K	0.00K
KELLER	5/24/2011	18:55	CST-6	Hail	2.50 in.	0	0	25.00K	0.00K
KELLER	5/24/2011	18:56	CST-6	Hail	4.25 in.	0	0	300.00K	0.00K
SMITHFIELD	5/24/2011	18:58	CST-6	Hail	1.75 in.	0	0	12.00K	0.00K
KELLER	5/24/2011	19:00	CST-6	Hail	2.50 in.	0	0	50.00K	0.00K

Location	Date	Time	Time Zone	Type	Magnitude	Deaths	Injuries	Property Damage Estimate	Crop Damage Estimate
GRAPEVINE	5/24/2011	19:02	CST-6	Hail	1.75 in.	0	0	320.00K	0.00K
EULESS	5/24/2011	19:10	CST-6	Hail	1.50 in.	0	0	5.00K	0.00K
BEDFORD	5/24/2011	19:13	CST-6	Hail	1.75 in.	0	0	30.00K	0.00K
WHITE SETTLEMENT	5/24/2011	19:19	CST-6	Hail	1.75 in.	0	0	30.00K	0.00K
FT WORTH	5/24/2011	19:55	CST-6	Hail	2.75 in.	0	0	300.00K	0.00K
FT WORTH	5/24/2011	19:57	CST-6	Hail	1.75 in.	0	0	60.00K	0.00K
JOHNSONS STATION	5/24/2011	20:02	CST-6	Hail	2.75 in.	0	0	200.00K	0.00K
POLTECHNIEC	5/24/2011	20:02	CST-6	Hail	1.75 in.	0	0	40.00K	0.00K
EULESS	5/24/2011	20:15	CST-6	Hail	1.75 in.	0	0	40.00K	0.00K
ARLINGTON	5/24/2011	20:19	CST-6	Hail	1.75 in.	0	0	60.00K	0.00K
AVONDALE	5/24/2011	20:45	CST-6	Hail	1.75 in.	0	0	5.00K	0.00K
TARRANT CO.	6/20/2011	22:02	CST-6	Hail	2.00 in.	0	0	10.00K	0.00K
TARRANT CO.	6/20/2011	22:17	CST-6	Hail	2.00 in.	0	0	10.00K	0.00K
EULESS	4/3/2012	12:50	CST-6	Hail	1.75 in.	0	0	500.00K	0.00K
GREATER SW INTL ARPT	4/3/2012	12:54	CST-6	Hail	2.75 in.	0	0	12.000M	0.00K
PLEASANT GLADE	4/3/2012	13:00	CST-6	Hail	2.75 in.	0	0	10.000M	0.00K
EULESS	4/3/2012	13:02	CST-6	Hail	2.75 in.	0	0	10.000M	0.00K
SAGINAW	5/11/2012	17:48	CST-6	Hail	1.50 in.	0	0	0.00K	0.00K
SAGINAW	5/11/2012	17:55	CST-6	Hail	1.75 in.	0	0	15.00K	0.00K
CROWLEY	3/23/2013	6:30	CST-6	Hail	1.50 in.	0	0	5.00K	0.00K
EAGLE	5/15/2013	21:41	CST-6	Hail	1.75 in.	0	0	10.00K	0.00K
HASLET	10/26/2013	19:09	CST-6	Hail	1.75 in.	0	0	15.00K	0.00K
HICKS	10/26/2013	19:27	CST-6	Hail	1.75 in.	0	0	25.00K	0.00K
SOUTH LAKE	10/26/2013	19:35	CST-6	Hail	1.75 in.	0	0	500.00K	0.00K
Totals:						0	0	156.818M	0.00K

Assets Exposed to Hazard

- **Property Risk/Vulnerability.** It was determined that all critical facilities as well as all public, private, and commercial properties are vulnerable to hailstorms. Outdoor facilities, such as public parks, are more vulnerable to hail damage than other facilities. Additionally, vehicles parked outdoors are particularly vulnerable to hail damage and could increase the economic impact of a storm.
- **People Risk/Vulnerability.** It was determined that risk/vulnerability includes the entire population of Tarrant County because there is no way to determine the impact/magnitude of a hailstorm incident and no way to predict where and when a hailstorm will occur. People are vulnerable to the effects of hailstorms, including power outages, effects on transportation routes, damage to homes and cars, etc.
- **Environment Risk/Vulnerability.** Risks to the environment are significant should a hailstorm occur. Crops and vegetation may be destroyed.

The risk and vulnerability to hail for each participating jurisdiction is detailed below. It should be noted that the North Central Texas Council of Governments (NCTCOG) is an association of local governments that works to assist in planning and coordination efforts of 16 counties in North Central Texas. It is a government authority but does not hold or own any land or property, nor does it have any constituents. Therefore, there is minimal vulnerability to the NCTCOG.

Vulnerability to Hail	
City of Arlington	
Critical Asset Vulnerability	The City of Arlington is home to critical facilities that would be vulnerable to the effects of hail. This includes city facilities worth approximately 8.5 million, the Dallas Cowboys Stadium worth $1.6 billion dollars, as well as many U.S. Government office facilities, public schools, a university, a large theme park, and privately-owned facilities that employ a significant number of residents. Power, water and sewer treatment systems could also be affected as a result of hail.
Vulnerable Populations	As of 2010, 8% of the population in Arlington consists of individuals who were 65 years or older. In addition, approximately 16% of Arlington families live below the poverty line. While hail poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after a damaging hail storm has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by hail could result in serious environmental impacts to the city of Arlington. Such impacts could include contamination of soil, waterways, and reservoirs.
City of Azle	
Critical Asset Vulnerability	The City of Azle is home to critical facilities that would be vulnerable to the effects of hail. This includes city structures worth approximately 63.5 million, and public school facilities worth 96 million.
Vulnerable Populations	As of 2010, 12.8% of the population in Azle consists of individuals who were 65 years or older. In addition, approximately 6.9% of Azle families live below the poverty line. While hail poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after a damaging hail storm has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by hail could result in serious environmental impacts to the city of Azle. Such impacts could include contamination of soil, waterways, and reservoirs.
City of Bedford	

Vulnerability to Hail	
Critical Asset Vulnerability	The City of Bedford is home to critical facilities that would be vulnerable to the effects of hail. This includes city facilities, schools, and hospitals. In addition, the city is home to employers including Walmart, Transamerica, and Heartland that employ residents of the City of Bedford.
Vulnerable Populations	As of 2010, 8.7% of the population in Bedford consists of individuals who were 65 years or older. In addition, approximately 3.7% of Bedford families live below the poverty line. While hail poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after a damaging hail storm has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by hail could result in serious environmental impacts to the city of Bedford. Such impacts could include contamination of soil, waterways, and reservoirs.
City of Blue Mound	
Critical Asset Vulnerability	The City of Blue Mound is home to critical facilities that would be vulnerable to the effects of hail. This includes city facilities valued at 250,000, a school, and water production facilities that serve the residents of Blue Mound.
Vulnerable Populations	Approximately 7.2% of the population in Bedford consists of individuals who are 65 years or older. In addition, approximately 5.9 % of Blue Mound families live below the poverty line. While hail poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after a damaging hail storm has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by hail could result in serious environmental impacts to the city of Blue Mound. Such impacts could include contamination of soil, and water systems.
City of Colleyville	
Critical Asset Vulnerability	The City of Colleyville is home to critical facilities that would be vulnerable to the effects of hail. This includes city facilities valued at 11.7 million, and school facilities valued at 36 million.
Vulnerable Populations	Approximately 5.3% of the population in Colleyville consists of individuals who are 65 years or older. In addition, approximately 1.2 % of Colleyville families live below the poverty line. While hail poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after a damaging hail storm has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by hail could result in serious environmental impacts to the city of Colleyville. Such impacts could include contamination of soil, and water systems.
City of Crowley	
Critical Asset Vulnerability	The City of Crowley is home to critical facilities that would be vulnerable to the effects of hail. This includes city facilities valued at 10.2 million.
Vulnerable Populations	Approximately 8.3% of the population in Crowley consists of individuals who are 65 years or older. In addition, approximately 4.3 % of Crowley families live below the poverty line. While hail poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after a damaging hail storm has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by hail could result in serious environmental impacts to the city of Crowley. Such impacts could include contamination of soil, and water systems.
Dallas Fort Worth International Airport	
Critical Asset Vulnerability	The Dallas Fort Worth International Airport is home to critical facilities that would be vulnerable to the effects of hail. This includes airport towers, terminals, utilities plants, fuel facilities, water treatment facilities, storage facilities, as well as aircraft.

Vulnerability to Hail	
Vulnerable Populations	Vulnerable populations within the airport would consist of those individuals working in the airport as well as airline customers who happen to be at the airport during hail incident. Should the airport be impacted by hail, efforts must be aimed at safeguarding these individuals from harm and restoring flight systems as quickly as possible.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by hail could result in serious environmental impacts. Damage to fuel storage tanks could impact soil, and water systems.
City of Euless	
Critical Asset Vulnerability	The City of Euless is home to critical facilities that would be vulnerable to the effects of hail. This includes city facilities and public schools.
Vulnerable Populations	Approximately 5.8% of the population in Crowley consists of individuals who are 65 years or older. In addition, approximately 5.7 % of Euless families live below the poverty line. While hail poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after a damaging hail storm has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by hail could result in environmental impacts to the city of Euless. Such impacts could include contamination of soil, and water systems.
City of Forest Hill	
Critical Asset Vulnerability	The City of Forest Hill is home to critical facilities that would be vulnerable to the effects of hail. This includes city facilities valued at $875,220.
Vulnerable Populations	Approximately 9.1% of the population in Forest Hill consists of individuals who are 65 years or older. In addition, approximately 16.0 % of Forest Hill families live below the poverty line. While hail poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after a damaging hail storm has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by hail could result in environmental impacts to the city of Forest Hill. Such impacts could include contamination of soil, and water systems.
City of Fort Worth	
Critical Asset Vulnerability	The City of Fort Worth is home to critical facilities that would be vulnerable to the effects of hail. This includes city buildings, water pumps stations, water storage facilities, water treatment facilities, convention facilities, and radio towers valued at $571 million. The City also has school facilities, hospitals, a naval air station, as well as employers that employ many of the residents of the city.
Vulnerable Populations	Approximately 8.2% of the population in Fort Worth consists of individuals who are 65 years or older and approximately 18.7 % of individuals in Fort Worth live below the poverty line. In addition, there is a homeless population in in Fort Worth estimated at 2,000 individuals. While hail poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after a damaging hail storm has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by hail could result in environmental impacts to the city of Fort Worth. Such impacts could include contamination of soil, and water systems.
City of Grapevine	
Critical Asset Vulnerability	The City of Grapevine is home to critical facilities that would be vulnerable to the effects of hail. This includes city buildings, water storage facilities, and water treatment facilities, valued at 33.4 million.
Vulnerable Populations	Approximately 7.9% of the population in Grapevine consists of individuals who are 65 years or older. In addition, approximately 7.9 % of individuals in Grapevine live below the poverty line.

Vulnerability to Hail	
	While hail poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after a damaging hail storm has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by hail could result in environmental impacts to the city of Grapevine. Such impacts could include contamination of soil, and water systems.
City of Haltom City	
Critical Asset Vulnerability	The City of Haltom City is home to critical facilities that would be vulnerable to the effects of hail. This includes city buildings valued at 10.8 million.
Vulnerable Populations	Approximately 10.0% of the population in Grapevine consists of individuals who are 65 years or older. In addition, approximately 16.7 % of individuals in Haltom City live below the poverty line. While hail poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after a damaging hail storm has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by hail could result in environmental impacts to the city of Haltom City. Such impacts could include contamination of soil, and water systems.
City of Haslet	
Critical Asset Vulnerability	The City of Haslet is home to critical facilities that would be vulnerable to the effects of hail. This includes a city building housing fire and emergency management, and an elementary school. The City also is home to an Amazon Incorporated distribution center that employs approximately 1500 people.
Vulnerable Populations	A breakdown of vulnerable populations was not available for the city of Haslet as of the writing of this document.
Environmental Vulnerability	There are multiple train tracks and distribution centers located in the city. Hazardous materials spills and leaks as a result of damage caused by hail could result in environmental impacts to the city of Haslet. Such impacts could include contamination of soil, and water systems.
City of Hurst	
Critical Asset Vulnerability	The City of Hurst is home to critical facilities that would be vulnerable to the effects of hail. This includes city buildings valued at 34.6 million and a children's medical center valued at 15 million. In addition, there is a Mall in Hurst whose property is valued at 155 million.
Vulnerable Populations	Approximately 12.4% of the population in Hurst consists of individuals who are 65 years or older. In addition, approximately 6.6 % of individuals in Hurst live below the poverty line. While hail poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after a damaging hail storm has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by hail could result in environmental impacts to the city of Hurst. Such impacts could include contamination of soil, and water systems.
City of Keller	
Critical Asset Vulnerability	The City of Keller is home to critical facilities that would be vulnerable to the effects of hail. This includes city buildings valued at 46.7 million, and school facilities valued at approximately 84.1 million.
Vulnerable Populations	Approximately 8.6% of the population in Keller consists of individuals who are 65 years or older. In addition, approximately 3.9 % of individuals in Keller live below the poverty line. While hail poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after a damaging hail storm has occurred.

Vulnerability to Hail	
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by hail could result in environmental impacts to the city of Keller. Such impacts could include contamination of soil, and water systems.
City of Kennedale	
Critical Asset Vulnerability	The City of Kennedale is home to critical facilities that would be vulnerable to the effects of hail. This includes city buildings, water storage tanks, and well pumps valued at 36 million.
Vulnerable Populations	Approximately 10.5% of the population in Kennedale consists of individuals who are 65 years or older. In addition, approximately 8.1 % of individuals in Kennedale live below the poverty line. While hail poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after a damaging hail storm has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by hail could result in environmental impacts to the city of Kennedale. Such impacts could include contamination of soil, and water systems.
City of Lake Worth	
Critical Asset Vulnerability	The City of Lake Worth is home to critical facilities that would be vulnerable to the effects of hail. This includes city buildings valued at 4.1 million, schools valued at 58.4 million, and two nursing home facilities valued at 2.3 million.
Vulnerable Populations	Approximately 16.1% of the population in Lake Worth consists of individuals who are 65 years or older. In addition, approximately 9.4 % of individuals in Lake Worth live below the poverty line. While hail poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after a damaging hail storm has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by hail could result in environmental impacts to the city of Lake Worth. Such impacts could include contamination of soil, and water systems.
City of Lakeside	
Critical Asset Vulnerability	The City of Lakeside is home to critical facilities that would be vulnerable to the effects of hail. This includes a city building, a water pump station, a waste water facility, and two gas wells.
Vulnerable Populations	Approximately 18.4% of the population in Lakeside consists of individuals who are 65 years or older. In addition, approximately 3.0 % of individuals in Lakeside live below the poverty line. While hail poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after a damaging hail storm has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by hail could result in environmental impacts to the city of Lakeside. Such impacts could include contamination of soil, and water systems.
City of North Richland Hills	
Critical Asset Vulnerability	The City of North Richland Hills is home to critical facilities that would be vulnerable to the effects of hail. This includes city buildings, water storage facilities, sewage lift stations, pump stations and a hospital.
Vulnerable Populations	Approximately 12.3% of the population in North Richland Hills consists of individuals who are 65 years or older. In addition, approximately 7.5 % of individuals in North Richland Hills live below the poverty line. While hail poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after a damaging hail storm has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by hail could result in environmental impacts to the city of North Richland Hills. Such impacts could include contamination of soil, and water systems.

Vulnerability to Hail	
City of Richland Hills	
Critical Asset Vulnerability	The City of Richland Hills is home to critical facilities that would be vulnerable to the effects of hail. This includes a city building and a county fire alarm center. The city is also home to several food processing and industrial facilities.
Vulnerable Populations	Approximately 18.4% of the population in Richland Hills consists of individuals who are 65 years or older. In addition, approximately 7.8 % of individuals in Richland Hills live below the poverty line. While hail poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after a damaging hail storm has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by hail could result in environmental impacts to the city of Richland Hills. Such impacts could include contamination of soil, and water systems.
City of Saginaw	
Critical Asset Vulnerability	The City of Saginaw is home to critical facilities that would be vulnerable to the effects of hail. This includes a city building and a county fire alarm center. The city is also home to several food processing and industrial facilities.
Vulnerable Populations	Approximately 6.8% of the population in Saginaw consists of individuals who are 65 years or older. In addition, approximately 4.2 % of individuals in Saginaw live below the poverty line. While hail poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after a damaging hail storm has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by hail could result in environmental impacts to the city of Saginaw. Such impacts could include contamination of soil, and water systems.
City of Southlake	
Critical Asset Vulnerability	The City of Southlake is home to critical facilities that would be vulnerable to the effects of hail. This includes a city buildings valued at 15.2 million, a hospital valued at 10.3 million, and school facilities valued at 284 million. In addition, there are two nursing facilities valued at 16.3 million, as well as several major employers.
Vulnerable Populations	Approximately 5.9% of the population in Southlake consists of individuals who are 65 years or older. In addition, approximately 3.3 % of individuals in Southlake live below the poverty line. While hail poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after a damaging hail storm has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by hail could result in environmental impacts to the city of Southlake. Such impacts could include contamination of soil, and water systems.
Tarrant County	
Critical Asset Vulnerability	Tarrant County is home to critical facilities that would be vulnerable to the effects of hail. This includes county buildings valued at 628.2 million, school district facilities, Dallas Fort Worth International Airport, and healthcare facilities.
Vulnerable Populations	Approximately 9.9% of the population in Tarrant County consists of individuals who are 65 years or older. In addition, approximately 14.7 % of individuals in Tarrant County live below the poverty line. While hail poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after a damaging hail storm has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by hail could result in environmental impacts to Tarrant County. Such impacts could include contamination of soil, water ways, and water systems.

Vulnerability to Hail	
City of Watauga	
Critical Asset Vulnerability	The city of Watauga is home to critical facilities that would be vulnerable to the effects of hail. This includes city buildings valued at 18.1 million.
Vulnerable Populations	Approximately 7.4% of the population in Watauga consists of individuals who are 65 years or older. In addition, approximately 8.1 % of individuals in Watauga live below the poverty line. While hail poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after a damaging hail storm has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by hail could result in environmental impacts to the city of Watauga. Such impacts could include contamination of soil, water ways, and water systems.
City of Westlake	
Critical Asset Vulnerability	The city of Westlake is home to critical facilities that would be vulnerable to the effects of hail. This includes a water pump station valued at 4 million, a fire station valued at $300,000, a charter school, and a university. There are also two large employers in the city, Fidelity Investments and the Solana Business Complex.
Vulnerable Populations	Approximately 11.6% of the population in Westlake consists of individuals who are 65 years or older. In addition, approximately 2.7 % of individuals in Westlake live below the poverty line. While hail poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after a damaging hail storm has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by hail could result in environmental impacts to the city of Westlake. Such impacts could include contamination of soil, water ways, and water systems.
City of Westworth Village	
Critical Asset Vulnerability	The city of Westworth Village is home to critical facilities that would be vulnerable to the effects of hail. This includes two city facilities valued at 4.9 million, as well as a school.
Vulnerable Populations	Approximately 11.5% of the population in Westworth Village consists of individuals who are 65 years or older. In addition, approximately 9.1 % of individuals in Westworth Village live below the poverty line. While hail poses a serious threat to any population, issues with mobility could make it difficult for these populations to evacuate ahead of such a threat or relocate after a damaging hail storm has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by hail could result in environmental impacts to the city of Westworth Village. Such impacts could include contamination of soil and water systems.

Vulnerability

The following chart provides the potential impact of hail for all participating jurisdictions. Potential losses should hail impact each jurisdiction are provided in Appendix G where the value of each piece of critical infrastructure is detailed for building and contents losses.

Hail

Frequency of Occurrence	Highly Likely
Warning Time	3 -6 hours
Geographic Extent	Community-wide
Potential Impact	Moderate

* For the purposes of the hazard Hail, "forecast warning" is defined as the amount of time necessary to determine whether severe weather has the potential to impact a jurisdiction. This should not be confused with the National Weather Service's definition or use of the term "warning".

Multijurisdictional Concerns

Tarrant County and all participating jurisdictions are vulnerable to hailstorms and therefore should be included in any prospective mitigation projects. The probability of hailstorms occurring in the future is relatively high based on previous data. Hailstorms affect Tarrant County and participating jurisdictions equally and uniformly.

Land Use and Development Trends

Future development throughout Tarrant County and the participating jurisdictions will be vulnerable to potential damage of property from hailstorms because no property is immune to a hailstorm's effects.

Hazard Summary

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 hailstorms and thunderstorms. There is wide potential variation in these severity components. The size of the hail is a direct function of the severity and size of the storm. The duration of each storm varies but rarely lasts longer than a couple of hours.

Hailstorms rarely result in the loss of human life, but they cause nearly $1 billion in property, livestock, and crop damage in the United States each year. Once a hailstone reaches the size of about 1.5 inches in diameter, damage to cars, windows, and siding will occur. Although typically not life-threatening, severe hailstorms have the potential to cause significant property damage, particularly to automobiles and some building types.

4.1.5 Lightning

Hazard Definition

Lightning typically occurs as a byproduct of severe thunderstorms. Lightning strikes proceed from cloud to cloud, cloud to ground, or, where high structures are involved, from ground to cloud. Lightning strikes the ground in the United States nearly every day as a result of moist, warm climates. There are roughly 5 to 10 times as many cloud flashes as there is cloud to ground flashes, but there are still 20,000,000 clouds to ground flashes every year. The NWS estimates that during the past 30 years, lightning killed an average of 58 people each year and injured approximately 300 people each year. Lightning strikes in Tarrant County and the participating jurisdictions are most prevalent in May and August.

The National Weather Service utilizes the Lightning Activity Level as a scale to describe lightning activity. Based on the LAL, Tarrant County and participating jurisdictions can expect to see lightning activity from a LAL 1 to LAL 6.

Table 4-15
Lightning Activity Scale[15]

[15] Source: National Oceanic and Atmospheric Administration (NOAA), http://www.nws.noaa.gov/forecasts/wfo/definitions/defineLAL.html.

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

Hazard Identification

Lightning, as with many natural hazards, can strike anywhere and at any time. Data from SHELDUS reported 100 incidents of lightning strikes in Tarrant County and the participating jurisdictions in the past 50 years. Much of the property damage associated with lightning strikes in Tarrant County and the participating jurisdictions is the result of fires in commercial and residential buildings started by lightning strikes. Many jurisdictions in Tarrant County and the participating jurisdictions report structural fires and damage as a result of lightning strikes, although they are not found in the SHELDUS report. The following instances also occurred in Tarrant County and the participating jurisdictions.

- January 1995: A house chimney, wooden mantel, and ceiling were damaged in Arlington, totaling $3,000.
- July 1997: Two men were injured when lightning struck a pole near them in Arlington.
- February 1998: Lightning strikes in the City of Arlington caused fires in 6 homes, with damage totaling $100,000.
- September 2001: A lightning strike in Southlake started a fire that damaged one home and caused $20,000 in damage.
- June 2003: 5 structure fires were caused by lighting in the City of Colleyville.
- June 2004: The City of Colleyville reported a 2-alarm house fire as the result of a lightning strike.
- August 2005: In Arlington, a 3,300 square foot house was struck by lightning and burned to the ground, resulting in a $325,000 loss.
- May 2013: A Kennedale home was struck by lightning that caused $150,000 in damage.

There is a 100% chance of lightning occurring any given year in all participating jurisdictions. Lightning events that have occurred in the planning area since 1996 are listed in the table below.

Table 4-16[16]
Lightning Strikes in Tarrant County

Location	Date	Time	Time Zone	Type	Deaths	Injuries	Property Damage Estimate	Crop Damage Estimate
FT WORTH	4/22/1996	6:50	CST	Lightning	0	0	100.00K	0.00K
MANSFIELD	8/9/1996	13:00	CST	Lightning	0	0	0.00K	0.00K
EULESS	8/31/1996	16:00	CST	Lightning	0	0	40.00K	0.00K
FT WORTH	4/20/1997	20:30	CST	Lightning	0	0	25.00K	0.00K
HURST	5/15/1997	8:00	CST	Lightning	0	0	75.00K	0.00K
HURST	6/22/1997	14:55	CST	Lightning	0	1	0.00K	0.00K
ARLINGTON	7/5/1997	9:00	CST	Lightning	0	2	0.00K	0.00K
ARLINGTON	9/3/1997	19:45	CST	Lightning	0	0	30.00K	0.00K
ARLINGTON	2/25/1998	20:00	CST	Lightning	0	0	100.00K	0.00K
HALTOM CITY	4/20/1998	0:30	CST	Lightning	0	0	270.00K	0.00K
ARLINGTON	5/27/1998	0:46	CST	Lightning	0	0	35.00K	0.00K
ARLINGTON	5/26/1999	5:05	CST	Lightning	0	0	5.00K	0.00K
FT WORTH	3/10/2000	10:15	CST	Lightning	0	0	35.00K	0.00K
ARLINGTON	5/28/2001	1:15	CST	Lightning	0	0	20.00K	0.00K
CROWLEY	6/14/2001	19:45	CST	Lightning	0	0	15.00K	0.00K
BEDFORD	8/6/2001	19:00	CST	Lightning	1	0	0.00K	0.00K
AZLE	8/10/2001	13:15	CST	Lightning	0	1	0.00K	0.00K
BEDFORD	8/17/2001	7:00	CST	Lightning	0	1	0.00K	0.00K
SOUTH LAKE	9/18/2001	18:00	CST	Lightning	0	0	20.00K	0.00K
GRAPEVINE	5/6/2002	3:00	CST	Lightning	0	0	50.00K	0.00K
FT WORTH	8/10/2002	11:20	CST	Lightning	0	0	280.00K	0.00K
BEDFORD	4/23/2003	20:25	CST	Lightning	0	0	20.00K	0.00K
FT WORTH	5/16/2003	3:00	CST	Lightning	0	0	90.00K	0.00K
HALTOM CITY	6/11/2003	22:00	CST	Lightning	0	0	60.00K	0.00K
COLLEYVILLE	6/13/2003	3:30	CST	Lightning	0	0	450.00K	0.00K

[16] Source: National Climatic Data Center, http://www.ncdc.noaa.gov/oa/ncdc.html.

Location	Date	Time	Time Zone	Type	Deaths	Injuries	Property Damage Estimate	Crop Damage Estimate
GRAPEVINE	6/13/2003	4:00	CST	Lightning	0	0	96.00K	0.00K
FT WORTH	8/11/2003	23:30	CST	Lightning	0	0	550.00K	0.00K
FT WORTH	8/12/2003	20:00	CST	Lightning	0	0	400.00K	0.00K
FT WORTH	8/12/2003	20:40	CST	Lightning	0	0	10.00K	0.00K
FT WORTH	8/12/2003	21:45	CST	Lightning	0	0	300.00K	0.00K
FT WORTH	8/12/2003	22:00	CST	Lightning	0	0	45.00K	0.00K
KELLER	8/13/2003	15:30	CST	Lightning	0	0	5.00K	0.00K
COLLEYVILLE	8/26/2003	16:00	CST	Lightning	0	0	300.00K	0.00K
ARLINGTON	7/7/2005	9:00	CST	Lightning	0	0	1.00K	0.00K
ARLINGTON	8/5/2005	14:30	CST	Lightning	0	0	325.00K	0.00K
WATAUGA	8/6/2005	17:00	CST	Lightning	0	0	3.00K	0.00K
WATAUGA	8/7/2005	17:00	CST	Lightning	0	0	0.50K	0.00K
ARLINGTON	10/31/2005	11:00	CST	Lightning	0	0	0.00K	0.00K
FT WORTH	2/25/2006	4:44	CST	Lightning	0	0	160.00K	0.00K
ARLINGTON	5/5/2006	3:11	CST	Lightning	0	1	5.00K	0.00K
FT WORTH	5/5/2006	4:30	CST	Lightning	0	0	580.00K	0.00K
FT WORTH	8/27/2006	18:30	CST	Lightning	0	0	3.00K	0.00K
GRAPEVINE	5/2/2007	18:00	CST-6	Lightning	0	0	5.00K	0.00K
FT WORTH	10/14/2007	21:10	CST-6	Lightning	0	0	10.00K	0.00K
FT WORTH	2/5/2008	5:00	CST-6	Lightning	0	0	12.00K	0.00K
ARLINGTON	4/27/2009	5:23	CST-6	Lightning	0	0	30.00K	0.00K
FT WORTH SAGINAW ARP	6/10/2009	17:20	CST-6	Lightning	0	0	500.00K	0.00K
LAKE WORTH	6/10/2009	17:20	CST-6	Lightning	0	0	10.00K	0.00K
FT WORTH	6/10/2009	17:30	CST-6	Lightning	0	0	1.000M	0.00K
TARRANT	6/10/2009	20:05	CST-6	Lightning	0	0	150.00K	0.00K
KELLER	6/11/2009	1:00	CST-6	Lightning	0	0	1.00K	0.00K
FT WORTH BLUE MND AR	8/21/2009	6:05	CST-6	Lightning	0	0	6.00K	0.00K

Location	Date	Time	Time Zone	Type	Deaths	Injuries	Property Damage Estimate	Crop Damage Estimate
HURST	8/27/2009	18:30	CST-6	Lightning	1	0	0.00K	0.00K
SOUTH LAKE	9/1/2010	17:29	CST-6	Lightning	0	0	500.00K	0.00K
LAKE WORTH	9/2/2010	3:00	CST-6	Lightning	0	0	200.00K	0.00K
EULESS	9/2/2010	4:07	CST-6	Lightning	0	0	100.00K	0.00K
KELLER GOODE ARPT	11/2/2010	10:50	CST-6	Lightning	0	0	1.000M	0.00K
GRAPEVINE	5/11/2011	13:15	CST-6	Lightning	0	0	7.00K	0.00K
FT WORTH	9/16/2011	16:26	CST-6	Lightning	0	0	8.00K	0.00K
WEBB	1/25/2012	5:00	CST-6	Lightning	0	0	10.00K	0.00K
KELLER GOODE ARPT	4/8/2012	11:00	CST-6	Lightning	0	0	12.00K	0.00K
POLTECHNIEC	4/8/2012	13:15	CST-6	Lightning	0	0	2.00K	0.00K
PANTEGO	6/6/2012	18:00	CST-6	Lightning	0	0	30.00K	0.00K
BENBROOK LAKE	8/18/2012	14:30	CST-6	Lightning	0	0	15.00K	0.00K
NORTH RICHLAND HILLS	6/6/2013	2:30	CST-6	Lightning	0	0	50.00K	0.00K
KELLER	8/11/2013	20:00	CST-6	Lightning	0	0	250.00K	0.00K
TARRANT CO.	9/1/2013	21:45	CST-6	Lightning	0	0	20.00K	0.00K
TARRANT CO.	9/2/2013	0:45	CST-6	Lightning	0	0	35.00K	0.00K
Totals:					2	6	8.466M	0.00K

Assets Exposed to Hazard

- **Property Risk/Vulnerability.** In evaluating assets that are vulnerable to lightning incidents, the Tarrant County Local Mitigation Action Plan Committee determined that all critical facilities as well as all public, private, and commercial property are vulnerable to lightning incidents.
- **People Risk/Vulnerability.** It was determined that risk/vulnerability includes the entire population of Tarrant County, because there is no way to determine the impact or magnitude of a lightning incident and no way to predict where a lightning incident will occur. People are vulnerable to lightning incidents through power outages, effects on transportation routes, establishment of shelters, being struck by lightning, etc. A significant chance of a lightning incident exists in any given year in Tarrant County.
- **Environment Risk/Vulnerability.** In more rural areas, lightning strikes pose danger by causing wildfires. Due to its urban environment, the environmental risk of lightning strikes is low in Tarrant County.

The risk and vulnerability to lightning strikes for each participating jurisdiction are detailed below. It should be noted that the North Central Texas Council of Governments (NCTCOG) is an association of local governments that works to assist in planning and coordination efforts of 16 counties in North Central Texas. It is a government authority but does not hold or own any land or property, nor does it have any constituents. Therefore, there is minimal vulnerability to the NCTCOG.

Vulnerability to Lightning	
City of Arlington	
Critical Asset Vulnerability	The City of Arlington is home to critical facilities that would be vulnerable to the effects of lightning. This includes city facilities worth approximately 8.5 million, the Dallas Cowboys Stadium worth $1.6 billion dollars, as well as many U.S. Government office facilities, public schools, a university, a large theme park, and privately-owned facilities that employ a significant number of residents. Power, water and sewer treatment systems could also be affected as a result of lightning.
Vulnerable Populations	As of 2010, 8% of the population in Arlington consists of individuals who were 65 years or older. In addition, approximately 16% of Arlington families live below the poverty line. While lightning poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or relocate after a lightning caused fire or electrical damage has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by lightning could result in serious environmental impacts to the city of Arlington. Such impacts could include contamination of soil, waterways, and reservoirs.
City of Azle	
Critical Asset Vulnerability	The City of Azle is home to critical facilities that would be vulnerable to the effects of lightning. This includes city structures worth approximately 63.5 million, and public school facilities worth 96 million.
Vulnerable Populations	As of 2010, 12.8% of the population in Azle consists of individuals who were 65 years or older. In addition, approximately 6.9% of Azle families live below the poverty line. While lightning poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or relocate after a lightning caused fire or electrical damage has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by lightning could result in serious environmental impacts to the city of Azle. Such impacts could include contamination of soil, waterways, and reservoirs.
City of Bedford	
Critical Asset Vulnerability	The City of Bedford is home to critical facilities that would be vulnerable to the effects of lightning. This includes city facilities, schools, and hospitals. In addition, the city is home to employers including Walmart, Transamerica, and Heartland that employ residents of the City of Bedford.
Vulnerable Populations	As of 2010, 8.7% of the population in Bedford consists of individuals who were 65 years or older. In addition, approximately 3.7% of Bedford families live below the poverty line. While lightning poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or relocate after a lightning caused fire or electrical damage has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by lightning could result in serious environmental impacts to the city of Bedford. Such impacts could include contamination of soil, waterways, and reservoirs.
City of Blue Mound	

Vulnerability to Lightning	
Critical Asset Vulnerability	The City of Blue Mound is home to critical facilities that would be vulnerable to the effects of lightning. This includes city facilities valued at 250,000, a school, and water production facilities that serve the residents of Blue Mound.
Vulnerable Populations	Approximately 7.2% of the population in Bedford consists of individuals who are 65 years or older. In addition, approximately 5.9 % of Blue Mound families live below the poverty line. While lightning poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or relocate after a lightning caused fire or electrical damage has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by lightning could result in serious environmental impacts to the city of Blue Mound. Such impacts could include contamination of soil, and water systems.
City of Colleyville	
Critical Asset Vulnerability	The City of Colleyville is home to critical facilities that would be vulnerable to the effects of lightning. This includes city facilities valued at 11.7 million, and school facilities valued at 36 million.
Vulnerable Populations	Approximately 5.3% of the population in Colleyville consists of individuals who are 65 years or older. In addition, approximately 1.2 % of Colleyville families live below the poverty line. While lightning poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or relocate after a lightning caused fire or electrical damage has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by lightning could result in serious environmental impacts to the city of Colleyville. Such impacts could include contamination of soil, and water systems.
City of Crowley	
Critical Asset Vulnerability	The City of Crowley is home to critical facilities that would be vulnerable to the effects of lightning. This includes city facilities valued at 10.2 million.
Vulnerable Populations	Approximately 8.3% of the population in Crowley consists of individuals who are 65 years or older. In addition, approximately 4.3 % of Crowley families live below the poverty line. While lightning poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or relocate after a lightning caused fire or electrical damage has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by lightning could result in serious environmental impacts to the city of Crowley. Such impacts could include contamination of soil, and water systems.
Dallas Fort Worth International Airport	
Critical Asset Vulnerability	The Dallas Fort Worth International Airport is home to critical facilities that would be vulnerable to the effects of lightning. This includes airport towers, terminals, utilities plants, fuel facilities, water treatment facilities, storage facilities, as well as aircraft.
Vulnerable Populations	Vulnerable populations within the airport would consist of those individuals working in the airport as well as airline customers who happen to be at the airport during lightning incidents. Should the airport be impacted by lightning, efforts must be aimed at safeguarding these individuals from harm and restoring flight systems as quickly as possible.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by lightning could result in serious environmental impacts. Damage to fuel storage tanks could impact soil, and water systems.
City of Euless	
Critical Asset Vulnerability	The City of Euless is home to critical facilities that would be vulnerable to the effects of lightning. This includes city facilities and public schools.
Vulnerable Populations	Approximately 5.8% of the population in Crowley consists of individuals who are 65 years or older. In addition, approximately 5.7 % of Euless families live below the poverty line. While

Vulnerability to Lightning	
	lightning poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or relocate after a lightning caused fire or electrical damage has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by lightning could result in environmental impacts to the city of Euless. Such impacts could include contamination of soil, and water systems.
City of Forest Hill	
Critical Asset Vulnerability	The City of Forest Hill is home to critical facilities that would be vulnerable to the effects of lightning. This includes city facilities valued at $875,220.
Vulnerable Populations	Approximately 9.1% of the population in Forest Hill consists of individuals who are 65 years or older. In addition, approximately 16.0 % of Forest Hill families live below the poverty line. While lightning poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or relocate after a lightning caused fire or electrical damage has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by lightning could result in environmental impacts to the city of Forest Hill. Such impacts could include contamination of soil, and water systems.
City of Fort Worth	
Critical Asset Vulnerability	The City of Fort Worth is home to critical facilities that would be vulnerable to the effects of lightning. This includes city buildings, water pumps stations, water storage facilities, water treatment facilities, convention facilities, and radio towers valued at $571 million. The City also has school facilities, hospitals, a naval air station, as well as employers that employ many of the residents of the city.
Vulnerable Populations	Approximately 8.2% of the population in Fort Worth consists of individuals who are 65 years or older and approximately 18.7 % of individuals in Fort Worth live below the poverty line. In addition, there is a homeless population in in Fort Worth estimated at 2,000 individuals. While lightning poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or relocate after a lightning caused fire or electrical damage has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by lightning could result in environmental impacts to the city of Fort Worth. Such impacts could include contamination of soil, and water systems.
City of Grapevine	
Critical Asset Vulnerability	The City of Grapevine is home to critical facilities that would be vulnerable to the effects of lightning. This includes city buildings, water storage facilities, and water treatment facilities, valued at 33.4 million.
Vulnerable Populations	Approximately 7.9% of the population in Grapevine consists of individuals who are 65 years or older. In addition, approximately 7.9 % of individuals in Grapevine live below the poverty line. While lightning poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or relocate after a lightning caused fire or electrical damage has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by lightning could result in environmental impacts to the city of Grapevine. Such impacts could include contamination of soil, and water systems.
City of Haltom City	
Critical Asset Vulnerability	The City of Haltom City is home to critical facilities that would be vulnerable to the effects of lightning. This includes city buildings valued at 10.8 million.
Vulnerable Populations	Approximately 10.0% of the population in Grapevine consists of individuals who are 65 years or older. In addition, approximately 16.7 % of individuals in Haltom City live below the poverty line. While lightning poses a serious threat to any population, issues with mobility could make it

Vulnerability to Lightning	
	difficult for those individuals to seek shelter ahead of such a threat or relocate after a lightning caused fire or electrical damage has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by lightning could result in environmental impacts to the city of Haltom City. Such impacts could include contamination of soil, and water systems.
City of Haslet	
Critical Asset Vulnerability	The City of Haslet is home to critical facilities that would be vulnerable to the effects of lightning. This includes a city building housing fire and emergency management, and an elementary school. The City also is home to an Amazon Incorporated distribution center that employs approximately 1500 people.
Vulnerable Populations	A breakdown of vulnerable populations was not available for the city of Haslet as of the writing of this document.
Environmental Vulnerability	There are multiple train tracks and distribution centers located in the city. Hazardous materials spills and leaks as a result of damage caused by lightning could result in environmental impacts to the city of Haslet. Such impacts could include contamination of soil, and water systems.
City of Hurst	
Critical Asset Vulnerability	The City of Hurst is home to critical facilities that would be vulnerable to the effects of lightning. This includes city buildings valued at 34.6 million and a children's medical center valued at 15 million. In addition, there is a Mall in Hurst whose property is valued at 155 million.
Vulnerable Populations	Approximately 12.4% of the population in Hurst consists of individuals who are 65 years or older. In addition, approximately 6.6 % of individuals in Hurst live below the poverty line. While lightning poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or relocate after a lightning caused fire or electrical damage has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by lightning could result in environmental impacts to the city of Hurst. Such impacts could include contamination of soil, and water systems.
City of Keller	
Critical Asset Vulnerability	The City of Keller is home to critical facilities that would be vulnerable to the effects of lightning. This includes city buildings valued at 46.7 million, and school facilities valued at approximately 84.1 million.
Vulnerable Populations	Approximately 8.6% of the population in Keller consists of individuals who are 65 years or older. In addition, approximately 3.9 % of individuals in Keller live below the poverty line. While lightning poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or relocate after a lightning caused fire or electrical damage has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by lightning could result in environmental impacts to the city of Keller. Such impacts could include contamination of soil, and water systems.
City of Kennedale	
Critical Asset Vulnerability	The City of Kennedale is home to critical facilities that would be vulnerable to the effects of lightning. This includes city buildings, water storage tanks, and well pumps valued at 36 million.
Vulnerable Populations	Approximately 10.5% of the population in Kennedale consists of individuals who are 65 years or older. In addition, approximately 8.1 % of individuals in Kennedale live below the poverty line. While lightning poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or relocate after a lightning caused fire or electrical damage has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by lightning could result in environmental impacts to the city of Kennedale. Such impacts could include contamination of soil, and water systems.

Vulnerability to Lightning	
City of Lake Worth	
Critical Asset Vulnerability	The City of Lake Worth is home to critical facilities that would be vulnerable to the effects of lightning. This includes city buildings valued at 4.1 million, schools valued at 58.4 million, and two nursing home facilities valued at 2.3 million.
Vulnerable Populations	Approximately 16.1% of the population in Lake Worth consists of individuals who are 65 years or older. In addition, approximately 9.4 % of individuals in Lake Worth live below the poverty line. While lightning poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or relocate after a lightning caused fire or electrical damage has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by lightning could result in environmental impacts to the city of Lake Worth. Such impacts could include contamination of soil, and water systems.
City of Lakeside	
Critical Asset Vulnerability	The City of Lakeside is home to critical facilities that would be vulnerable to the effects of lightning. This includes a city building, a water pump station, a waste water facility, and two gas wells.
Vulnerable Populations	Approximately 18.4% of the population in Lakeside consists of individuals who are 65 years or older. In addition, approximately 3.0 % of individuals in Lakeside live below the poverty line. While lightning poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or relocate after a lightning caused fire or electrical damage has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by lightning could result in environmental impacts to the city of Lakeside. Such impacts could include contamination of soil, and water systems.
City of North Richland Hills	
Critical Asset Vulnerability	The City of North Richland Hills is home to critical facilities that would be vulnerable to the effects of lightning. This includes city buildings, water storage facilities, sewage lift stations, pump stations and a hospital.
Vulnerable Populations	Approximately 12.3% of the population in North Richland Hills consists of individuals who are 65 years or older. In addition, approximately 7.5 % of individuals in North Richland Hills live below the poverty line. While lightning poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or relocate after a lightning caused fire or electrical damage has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by lightning could result in environmental impacts to the city of North Richland Hills. Such impacts could include contamination of soil, and water systems.
City of Richland Hills	
Critical Asset Vulnerability	The City of Richland Hills is home to critical facilities that would be vulnerable to the effects of lightning. This includes city buildings, water storage facilities, sewage lift stations, pump stations and a hospital.
Vulnerable Populations	Approximately 18.4% of the population in Richland Hills consists of individuals who are 65 years or older. In addition, approximately 7.8 % of individuals in Richland Hills live below the poverty line. While lightning poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or relocate after a lightning caused fire or electrical damage has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by lightning could result in environmental impacts to the city of Richland Hills. Such impacts could include contamination of soil, and water systems.
City of Saginaw	

Vulnerability to Lightning	
Critical Asset Vulnerability	The City of Saginaw is home to critical facilities that would be vulnerable to the effects of lightning. This includes a city building and a county fire alarm center. The city is also home to several food processing and industrial facilities.
Vulnerable Populations	Approximately 6.8% of the population in Saginaw consists of individuals who are 65 years or older. In addition, approximately 4.2 % of individuals in Saginaw live below the poverty line. While lightning poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or relocate after a lightning caused fire or electrical damage has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by lightning could result in environmental impacts to the city of Saginaw. Such impacts could include contamination of soil, and water systems.
City of Southlake	
Critical Asset Vulnerability	The City of Southlake is home to critical facilities that would be vulnerable to the effects of lightning. This includes a city buildings valued at 15.2 million, a hospital valued at 10.3 million, and school facilities valued at 284 million. In addition, there are two nursing facilities valued at 16.3 million, as well as several major employers.
Vulnerable Populations	Approximately 5.9% of the population in Southlake consists of individuals who are 65 years or older. In addition, approximately 3.3 % of individuals in Southlake live below the poverty line. While lightning poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or relocate after a lightning caused fire or electrical damage has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by lightning could result in environmental impacts to the city of Southlake. Such impacts could include contamination of soil, and water systems.
Tarrant County	
Critical Asset Vulnerability	Tarrant County is home to critical facilities that would be vulnerable to the effects of lightning. This includes county buildings valued at 628.2 million, school district facilities, Dallas Fort Worth International Airport, and healthcare facilities.
Vulnerable Populations	Approximately 9.9% of the population in Tarrant County consists of individuals who are 65 years or older. In addition, approximately 14.7 % of individuals in Tarrant County live below the poverty line. While lightning poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or relocate after a lightning caused fire or electrical damage has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by lightning could result in environmental impacts to Tarrant County. Such impacts could include contamination of soil, water ways, and water systems.
City of Watauga	
Critical Asset Vulnerability	The city of Watauga is home to critical facilities that would be vulnerable to the effects of lightning. This includes city buildings valued at 18.1 million.
Vulnerable Populations	Approximately 7.4% of the population in Watauga consists of individuals who are 65 years or older. In addition, approximately 8.1 % of individuals in Watauga live below the poverty line. While lightning poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or relocate after a lightning caused fire or electrical damage has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by lightning could result in environmental impacts to the city of Watauga. Such impacts could include contamination of soil, water ways, and water systems.
City of Westlake	
Critical Asset Vulnerability	The city of Westlake is home to critical facilities that would be vulnerable to the effects of lightning. This includes a water pump station valued at 4 million, a fire station valued at

Vulnerability to Lightning	
	$300,000, a charter school, and a university. There are also two large employers in the city, Fidelity Investments and the Solana Business Complex.
Vulnerable Populations	Approximately 11.6% of the population in Westlake consists of individuals who are 65 years or older. In addition, approximately 2.7 % of individuals in Westlake live below the poverty line. While lightning poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or relocate after a lightning caused fire or electrical damage has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by lightning could result in environmental impacts to the city of Westlake. Such impacts could include contamination of soil, water ways, and water systems.
City of Westworth Village	
Critical Asset Vulnerability	The city of Westworth Village is home to critical facilities that would be vulnerable to the effects of lightning. This includes two city facilities valued at 4.9 million, as well as a school.
Vulnerable Populations	Approximately 11.5% of the population in Westworth Village consists of individuals who are 65 years or older. In addition, approximately 9.1 % of individuals in Westworth Village live below the poverty line. While lightning poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or relocate after a lightning caused fire or electrical damage has occurred.
Environmental Vulnerability	Hazardous materials spills and leaks as a result of damage caused by lightning could result in environmental impacts to the city of Westworth Village. Such impacts could include contamination of soil and water systems.

Vulnerability

Lightning Strikes

Frequency of Occurrence	Highly Likely
Warning Time	None-Minimal
Geographic Extent	Localized
Potential Impact	Minor

Multijurisdictional Concerns

The entire planning area is vulnerable to lightning strikes, specifically given that fact that lightning can strike at any time without warning. As a result, any mitigation steps taken related to lightning should be undertaken on a countywide basis.

Land Use and Development Trends

Tarrant County does not currently have land use or development trends related to lightning.

Hazard Summary

Lightning strikes, although rare in occurrence, have a high danger potential associated with them. Lightning, as with some of the other natural hazards typical to Tarrant County, can strike anywhere and at any time. The unpredictability of lightning along with its potential to be deadly and destructive is all the more reason to explore mitigation actions.

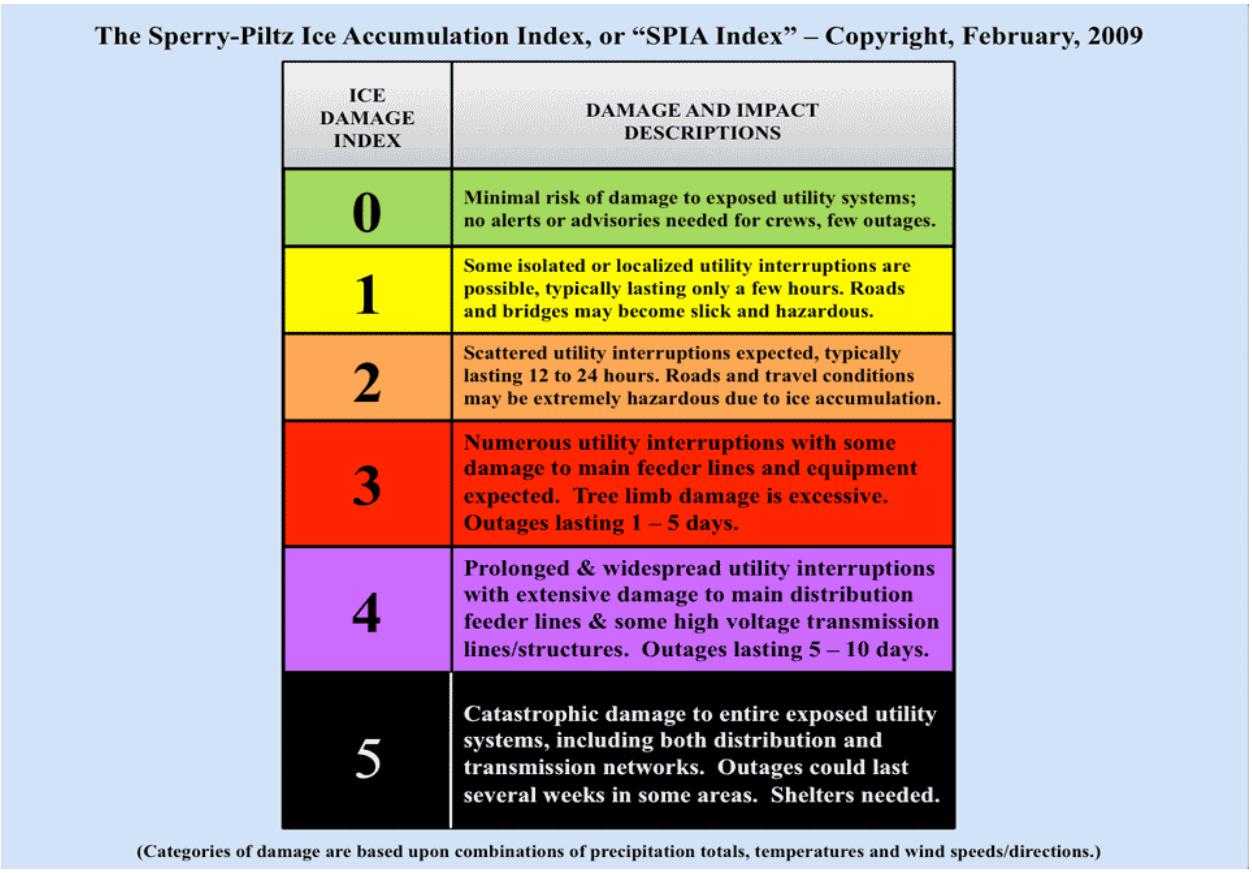
4.1.6 Winter Storms

Hazard Definition

Severe winter storms bring the threat of snow, freezing rain, and ice storms to Tarrant County. A heavy accumulation of ice, especially when accompanied by high winds, can destroy trees and power lines. Sidewalks, streets, and highways can become extremely hazardous to pedestrians and motorists. Severe winter storms originate as mid-latitude depressions of cyclonic weather systems and can cause snowstorms, blizzards, and ice storms. Winter storms can paralyze a county or community by shutting down normal day-to-day operations and can produce an accumulation of snow and ice on trees and utility lines, resulting in loss of electricity and blocked transportation routes. These storms can also lead to frozen water pipes, which when erupted, can lead to extensive property damage and the depletion of natural resources. Severe winter storms produce additional complications for the elderly and children due to vulnerabilities to extreme cold temperatures.

There are two measurements used to classify and define winter storms: ice accumulation and snowfall. Extreme cold events are covered in Section 4.1.9 of this plan. Ice accumulation is measured using the Sperry-Piltz Ice Accumulation Index, or the SPIA Index, as shown in the figure below. Tarrant County and participating jurisdictions may expect an ice damage index from 0 to 5, providing a wide range of damage.

Figure 4-6[17]
Sperry-Piltz Ice Accumulation Index



Snowfall is measured using the Regional Snowfall Index (RSI). The RSI is produced by the National Climatic Data Center and ranks snowstorm impacts on a scale of 1 to 5, similar to the Fujita scale for tornadoes or the Saffir-Simpson scale for hurricanes. Tarrant County and the participating jurisdictions can expect to see snowfall between a range of 1 to 4 on the RSI.

Figure 4-7[18]
Regional Snowfall Index

Category	RSI Value	Description
1	1–3	Notable
2	3–6	Significant
3	6–10	Major
4	10–18	Crippling
5	18.0+	Extreme

[17] Source: SPIA Index, http://www.spia-index.com/.
[18] Source: NOAA, http://www.ncdc.noaa.gov/snow-and-ice/rsi/.

Hazard Identification

Numerous sources were used in identifying the severe winter storm hazards that have occurred in Tarrant County and the participating jurisdictions (both primary and secondary). Sources included the National Oceanic Atmospheric Agency (NOAA), National Climatic Data Center (NCDC), the National Weather Service (NWS), and the Spatial Hazard Events and Losses Database (SHELDUS).

Research from the NCDC indicates that winter storm occurrences recorded for Tarrant County and the participating jurisdictions have produced injuries, fatalities, or significant property or crop damage. Statistically, Tarrant County and the participating jurisdictions can expect a winter storm every three years, equating to a 33% chance of a winter storm in any given year.

One of the biggest winter storms seen in Tarrant County occurred on January 15-16, 1964, when accumulations of snow between 8-12 inches were reported in the Dallas Fort Worth area. Another winter storm of note occurred on December 22-24, 1998, when a combination of freezing drizzle, freezing rain, sleet, and snow moved over all of North Texas. The result was more than 2000 traffic accidents and 6 deaths. Dallas Fort Worth (DFW) International Airport was forced to cancel over 400 flights, impacting the national air travel system as a whole. Arlington reported that two people died from hypothermia and many were injured from falling on the ice. Another devastating winter storm occurred a few years later, when on February 24-25, 2003, up to five inches of sleet and snow fell in the area, including one inch of ice accumulation. Area schools were closed for several days while county and local government personnel worked round the clock to clear the streets. There was a significant economic loss due to lost revenue from stranded truckers, canceled flights, closed businesses, and emergency expenditures.

Although these storms were large disasters, the February 11-12, 2010, storm was record-breaking. Snow began to fall across North Texas beginning in the early hours of February 11 and continued for 24 hours. Climate data records for snow were eclipsed at DFW International Airport, totaling the largest snowfall in Tarrant County history. A total of 12.5 inches fell across the region, with the highest snowfall total of 14.4 inches being reported in northwest Tarrant County. Some jurisdictions, such as Southlake, were fortunate to experience minimal impact despite the snow totals. Others, however, were not as fortunate. Extreme low temperatures combined with high winds caused a water main pipe to burst inside Westlake Academy, causing nearly $700,000 in damage. Grapevine reported $500,000 in losses from the storm due to widespread power outages, treacherous travel conditions, and ice conditions of up to two inches. The storm caused 20,000 Arlington citizens to be without power. In Fort Worth, on the morning of February 12, the roof of Rahr & Sons Brewing Company, a microbrewery south of downtown Fort Worth, collapsed, damaging the building and coolant lines to the storage tanks. The total economic impact of this storm totaled approximately $20 million region wide.

The table below lists winter storm events that have occurred in the planning area since 1996.

Table 4-17
Winter Storm Events[19]

Location	Date	Time	Time Zone	Type	Deaths	Injuries	Property Damage Estimate	Crop Damage Estimate
TARRANT (ZONE)	11/24/1996	14:00	CST	Winter Storm	0	0	0.00K	0.00K
TARRANT (ZONE)	1/6/1997	12:00	CST	Heavy Snow	0	0	0.00K	0.00K
TARRANT (ZONE)	1/12/1997	20:00	CST	Winter Weather	0	0	0.00K	0.00K
TARRANT (ZONE)	1/14/1997	23:00	CST	Winter Weather	0	0	0.00K	0.00K
TARRANT (ZONE)	12/22/1998	0:00	CST	Ice Storm	0	0	0.00K	0.00K
TARRANT (ZONE)	1/25/2000	0:00	CST	Winter Storm	2	0	0.00K	0.00K
TARRANT (ZONE)	12/12/2000	18:00	CST	Winter Storm	0	0	0.00K	0.00K
TARRANT (ZONE)	12/25/2000	0:00	CST	Winter Storm	0	0	0.00K	0.00K
TARRANT (ZONE)	12/31/2000	0:00	CST	Winter Storm	0	0	0.00K	0.00K
TARRANT (ZONE)	1/1/2001	0:00	CST	Heavy Snow	0	0	0.00K	0.00K
TARRANT (ZONE)	11/28/2001	8:13	CST	Ice Storm	0	0	0.00K	0.00K
TARRANT (ZONE)	2/5/2002	9:00	CST	Winter Storm	0	0	0.00K	0.00K
TARRANT (ZONE)	3/2/2002	2:15	CST	Winter Storm	0	0	0.00K	0.00K
TARRANT (ZONE)	2/24/2003	11:20	CST	Winter Storm	0	0	0.00K	0.00K
TARRANT (ZONE)	2/14/2004	1:00	CST	Heavy Snow	0	0	0.00K	0.00K
TARRANT (ZONE)	12/22/2004	0:01	CST	Winter Weather	0	0	0.00K	0.00K
TARRANT (ZONE)	12/7/2005	7:00	CST	Winter Storm	0	0	0.00K	0.00K
TARRANT (ZONE)	2/18/2006	3:30	CST	Winter Weather	0	0	0.00K	0.00K
TARRANT (ZONE)	11/30/2006	6:00	CST-6	Winter Storm	0	0	20.00K	0.00K
TARRANT (ZONE)	1/13/2007	11:00	CST-6	Ice Storm	0	0	50.00K	0.00K
TARRANT (ZONE)	1/17/2007	3:00	CST-6	Winter Weather	0	0	20.00K	0.00K
TARRANT (ZONE)	2/1/2007	1:00	CST-6	Winter Weather	0	0	0.00K	0.00K
TARRANT (ZONE)	3/6/2008	11:00	CST-6	Winter Storm	0	0	0.00K	0.00K
TARRANT (ZONE)	12/15/2008	18:00	CST-6	Winter Weather	0	0	0.00K	0.00K
TARRANT (ZONE)	12/23/2008	6:00	CST-6	Winter Weather	0	0	0.00K	0.00K
TARRANT (ZONE)	1/5/2009	8:00	CST-6	Winter Weather	0	0	35.00K	0.00K
TARRANT (ZONE)	1/27/2009	8:00	CST-6	Ice Storm	0	0	300.00K	0.00K
TARRANT (ZONE)	12/24/2009	10:00	CST-6	Winter Weather	0	0	120.00K	0.00K
TARRANT (ZONE)	1/7/2010	3:00	CST-6	Winter Weather	0	0	600.00K	0.00K
TARRANT (ZONE)	1/7/2010	3:00	CST-6	Frost/freeze	0	0	0.00K	0.00K
TARRANT (ZONE)	2/11/2010	2:45	CST-6	Heavy Snow	0	0	20.000M	0.00K
TARRANT (ZONE)	3/20/2010	16:45	CST-6	Winter Weather	0	0	80.00K	0.00K
TARRANT (ZONE)	2/1/2011	0:00	CST-6	Ice Storm	0	0	500.00K	0.00K
TARRANT (ZONE)	2/3/2011	23:00	CST-6	Heavy Snow	0	0	50.00K	0.00K

[19] Source: Spatial Hazard Events and Losses Database for the United States, http://webra.cas.sc.edu/hvriapps/sheldus_setup/sheldus_results.aspx.

Location	Date	Time	Time Zone	Type	Deaths	Injuries	Property Damage Estimate	Crop Damage Estimate
TARRANT (ZONE)	11/25/2013	5:26	CST-6	Winter Storm	0	0	6.00K	0.00K
TARRANT (ZONE)	12/5/2013	14:00	CST-6	Winter Storm	0	0	10.000M	0.00K
Totals:					2	0	31.781M	0.00K

Assets Exposed to Hazard

- **Property Risk/Vulnerability.** In evaluating assets that may potentially be impacted by the effects of severe winter storms, all critical facilities as well as all public, private, and commercial properties are vulnerable to the effects of a winter storm. Critical functions that rely on power are most vulnerable to winter storms. Loss of power occurs frequently as a result of heavy ice and snow on power lines. Additionally, cold temperatures and wind chills brought on by winter storms may cause water pipes to burst or freeze. A list of jurisdiction critical infrastructure may be found in Appendix G and all is considered vulnerable to winter storms. Additionally, the impact of snow and ice on roadways may prevent personnel who monitor and control critical infrastructure from accessing facilities, impacting their ability to keep these facilities functioning during winter weather.
- **People Risk/Vulnerability.** It was determined that risk/vulnerability includes the entire population of the planning area because there is no way to determine the impact/magnitude of a winter storm and no way to predict where a storm will occur. People are vulnerable to winter storms through power outages, effects on transportation routes, establishment of shelters, water freezing, etc. The impact of a winter storm is larger in mild climates due to less familiarity and experience driving in and handling snow and ice, such as in Tarrant County and participating jurisdictions.
- **Environment Risk/Vulnerability.** Risks to the environment are low for a winter storm. Winter thaw can cause flooding, impacting the environment and possibly creating contamination of potable water for public consumption.

The risks and vulnerability to severe winter storms for each participating jurisdictions are detailed below. It should be noted that the North Central Texas Council of Governments (NCTCOG) is an association of local governments that works to assist in planning and coordination efforts of 16 counties in North Central Texas. It is a government authority but does not hold or own any land or property, nor does it have any constituents. Therefore, there is minimal vulnerability to the NCTCOG.

Vulnerability to Winter Storms	
City of Arlington	
Critical Asset Vulnerability	The City of Arlington is home to critical facilities that would be vulnerable to the effects of winter storms. This includes city facilities worth approximately 8.5 million, the Dallas Cowboys Stadium worth $1.6 billion dollars, as well as many U.S. Government office facilities, public schools, a university, a large theme park, and privately-owned facilities that employ a significant number of residents. Power, water and sewer treatment systems could also be affected as a result of winter storms.

Vulnerability to Winter Storms	
Vulnerable Populations	As of 2010, 8% of the population in Arlington consists of individuals who were 65 years or older. In addition, approximately 16% of Arlington families live below the poverty line. While winter storms poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or to relocate to adequate shelter once a winter storm occurs.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a winter storm.
City of Azle	
Critical Asset Vulnerability	The City of Azle is home to critical facilities that would be vulnerable to the effects of winter storms. This includes city structures worth approximately 63.5 million, and public school facilities worth 96 million.
Vulnerable Populations	As of 2010, 12.8% of the population in Azle consists of individuals who were 65 years or older. In addition, approximately 6.9% of Azle families live below the poverty line. While winter storms poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or to relocate to adequate shelter once a winter storm occurs.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a winter storm.
City of Bedford	
Critical Asset Vulnerability	The City of Bedford is home to critical facilities that would be vulnerable to the effects of winter storms. This includes city facilities, schools, and hospitals. In addition, the city is home to employers including Walmart, Transamerica, and Heartland that employ residents of the City of Bedford.
Vulnerable Populations	As of 2010, 8.7% of the population in Bedford consists of individuals who were 65 years or older. In addition, approximately 3.7% of Bedford families live below the poverty line. While winter storms poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or to relocate to adequate shelter once a winter storm occurs.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a winter storm.
City of Blue Mound	
Critical Asset Vulnerability	The City of Blue Mound is home to critical facilities that would be vulnerable to the effects of winter storms. This includes city facilities valued at 250,000, a school, and water production facilities that serve the residents of Blue Mound.
Vulnerable Populations	Approximately 7.2% of the population in Bedford consists of individuals who are 65 years or older. In addition, approximately 5.9 % of Blue Mound families live below the poverty line. While winter storms poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or to relocate to adequate shelter once a winter storm occurs.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a winter storm.
City of Colleyville	
Critical Asset Vulnerability	The City of Colleyville is home to critical facilities that would be vulnerable to the effects of winter storms. This includes city facilities valued at 11.7 million, and school facilities valued at 36 million.
Vulnerable Populations	Approximately 5.3% of the population in Colleyville consists of individuals who are 65 years or older. In addition, approximately 1.2 % of Colleyville families live below the poverty line. While winter storms poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or to relocate to adequate shelter once a winter storm occurs.

Vulnerability to Winter Storms	
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a winter storm.
City of Crowley	
Critical Asset Vulnerability	The City of Crowley is home to critical facilities that would be vulnerable to the effects of winter storms. This includes city facilities valued at 10.2 million.
Vulnerable Populations	Approximately 8.3% of the population in Crowley consists of individuals who are 65 years or older. In addition, approximately 4.3 % of Crowley families live below the poverty line. While winter storms poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or to relocate to adequate shelter once a winter storm occurs.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a winter storm.
Dallas Fort Worth International Airport	
Critical Asset Vulnerability	The Dallas Fort Worth International Airport is home to critical facilities that would be vulnerable to the effects of winter storms. This includes airport towers, terminals, utilities plants, fuel facilities, water treatment facilities, storage facilities, as well as aircraft.
Vulnerable Populations	Vulnerable populations within the airport would consist of those individuals working in the airport as well as airline customers who happen to be at the airport during winter storms incidents. Should the airport be impacted by winter storms, efforts must be aimed at safeguarding these individuals from harm and restoring flight systems as quickly as possible.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a winter storm.
City of Euless	
Critical Asset Vulnerability	The City of Euless is home to critical facilities that would be vulnerable to the effects of winter storms. This includes city facilities and public schools.
Vulnerable Populations	Approximately 5.8% of the population in Crowley consists of individuals who are 65 years or older. In addition, approximately 5.7 % of Euless families live below the poverty line. While winter storms poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or to relocate to adequate shelter once a winter storm occurs.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a winter storm.
City of Forest Hill	
Critical Asset Vulnerability	The City of Forest Hill is home to critical facilities that would be vulnerable to the effects of winter storms. This includes city facilities valued at $875,220.
Vulnerable Populations	Approximately 9.1% of the population in Forest Hill consists of individuals who are 65 years or older. In addition, approximately 16.0 % of Forest Hill families live below the poverty line. While winter storms poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or to relocate to adequate shelter once a winter storm occurs.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a winter storm.
City of Fort Worth	
Critical Asset Vulnerability	The City of Fort Worth is home to critical facilities that would be vulnerable to the effects of winter storms. This includes city buildings, water pumps stations, water storage facilities, water treatment facilities, convention facilities, and radio towers valued at $571 million. The City also has school facilities, hospitals, a naval air station, as well as employers that employ many of the residents of the city.

Vulnerability to Winter Storms	
Vulnerable Populations	Approximately 8.2% of the population in Fort Worth consists of individuals who are 65 years or older and approximately 18.7 % of individuals in Fort Worth live below the poverty line. In addition, there is a homeless population in in Fort Worth estimated at 2,000 individuals. While winter storms poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or to relocate to adequate shelter once a winter storm occurs.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a winter storm.
City of Grapevine	
Critical Asset Vulnerability	The City of Grapevine is home to critical facilities that would be vulnerable to the effects of winter storms. This includes city buildings, water storage facilities, and water treatment facilities, valued at 33.4 million.
Vulnerable Populations	Approximately 7.9% of the population in Grapevine consists of individuals who are 65 years or older. In addition, approximately 7.9 % of individuals in Grapevine live below the poverty line. While winter storms poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or to relocate to adequate shelter once a winter storm occurs.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a winter storm.
City of Haltom City	
Critical Asset Vulnerability	The City of Haltom City is home to critical facilities that would be vulnerable to the effects of winter storms. This includes city buildings valued at 10.8 million.
Vulnerable Populations	Approximately 10.0% of the population in Grapevine consists of individuals who are 65 years or older. In addition, approximately 16.7 % of individuals in Haltom City live below the poverty line. While winter storms poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or to relocate to adequate shelter once a winter storm occurs.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a winter storm.
City of Haslet	
Critical Asset Vulnerability	The City of Haslet is home to critical facilities that would be vulnerable to the effects of winter storms. This includes a city building housing fire and emergency management, and an elementary school. The City also is home to an Amazon Incorporated distribution center that employs approximately 1500 people.
Vulnerable Populations	A breakdown of vulnerable populations was not available for the city of Haslet as of the writing of this document.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a winter storm.
City of Hurst	
Critical Asset Vulnerability	The City of Hurst is home to critical facilities that would be vulnerable to the effects of winter storms. This includes city buildings valued at 34.6 million and a children's medical center valued at 15 million. In addition, there is a Mall in Hurst whose property is valued at 155 million.
Vulnerable Populations	Approximately 12.4% of the population in Hurst consists of individuals who are 65 years or older. In addition, approximately 6.6 % of individuals in Hurst live below the poverty line. While winter storms poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or to relocate to adequate shelter once a winter storm occurs.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a winter storm.

Vulnerability to Winter Storms	
City of Keller	
Critical Asset Vulnerability	The City of Keller is home to critical facilities that would be vulnerable to the effects of winter storms. This includes city buildings valued at 46.7 million, and school facilities valued at approximately 84.1 million.
Vulnerable Populations	Approximately 8.6% of the population in Keller consists of individuals who are 65 years or older. In addition, approximately 3.9 % of individuals in Keller live below the poverty line. While winter storms poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or to relocate to adequate shelter once a winter storm occurs.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a winter storm.
City of Kennedale	
Critical Asset Vulnerability	The City of Kennedale is home to critical facilities that would be vulnerable to the effects of winter storms. This includes city buildings, water storage tanks, and well pumps valued at 36 million.
Vulnerable Populations	Approximately 10.5% of the population in Kennedale consists of individuals who are 65 years or older. In addition, approximately 8.1 % of individuals in Kennedale live below the poverty line. While winter storms poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or to relocate to adequate shelter once a winter storm occurs.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a winter storm.
City of Lake Worth	
Critical Asset Vulnerability	The City of Lake Worth is home to critical facilities that would be vulnerable to the effects of winter storms. This includes city buildings valued at 4.1 million, schools valued at 58.4 million, and two nursing home facilities valued at 2.3 million.
Vulnerable Populations	Approximately 16.1% of the population in Lake Worth consists of individuals who are 65 years or older. In addition, approximately 9.4 % of individuals in Lake Worth live below the poverty line. While winter storms poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or to relocate to adequate shelter once a winter storm occurs.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a winter storm.
City of Lakeside	
Critical Asset Vulnerability	The City of Lakeside is home to critical facilities that would be vulnerable to the effects of winter storms. This includes a city building, a water pump station, a waste water facility, and two gas wells.
Vulnerable Populations	Approximately 18.4% of the population in Lakeside consists of individuals who are 65 years or older. In addition, approximately 3.0 % of individuals in Lakeside live below the poverty line. While winter storms poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or to relocate to adequate shelter once a winter storm occurs.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a winter storm.
City of North Richland Hills	
Critical Asset Vulnerability	The City of North Richland Hills is home to critical facilities that would be vulnerable to the effects of winter storms. This includes city buildings, water storage facilities, sewage lift stations, pump stations and a hospital.

Vulnerability to Winter Storms	
Vulnerable Populations	Approximately 12.3% of the population in North Richland Hills consists of individuals who are 65 years or older. In addition, approximately 7.5 % of individuals in North Richland Hills live below the poverty line. While winter storms poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or to relocate to adequate shelter once a winter storm occurs.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a winter storm.
City of Richland Hills	
Critical Asset Vulnerability	The City of Richland Hills is home to critical facilities that would be vulnerable to the effects of winter storms. This includes city buildings, water storage facilities, sewage lift stations, pump stations and a hospital.
Vulnerable Populations	Approximately 18.4% of the population in Richland Hills consists of individuals who are 65 years or older. In addition, approximately 7.8 % of individuals in Richland Hills live below the poverty line. While winter storms poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or to relocate to adequate shelter once a winter storm occurs.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a winter storm.
City of Saginaw	
Critical Asset Vulnerability	The City of Saginaw is home to critical facilities that would be vulnerable to the effects of winter storms. This includes a city building and a county fire alarm center. The city is also home to several food processing and industrial facilities.
Vulnerable Populations	Approximately 6.8% of the population in Saginaw consists of individuals who are 65 years or older. In addition, approximately 4.2 % of individuals in Saginaw live below the poverty line. While winter storms poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or to relocate to adequate shelter once a winter storm occurs.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a winter storm.
City of Southlake	
Critical Asset Vulnerability	The City of Southlake is home to critical facilities that would be vulnerable to the effects of winter storms. This includes a city buildings valued at 15.2 million, a hospital valued at 10.3 million, and school facilities valued at 284 million. In addition, there are two nursing facilities valued at 16.3 million, as well as several major employers.
Vulnerable Populations	Approximately 5.9% of the population in Southlake consists of individuals who are 65 years or older. In addition, approximately 3.3 % of individuals in Southlake live below the poverty line. While winter storms poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or to relocate to adequate shelter once a winter storm occurs.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a winter storm.
Tarrant County	
Critical Asset Vulnerability	Tarrant County is home to critical facilities that would be vulnerable to the effects of winter storms. This includes county buildings valued at 628.2 million, school district facilities, Dallas Fort Worth International Airport, and healthcare facilities.
Vulnerable Populations	Approximately 9.9% of the population in Tarrant County consists of individuals who are 65 years or older. In addition, approximately 14.7 % of individuals in Tarrant County live below the poverty line. While winter storms poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or to relocate to adequate shelter once a winter storm occurs.

Vulnerability to Winter Storms	
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a winter storm.
City of Watauga	
Critical Asset Vulnerability	The city of Watauga is home to critical facilities that would be vulnerable to the effects of winter storms. This includes city buildings valued at 18.1 million.
Vulnerable Populations	Approximately 7.4% of the population in Watauga consists of individuals who are 65 years or older. In addition, approximately 8.1 % of individuals in Watauga live below the poverty line. While winter storms poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or to relocate to adequate shelter once a winter storm occurs.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a winter storm.
City of Westlake	
Critical Asset Vulnerability	The city of Westlake is home to critical facilities that would be vulnerable to the effects of winter storms. This includes a water pump station valued at 4 million, a fire station valued at $300,000, a charter school, and a university. There are also two large employers in the city, Fidelity Investments and the Solana Business Complex.
Vulnerable Populations	Approximately 11.6% of the population in Westlake consists of individuals who are 65 years or older. In addition, approximately 2.7 % of individuals in Westlake live below the poverty line. While winter storms poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or to relocate to adequate shelter once a winter storm occurs.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a winter storm.
City of Westworth Village	
Critical Asset Vulnerability	The city of Westworth Village is home to critical facilities that would be vulnerable to the effects of winter storms. This includes two city facilities valued at 4.9 million, as well as a school.
Vulnerable Populations	Approximately 11.5% of the population in Westworth Village consists of individuals who are 65 years or older. In addition, approximately 9.1 % of individuals in Westworth Village live below the poverty line. While winter storms poses a serious threat to any population, issues with mobility could make it difficult for those individuals to seek shelter ahead of such a threat or to relocate to adequate shelter once a winter storm occurs.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a winter storm.

Vulnerability

The following chart provides the potential impact of severe winter storms for all participating jurisdictions. Potential losses should winter storms impact each jurisdiction are provided in Appendix G where the value of each piece of critical infrastructure is detailed for building and contents losses.

Severe Winter Storms

Frequency of Occurrence	Likely
Warning Time	More than 12 hours
Geographic Extent	Countywide
Potential Impact	Moderate

Multijurisdictional Concerns

Tarrant County and its participating jurisdictions can be affected by a winter storm. As a result, any mitigation steps taken related to severe winter storms should be undertaken on a countywide basis.

Land Use and Development Trends

Tarrant County currently has no land use or development trends related to winter storms.

Hazard Summary

Severe winter storms, unlike other natural hazards, typically afford communities some advance warning. The NWS issues winter storm watches, warnings, and advisories as these storms make their way through Tarrant County. Due to the frequency of winter storms in Tarrant County, most buildings and infrastructure are typically designed to sustain severe winter conditions. However, aging facilities and particularly heavy snowfalls bring the possibility of building collapse and infrastructure damage. Additionally, winter weather always brings a possibility for dangerous driving conditions, particularly in a community such as Tarrant County in which winter weather is not a regular occurrence.

4.1.7 Drought

Hazard Definition

By definition, a drought is a prolonged period of moisture deficiency. The severity of drought may be exacerbated by other factors, such as prolonged high winds and low humidity. There are several types of drought. A meteorological drought is defined on the degree of dryness, dependent on a lack of expected precipitation. A hydrological drought is related to the effects of decreased precipitation on reservoir, lake, and groundwater levels. An agricultural drought is solely defined on the demands of plant life relative to soil moisture deficiencies. These types of drought conditions affect the cultivation of crops as well as water availability and water quality. Agricultural drought conditions make natural fuels (grass, brush, trees, and dead vegetation) more fire-prone, thus making it a significant factor in wildfire production. A water management drought occurs when the demand for water exceeds the supply as a result of weather-related supply shortfall.

The severity of a drought depends on the duration, intensity, and geographic extent of the water shortage as well as the demands on the areas water supply. The United States Department of Agriculture rates droughts from D0-D4, as shown in Figure 4-8, depending on the severity of the drought, the amount of time it will take for vegetation to return to normal levels, and the possible effects of the drought on vegetation and water supply.

Drought differs from other natural hazards in multiple ways. First, drought is not as obvious as other hazards; it does not have the property destruction of a tornado or hurricane. Second, there is a lack of an exact and universally accepted definition of drought. Finally, the beginning and end of a drought is difficult to determine. In addition, droughts are often spread over a larger geographic area than other natural hazards. This considered, the economic effects of a drought can be just as devastating as any other natural hazards.

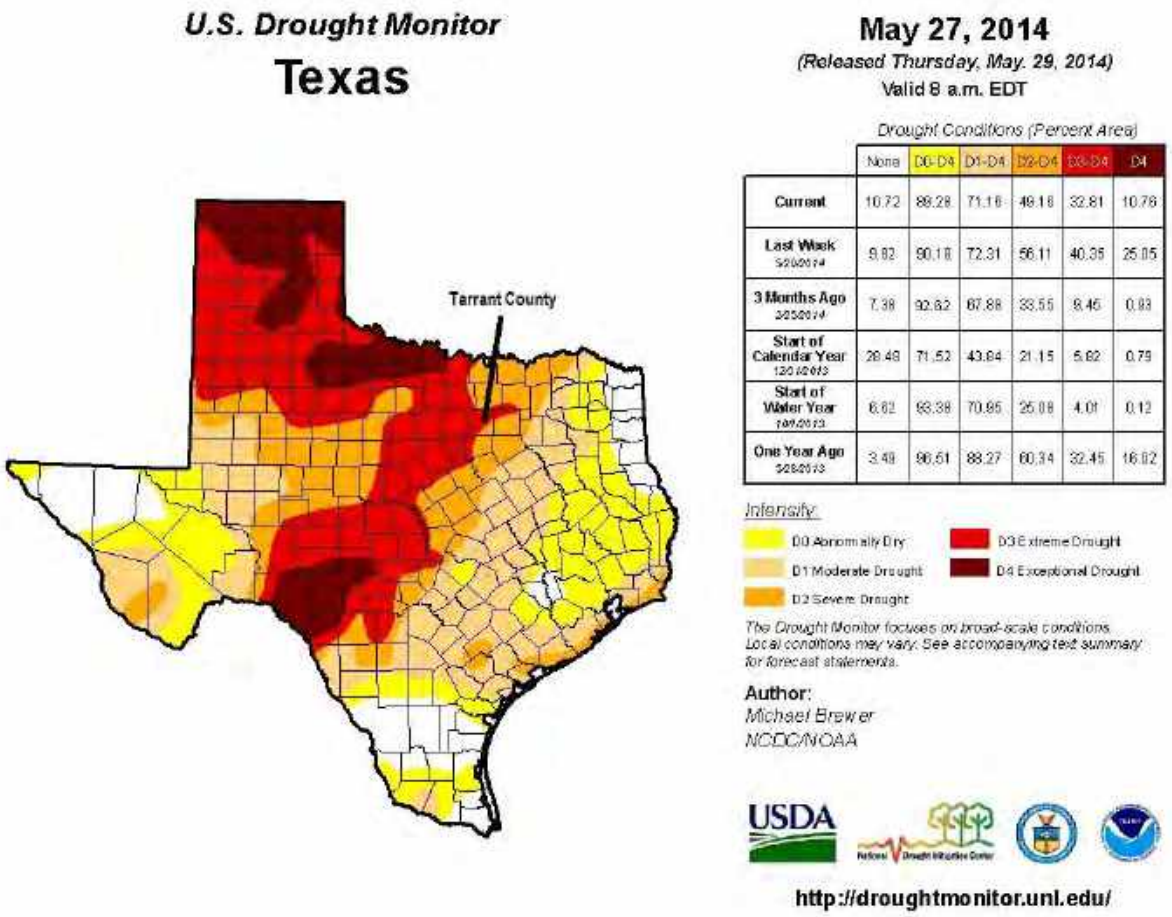
Figure 4-8
Drought Severity Index

Drought Severity	Return Period (years)	Description of Possible Impacts	Drought Monitoring Indices		
			Standardized Precipitation Index (SPI)	NDMC* Drought Category	Palmer Drought Index
Minor Drought	3 to 4	Going into drought; short-term dryness slowing growth of crops or pastures; fire risk above average. Coming out of drought; some lingering water deficits; pastures or crops not fully recovered.	-0.5 to -0.7	D0	-1.0 to -1.9
Moderate Drought	5 to 9	Some damage to crops or pastures; fire risk high; streams, reservoirs, or wells low, some water shortages developing or imminent, voluntary water use restrictions requested.	-0.8 to -1.2	D1	-2.0 to -2.9
Severe Drought	10 to 17	Crop or pasture losses likely; fire risk very high; water shortages common; water restrictions imposed.	-1.3 to -1.5	D2	-3.0 to -3.9
Extreme Drought	18 to 43	Major crop and pasture losses; extreme fire danger; widespread water shortages or restrictions.	-1.6 to -1.9	D3	-4.0 to -4.9
Exceptional Drought	44+	Exceptional and widespread crop and pasture losses; exceptional fire risk; shortages of water in reservoirs, streams, and wells creating water emergencies.	less than -2	D4	-5.0 or less

*NDMC - National Drought Mitigation Center

Figure 4-9 shows the Texas Drought Monitor, a map showing weekly drought conditions. Upon development of this plan, Tarrant County and its participating jurisdictions are experiencing conditions that range from severe drought in the southeast portion of the County to exceptional drought in the northwest portion of the County. This is an alarming example of the extent to which Tarrant County and its participating jurisdictions may experience drought, from Minor Drought conditions (D0) to Exceptional Drought conditions (D4).

Figure 4-9
Texas Drought Monitor (as of May 2014)[20]



Hazard Identification

In an urban environment such as Tarrant County and the participating jurisdictions, the impacts of drought are not widely understood. Many people associate drought damage with dried crops, and given that few areas within Tarrant County and the participating jurisdictions are used for agriculture, this misperception may be widespread. Some may then be surprised to learn that drought has had significant economic impacts in Tarrant County and the participating jurisdictions, according the NCDC and SHELDUS data.

Tarrant County and the participating jurisdictions experienced drought conditions from 2005 to 2007 that are its costliest in recent history. Dry weather increases water costs, causes heat waves, and can impact infrastructure if serious. Between 2005 and 2007, drought conditions cost Tarrant County, the participating jurisdictions, and businesses a combined total of $60 million.

The majority of the State of Texas, including Tarrant County and the participating jurisdictions, is currently under Federal Drought Declarations. In fact, for the 235 counties in Texas under Federal

[20] Source: national Drought Mitigations Center, http://droughtmonitor.unl.edu/MapsAndData/MapsandDataServices/MapService.aspx.

Drought Declaration, the current drought is drier than any other period in Texas except for the 1950's drought. Unfortunately, relief is not in sight as of the publishing of this LMAP. Limited August rainfall and late summer heat have intensified the drought across the North Central Texas region, with all counties in at least severe drought (D2) status and some in extreme drought (D3). Reservoirs are continuing to decline and jurisdictions have lost as much as 20 percent of their capacity in the last 12 months. Fire danger has increased, with many jurisdictions having burn bans in place. For much of Tarrant County, 17-month deficits of rainfall in excess of 20 inches persist. In the City of Fort Worth, hand watering is permitted between 10 am and 6 pm, twice-per-week landscape watering is allowed outside of these hours. The Tarrant Regional Water District is considering introducing Stage 2 water restrictions in October, which would limit outdoor watering to once a week. Stage 2 is enacted when water supplies fall below 60 percent. Overall, the region is suffering from persistent drought and more and more water conservation efforts are being sought. There is serious concern that if drought conditions continue, water supply issues will become a serious threat to region residents.

The table below provides the drought events that occurred between 1996 and 2013 in Tarrant County and its participating jurisdictions.

Table 4-18
Tarrant County Drought History

Location	Date	Time	Time Zone	Type	Deaths	Injuries	Property Damage Estimate	Crop Damage Estimate
TARRANT (ZONE)	6/1/1996	0:00	CST	Drought	0	0	0.00K	0.00K
TARRANT (ZONE)	7/1/1996	0:00	CST	Drought	0	0	0.00K	0.00K
TARRANT (ZONE)	8/1/1996	0:00	CST	Drought	0	0	0.00K	0.00K
TARRANT (ZONE)	7/1/1998	0:00	CST	Drought	0	0	0.00K	0.00K
TARRANT (ZONE)	8/1/2000	0:00	CST	Drought	0	0	0.00K	0.00K
TARRANT (ZONE)	9/1/2000	0:00	CST	Drought	0	0	0.00K	0.00K
TARRANT (ZONE)	6/1/2005	0:00	CST	Drought	0	0	0.00K	0.00K
TARRANT (ZONE)	7/1/2005	0:00	CST	Drought	0	0	0.00K	0.00K
TARRANT (ZONE)	8/1/2005	0:00	CST	Drought	0	0	0.00K	0.00K
TARRANT (ZONE)	9/1/2005	0:00	CST	Drought	0	0	0.00K	0.00K
TARRANT (ZONE)	10/1/2005	0:00	CST	Drought	0	0	0.00K	0.00K
TARRANT (ZONE)	11/1/2005	0:00	CST	Drought	0	0	0.00K	0.00K
TARRANT (ZONE)	12/1/2005	0:00	CST	Drought	0	0	0.00K	0.00K
TARRANT (ZONE)	1/1/2006	0:00	CST	Drought	0	0	0.00K	0.00K

Location	Date	Time	Time Zone	Type	Deaths	Injuries	Property Damage Estimate	Crop Damage Estimate
TARRANT (ZONE)	2/1/2006	0:00	CST	Drought	0	0	0.00K	0.00K
TARRANT (ZONE)	3/1/2006	0:00	CST	Drought	0	0	0.00K	0.00K
TARRANT (ZONE)	4/1/2006	0:00	CST	Drought	0	0	0.00K	0.00K
TARRANT (ZONE)	5/1/2006	0:00	CST	Drought	0	0	0.00K	0.00K
TARRANT (ZONE)	6/6/2006	0:00	CST	Drought	0	0	0.00K	0.00K
TARRANT (ZONE)	7/1/2006	0:00	CST	Drought	0	0	0.00K	0.00K
TARRANT (ZONE)	8/1/2006	0:00	CST	Drought	0	0	0.00K	0.00K
TARRANT (ZONE)	9/1/2006	0:00	CST	Drought	0	0	0.00K	0.00K
TARRANT (ZONE)	10/1/2006	0:00	CST-6	Drought	0	0	500.00K	500.00K
TARRANT (ZONE)	11/1/2006	0:00	CST-6	Drought	0	0	0.00K	800.00K
TARRANT (ZONE)	7/23/2008	0:00	CST-6	Drought	0	0	0.00K	50.00K
TARRANT (ZONE)	8/1/2008	0:00	CST-6	Drought	0	0	0.00K	5.00K
TARRANT (ZONE)	4/17/2011	0:00	CST-6	Drought	0	0	0.00K	5.00K
TARRANT (ZONE)	8/1/2011	0:00	CST-6	Drought	0	0	0.00K	20.00K
TARRANT (ZONE)	9/1/2011	0:00	CST-6	Drought	0	0	0.00K	25.00K
TARRANT (ZONE)	10/1/2011	0:00	CST-6	Drought	0	0	0.00K	7.00K
TARRANT (ZONE)	8/7/2012	0:00	CST-6	Drought	0	0	0.00K	0.00K
TARRANT (ZONE)	11/20/2012	0:00	CST-6	Drought	0	0	0.00K	2.00K
TARRANT (ZONE)	12/1/2012	0:00	CST-6	Drought	0	0	0.00K	2.00K
TARRANT (ZONE)	1/1/2013	0:00	CST-6	Drought	0	0	0.00K	2.00K
TARRANT (ZONE)	2/1/2013	0:00	CST-6	Drought	0	0	0.00K	2.00K
TARRANT (ZONE)	3/19/2013	0:00	CST-6	Drought	0	0	0.00K	1.00K
TARRANT (ZONE)	4/1/2013	0:00	CST-6	Drought	0	0	0.00K	2.00K
TARRANT (ZONE)	5/1/2013	0:00	CST-6	Drought	0	0	0.00K	3.00K
TARRANT (ZONE)	6/1/2013	0:00	CST-6	Drought	0	0	0.00K	3.00K

Location	Date	Time	Time Zone	Type	Deaths	Injuries	Property Damage Estimate	Crop Damage Estimate
TARRANT (ZONE)	7/1/2013	0:00	CST-6	Drought	0	0	0.00K	2.00K
TARRANT (ZONE)	8/1/2013	0:00	CST-6	Drought	0	0	5.00K	5.00K
TARRANT (ZONE)	9/1/2013	0:00	CST-6	Drought	0	0	0.00K	3.00K
TARRANT (ZONE)	10/1/2013	0:00	CST-6	Drought	0	0	0.00K	3.00K
TARRANT (ZONE)	11/1/2013	0:00	CST-6	Drought	0	0	0.00K	2.00K
Totals:					0	0	505.00K	1.444M

Assets Exposed to Hazard

- **Property Risk/Vulnerability.** Drought conditions typically pose little or no threat to structures; however, fires can occur as a result of dry weather. Drought may result in a large crop loss, resulting in a large economic loss, although this is not a large concern for the urban area of Tarrant County. Wildfire because of drought was considered, and it was determined that since previous instances of wildfire in Tarrant County have been relatively minimal, it does not bear a significant threat to the community.
- **People Risk/Vulnerability.** It was determined that risk/vulnerability includes the entire population of Tarrant County because there is no way to determine the impact/magnitude of a drought incident. People are vulnerable to the effects of drought, including reduction to the available water supply (both public and private wells), wildfires, and structural fires.
- **Environment Risk/Vulnerability.** Risks to the environment are high for a drought incident. Environmental concerns would be loss of vegetation and risk of erosion in areas that are affected by drought and reduced availability of water supply (both public and private wells).

The risks and vulnerability to drought for each participating jurisdictions are detailed below. It should be noted that the North Central Texas Council of Governments (NCTCOG) is an association of local governments that works to assist in planning and coordination efforts of 16 counties in North Central Texas. It is a government authority but does not hold or own any land or property, nor does it have any constituents. Therefore, there is minimal vulnerability to the NCTCOG.

Vulnerability to Drought	
City of Arlington	
Critical Asset Vulnerability	The City of Arlington is home to critical facilities that would be vulnerable to the effects of drought. This includes city facilities worth approximately 8.5 million, the Dallas Cowboys Stadium worth $1.6 billion dollars, as well as many U.S. Government office facilities, public schools, a university, a large theme park, and privately-owned facilities that employ a significant number of residents. Power, water and sewer treatment systems could also be affected as a result of drought. Effects can include water shortages and damage to foundations from shrinking soil.
Vulnerable Populations	As of 2010, 8% of the population in Arlington consists of individuals who were 65 years or older. In addition, approximately 16% of Arlington families live below the poverty line. While

Vulnerability to Drought	
	drought poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a drought.
City of Azle	
Critical Asset Vulnerability	The City of Azle is home to critical facilities that would be vulnerable to the effects of drought. This includes city structures worth approximately 63.5 million, and public school facilities worth 96 million. Effects can include water shortages and damage to foundations from shrinking soil.
Vulnerable Populations	As of 2010, 12.8% of the population in Azle consists of individuals who were 65 years or older. In addition, approximately 6.9% of Azle families live below the poverty line. While drought poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a drought.
City of Bedford	
Critical Asset Vulnerability	The City of Bedford is home to critical facilities that would be vulnerable to the effects of drought. This includes city facilities, schools, and hospitals. In addition, the city is home to employers including Walmart, Transamerica, and Heartland that employ residents of the City of Bedford. Effects can include water shortages and damage to foundations from shrinking soil.
Vulnerable Populations	As of 2010, 8.7% of the population in Bedford consists of individuals who were 65 years or older. In addition, approximately 3.7% of Bedford families live below the poverty line. While drought poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a drought.
City of Blue Mound	
Critical Asset Vulnerability	The City of Blue Mound is home to critical facilities that would be vulnerable to the effects of drought. This includes city facilities valued at 250,000, a school, and water production facilities that serve the residents of Blue Mound. Effects can include water shortages and damage to foundations from shrinking soil.
Vulnerable Populations	Approximately 7.2% of the population in Bedford consists of individuals who are 65 years or older. In addition, approximately 5.9 % of Blue Mound families live below the poverty line. While drought poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a drought.
City of Colleyville	
Critical Asset Vulnerability	The City of Colleyville is home to critical facilities that would be vulnerable to the effects of drought. This includes city facilities valued at 11.7 million, and school facilities valued at 36 million. Effects can include water shortages and damage to foundations from shrinking soil.
Vulnerable Populations	Approximately 5.3% of the population in Colleyville consists of individuals who are 65 years or older. In addition, approximately 1.2 % of Colleyville families live below the poverty line. While drought poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a drought.
City of Crowley	

Vulnerability to Drought	
Critical Asset Vulnerability	The City of Crowley is home to critical facilities that would be vulnerable to the effects of drought. This includes city facilities valued at 10.2 million. Effects can include water shortages and damage to foundations from shrinking soil.
Vulnerable Populations	Approximately 8.3% of the population in Crowley consists of individuals who are 65 years or older. In addition, approximately 4.3 % of Crowley families live below the poverty line. While drought poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a drought.
Dallas Fort Worth International Airport	
Critical Asset Vulnerability	The Dallas Fort Worth International Airport is home to critical facilities that would be vulnerable to the effects of drought. This includes airport towers, terminals, utilities plants, fuel facilities, water treatment facilities, storage facilities, as well as aircraft. Effects can include water shortages and damage to foundations from shrinking soil.
Vulnerable Populations	Water shortages and damage to facilities could impact those individuals working at or traveling through airport facilities.
Environmental Vulnerability	Severe damage to vegetation, runways, and roads can occur as a result of a drought.
City of Euless	
Critical Asset Vulnerability	The City of Euless is home to critical facilities that would be vulnerable to the effects of drought. This includes city facilities and public schools. Effects can include water shortages and damage to foundations from shrinking soil. While drought poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Vulnerable Populations	Approximately 5.8% of the population in Crowley consists of individuals who are 65 years or older. In addition, approximately 5.7 % of Euless families live below the poverty line. While drought poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a drought.
City of Forest Hill	
Critical Asset Vulnerability	The City of Forest Hill is home to critical facilities that would be vulnerable to the effects of drought. This includes city facilities valued at $875,220. Effects can include water shortages and damage to foundations from shrinking soil.
Vulnerable Populations	Approximately 9.1% of the population in Forest Hill consists of individuals who are 65 years or older. In addition, approximately 16.0 % of Forest Hill families live below the poverty line. While drought poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a drought.
City of Fort Worth	
Critical Asset Vulnerability	The City of Fort Worth is home to critical facilities that would be vulnerable to the effects of drought. This includes city buildings, water pumps stations, water storage facilities, water treatment facilities, convention facilities, and radio towers valued at $571 million. The City also has school facilities, hospitals, a naval air station, as well as employers that employ many of the residents of the city. Effects can include water shortages and damage to foundations from shrinking soil.
Vulnerable Populations	Approximately 8.2% of the population in Fort Worth consists of individuals who are 65 years or older and approximately 18.7 % of individuals in Fort Worth live below the poverty line. In addition, there is a homeless population in in Fort Worth estimated at 2,000 individuals. While

Vulnerability to Drought	
	drought poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a drought.
City of Grapevine	
Critical Asset Vulnerability	The City of Grapevine is home to critical facilities that would be vulnerable to the effects of drought. This includes city buildings, water storage facilities, and water treatment facilities, valued at 33.4 million. Effects can include water shortages and damage to foundations from shrinking soil.
Vulnerable Populations	Approximately 7.9% of the population in Grapevine consists of individuals who are 65 years or older. In addition, approximately 7.9 % of individuals in Grapevine live below the poverty line. While drought poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a drought.
City of Haltom City	
Critical Asset Vulnerability	The City of Haltom City is home to critical facilities that would be vulnerable to the effects of drought. This includes city buildings valued at 10.8 million. Effects can include water shortages and damage to foundations from shrinking soil.
Vulnerable Populations	Approximately 10.0% of the population in Grapevine consists of individuals who are 65 years or older. In addition, approximately 16.7 % of individuals in Haltom City live below the poverty line. While drought poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a drought.
City of Haslet	
Critical Asset Vulnerability	The City of Haslet is home to critical facilities that would be vulnerable to the effects of drought. This includes a city building housing fire and emergency management, and an elementary school. The City also is home to an Amazon Incorporated distribution center that employs approximately 1500 people. Effects can include water shortages and damage to foundations from shrinking soil.
Vulnerable Populations	A breakdown of vulnerable populations was not available for the city of Haslet as of the writing of this document.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a drought.
City of Hurst	
Critical Asset Vulnerability	The City of Hurst is home to critical facilities that would be vulnerable to the effects of drought. This includes city buildings valued at 34.6 million and a children's medical center valued at 15 million. In addition, there is a Mall in Hurst whose property is valued at 155 million. Effects can include water shortages and damage to foundations from shrinking soil.
Vulnerable Populations	Approximately 12.4% of the population in Hurst consists of individuals who are 65 years or older. In addition, approximately 6.6 % of individuals in Hurst live below the poverty line. While drought poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a drought.
City of Keller	
Critical Asset Vulnerability	The City of Keller is home to critical facilities that would be vulnerable to the effects of drought. This includes city buildings valued at 46.7 million, and school facilities valued at approximately

Vulnerability to Drought	
	84.1 million. Effects can include water shortages and damage to foundations from shrinking soil.
Vulnerable Populations	Approximately 8.6% of the population in Keller consists of individuals who are 65 years or older. In addition, approximately 3.9 % of individuals in Keller live below the poverty line. While drought poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a drought.
City of Kennedale	
Critical Asset Vulnerability	The City of Kennedale is home to critical facilities that would be vulnerable to the effects of drought. This includes city buildings, water storage tanks, and well pumps valued at 36 million. Effects can include water shortages and damage to foundations from shrinking soil.
Vulnerable Populations	Approximately 10.5% of the population in Kennedale consists of individuals who are 65 years or older. In addition, approximately 8.1 % of individuals in Kennedale live below the poverty line. While drought poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a drought.
City of Lake Worth	
Critical Asset Vulnerability	The City of Lake Worth is home to critical facilities that would be vulnerable to the effects of drought. This includes city buildings valued at 4.1 million, schools valued at 58.4 million, and two nursing home facilities valued at 2.3 million. Effects can include water shortages and damage to foundations from shrinking soil.
Vulnerable Populations	Approximately 16.1% of the population in Lake Worth consists of individuals who are 65 years or older. In addition, approximately 9.4 % of individuals in Lake Worth live below the poverty line. While drought poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a drought.
City of Lakeside	
Critical Asset Vulnerability	The City of Lakeside is home to critical facilities that would be vulnerable to the effects of drought. This includes a city building, a water pump station, a waste water facility, and two gas wells. Effects can include water shortages and damage to foundations from shrinking soil.
Vulnerable Populations	Approximately 18.4% of the population in Lakeside consists of individuals who are 65 years or older. In addition, approximately 3.0 % of individuals in Lakeside live below the poverty line. While drought poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a drought.
City of North Richland Hills	
Critical Asset Vulnerability	The City of North Richland Hills is home to critical facilities that would be vulnerable to the effects of drought. This includes city buildings, water storage facilities, sewage lift stations, pump stations and a hospital. Effects can include water shortages and damage to foundations from shrinking soil.
Vulnerable Populations	Approximately 12.3% of the population in North Richland Hills consists of individuals who are 65 years or older. In addition, approximately 7.5 % of individuals in North Richland Hills live below the poverty line. While drought poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.

Vulnerability to Drought	
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a drought.
City of Richland Hills	
Critical Asset Vulnerability	The City of Richland Hills is home to critical facilities that would be vulnerable to the effects of drought. This includes city buildings, water storage facilities, sewage lift stations, pump stations and a hospital. Effects can include water shortages and damage to foundations from shrinking soil.
Vulnerable Populations	Approximately 18.4% of the population in Richland Hills consists of individuals who are 65 years or older. In addition, approximately 7.8 % of individuals in Richland Hills live below the poverty line. While drought poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a drought.
City of Saginaw	
Critical Asset Vulnerability	The City of Saginaw is home to critical facilities that would be vulnerable to the effects of drought. This includes a city building and a county fire alarm center. The city is also home to several food processing and industrial facilities. Effects can include water shortages and damage to foundations from shrinking soil.
Vulnerable Populations	Approximately 6.8% of the population in Saginaw consists of individuals who are 65 years or older. In addition, approximately 4.2 % of individuals in Saginaw live below the poverty line. While drought poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a drought.
City of Southlake	
Critical Asset Vulnerability	The City of Southlake is home to critical facilities that would be vulnerable to the effects of drought. This includes a city buildings valued at 15.2 million, a hospital valued at 10.3 million, and school facilities valued at 284 million. In addition, there are two nursing facilities valued at 16.3 million, as well as several major employers. Effects can include water shortages and damage to foundations from shrinking soil.
Vulnerable Populations	Approximately 5.9% of the population in Southlake consists of individuals who are 65 years or older. In addition, approximately 3.3 % of individuals in Southlake live below the poverty line. While drought poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a drought.
Tarrant County	
Critical Asset Vulnerability	Tarrant County is home to critical facilities that would be vulnerable to the effects of drought. This includes county buildings valued at 628.2 million, school district facilities, Dallas Fort Worth International Airport, and healthcare facilities. Effects can include water shortages and damage to foundations from shrinking soil.
Vulnerable Populations	Approximately 9.9% of the population in Tarrant County consists of individuals who are 65 years or older. In addition, approximately 14.7 % of individuals in Tarrant County live below the poverty line. While drought poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a drought.
City of Watauga	

Vulnerability to Drought	
Critical Asset Vulnerability	The city of Watauga is home to critical facilities that would be vulnerable to the effects of drought. This includes city buildings valued at 18.1 million. Effects can include water shortages and damage to foundations from shrinking soil.
Vulnerable Populations	Approximately 7.4% of the population in Watauga consists of individuals who are 65 years or older. In addition, approximately 8.1 % of individuals in Watauga live below the poverty line. While drought poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a drought.
City of Westlake	
Critical Asset Vulnerability	The city of Westlake is home to critical facilities that would be vulnerable to the effects of drought. This includes a water pump station valued at 4 million, a fire station valued at $300,000, a charter school, and a university. There are also two large employers in the city, Fidelity Investments and the Solana Business Complex. Effects can include water shortages and damage to foundations from shrinking soil.
Vulnerable Populations	Approximately 11.6% of the population in Westlake consists of individuals who are 65 years or older. In addition, approximately 2.7 % of individuals in Westlake live below the poverty line. While drought poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a drought.
City of Westworth Village	
Critical Asset Vulnerability	The city of Westworth Village is home to critical facilities that would be vulnerable to the effects of drought. This includes two city facilities valued at 4.9 million, as well as a school. Effects can include water shortages and damage to foundations from shrinking soil.
Vulnerable Populations	Approximately 11.5% of the population in Westworth Village consists of individuals who are 65 years or older. In addition, approximately 9.1 % of individuals in Westworth Village live below the poverty line. While drought poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of a drought.

Vulnerability

Drought

Frequency of Occurrence	Likely
Warning Time	More than 12 hours
Geographic Extent	Countywide
Potential Impact	Minor

Multijurisdictional Concerns

Drought will impact the entire planning area, including Tarrant County and participating jurisdictions; therefore, multijurisdictional concerns do not exist.

Land Use and Development Trends

Future development considerations for Tarrant County regarding drought center on water conservation. The majority of impact from drought is citizens and businesses being placed on water

restrictions to ensure that jurisdiction water systems can provide the potable water necessary. Tarrant County and its jurisdictions will consider the effect any new developments will have on water systems to ensure that potable water is accessible and available during periods of drought.

Hazard Summary

Droughts do not have the immediate effects of other natural hazards, but sustained drought can cause severe economic stress in Tarrant County and the entire state. The potential negative effects of sustained drought are numerous. In addition to an increased threat of wildfires, drought can affect municipal and industrial water supplies, stream water quality, water recreation facilities, hydropower generation, and agricultural and forest resources.

4.1.8 Wildfires

Hazard Definition

A wildfire is defined as area sweeping and destructive conflagration, especially in a wilderness or a rural area. Wildfires in Texas can be defined as being a wildland, interface, or intermix fire. Wildfires can be a result of naturally occurring influences such as lightning, extreme drought, and heat as well as human influences such as a discarded cigarette butt, improperly extinguished campfire, or a stray spark from nearby railroad tracks. The potential for threat of wildfires is dependent upon topography and slope, surface fuel characteristics, recent climate conditions, current meteorological conditions, and fire behavior. Three methods for determining wildfire potential are provided below: the Keetch-Byram Drought Index, the Wildland Urban Interface and Fire Intensity Scales.

The Keetch-Byram Drought Index relates current weather conditions to potential or expected fire conditions. Fire behavior typically associated with these indices is provided in the table below.

Table 4-19
Keetch-Byram Drought Index

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

The Wildland Urban Interface (WUI) Response Index is a rating of the potential impact of a wildfire on people and their homes. The WUI reflects housing density data combined with Flame Length data and response functions, all calculated to determine where the greatest potential impact to homes and people is likely to occur as a result of wildfire.

Fire intensity scale maps are included for each jurisdiction in Appendix F. Fire Intensity Scales specifically identify the areas where significant fuel hazards and associated dangerous fire behavior potential exist. It is similar to the Richter scale for earthquakes, but allow for jurisdictions to gauge the potential for wildfire and identify their largest vulnerabilities. Fire intensity scales are based on five classes of wildfire. The minimum wildfire class, Class 1, represents minimum wildfire intensities and the maximum class, Class 5, represents very high wildfire intensities. The following descriptions identify class intensity.

1. **Class 1, Very Low:**

   Very small, discontinuous flames, usually less than 1 foot in length; very low rate of spread; no spotting. Fires are typically easy to suppress by firefighters with basic training and non-specialized equipment.

2. **Class 2, Low:**

   Small flames, usually less than two feet long; small amount of very short range spotting possible. Fires are easy to suppress by trained firefighters with protective equipment and specialized tools.

3. **Class 3, Moderate:**

   Flames up to 8 feet in length; short-range spotting is possible. Trained firefighters will find these fires difficult to suppress without support from aircraft or engines, but dozer and plows are generally effective. Increasing potential for harm or damage to life and property.

4. **Class 4, High:**

   Large flames, up to 30 feet in length; short-range spotting common; medium range spotting possible. Direct attack by trained firefighters, engines, and dozers is generally ineffective, indirect attack may be effective. Significant potential for harm or damage to life and property.

5. **Class 5, Very High:**

   Very large flames up to 150 feet in length; profuse short-range spotting, frequent long-range spotting; strong fire-induced winds. Indirect attack marginally effective at the head of the fire. Great potential for harm or damage to life and property.

The planning area has the possibility of experiencing wildfires ranging from Class 1 to Class 5.

Hazard Identification

The urban nature of Tarrant County and participating jurisdictions naturally mitigates against wildfires. There have been 8 wildfires in Tarrant County in the past 5 years, although many of them occurred in 2011. Tarrant County and the participating jurisdictions may experience wildfires every 3 years, equating to a 33% chance of a fire occurring in Tarrant County or the participating jurisdictions in a given year.

Many of the wildfire events reported by jurisdictions for the compilation of this plan occurred at DFW International Airport. Six wildfires have occurred at DFW International Airport since 2010, most of them burning only two acres or so. Although these wildfires did not burn many acres or cause much structural damage, the smoke from the fires were costly. Smoke over the DFW International Airport runways delayed flights out of and into the airport, creating a chain effect that impacted the entire national airspace system.

The City of Keller has only experienced small grass fires due to its shrinking urban-wildland interface within the City limits. However, it does have the potential for wildfire associated with drought, the railroad running north-south between the City and the City of Fort Worth, and the large lots and undeveloped land in the northern portion of the community. The fires that have been experienced have occurred during drought conditions within the community as noted in years 1996-98, 2000, 2005, and 2008.

Grapevine had a wildfire in 2006 that burned 20 acres and caused $30,000 in estimated economic losses. Another Grapevine wildfire spread to the DFW International Airport in 2010, burning 100 acres and causing $20,000 in losses.

An arsonist ignited multiple grass fires in northeast Johnson County and southeast Tarrant County. Pantego firefighters were covering the Kennedale fire station while Kennedale's firefighters were fighting wildfires involving structures in unincorporated Tarrant County. A fire ignited on JR Hawkins Road in Kennedale spread to adjacent storage buildings and spread north toward a row of houses on Swiney Hyett Road in Kennedale. Mutual-aid fire crews protected all of the threatened houses and extinguished the fire without a serious injury despite a temperature of 108 degrees. Contents losses totaled $5,000.

Wildfires that have impacted Tarrant County and participating jurisdictions since 2005 are listed in the table below.

Table 4-20
Wildfires in Tarrant County

Location	Date	Time	Time Zone	Type	Deaths	Injuries	Property Damage Estimate	Crop Damage Estimate
TARRANT (ZONE)	12/27/2005	18:00	CST	Wildfire	0	0	1.000M	0.00K
TARRANT (ZONE)	1/29/2008	12:00	CST-6	Wildfire	0	0	5.00K	0.00K
TARRANT (ZONE)	¾/2009	16:30	CST-6	Wildfire	0	0	200.00K	0.00K
TARRANT (ZONE)	7/28/2011	16:00	CST-6	Wildfire	0	1	1.000M	0.00K
TARRANT (ZONE)	8/17/2011	13:30	CST-6	Wildfire	0	0	0.00K	1.00K
TARRANT (ZONE)	8/18/2011	15:30	CST-6	Wildfire	0	0	700.00K	0.00K
TARRANT (ZONE)	9/9/2011	11:00	CST-6	Wildfire	0	0	50.00K	0.00K
TARRANT (ZONE)	9/9/2011	12:00	CST-6	Wildfire	0	0	7.00K	0.00K
Totals:					0	1	2.962M	1.00K

Potential for future wildfires exists in the planning area. Figure 4-10 is a map of the Wildland Urban Interface for Tarrant County and the participating jurisdictions. Figure 4-11 is a map of the fire intensity scale for Tarrant County. Specific jurisdiction information may be found in Appendix F.

Figure 4-10
Tarrant County WUI Response Index

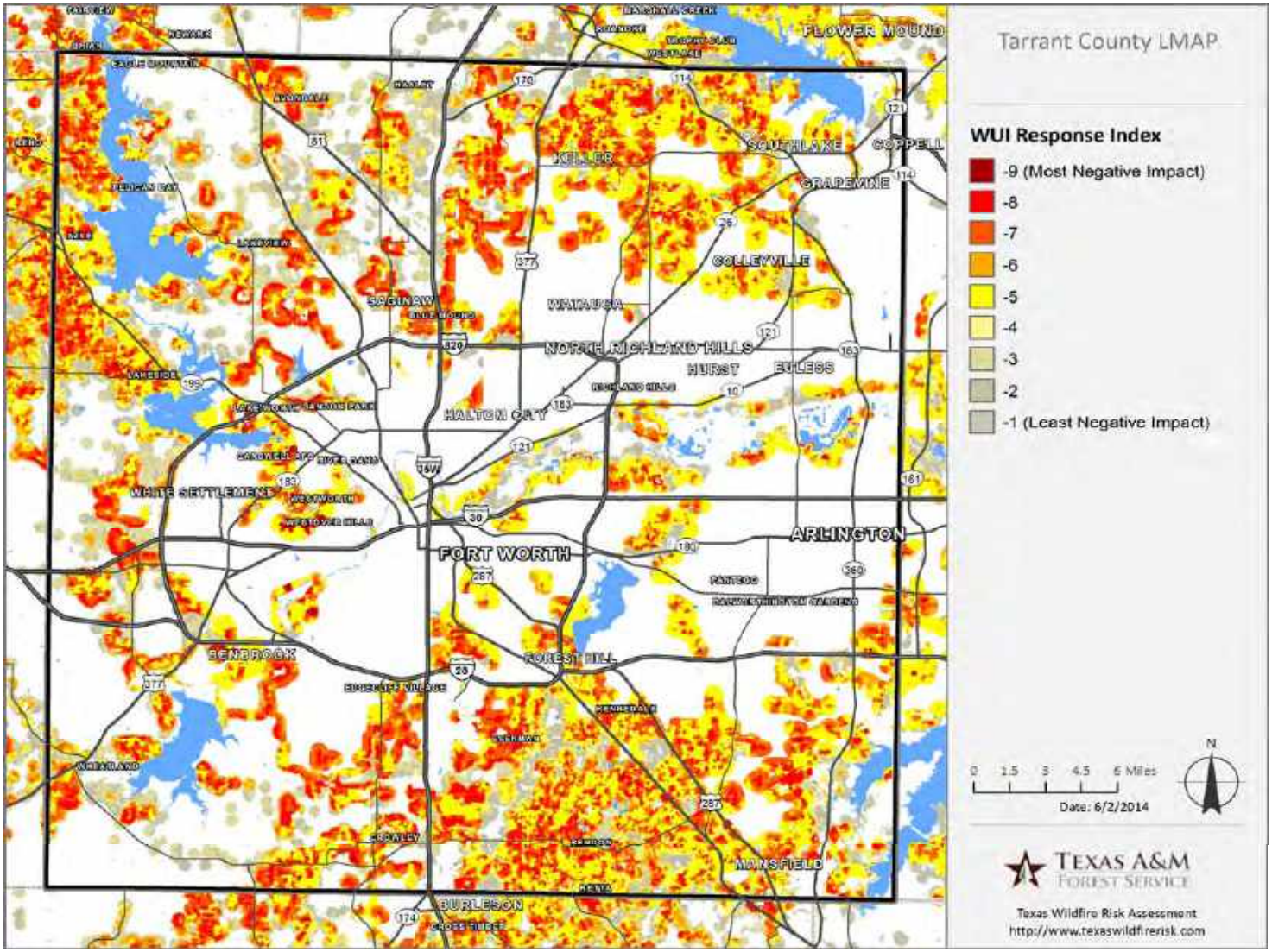
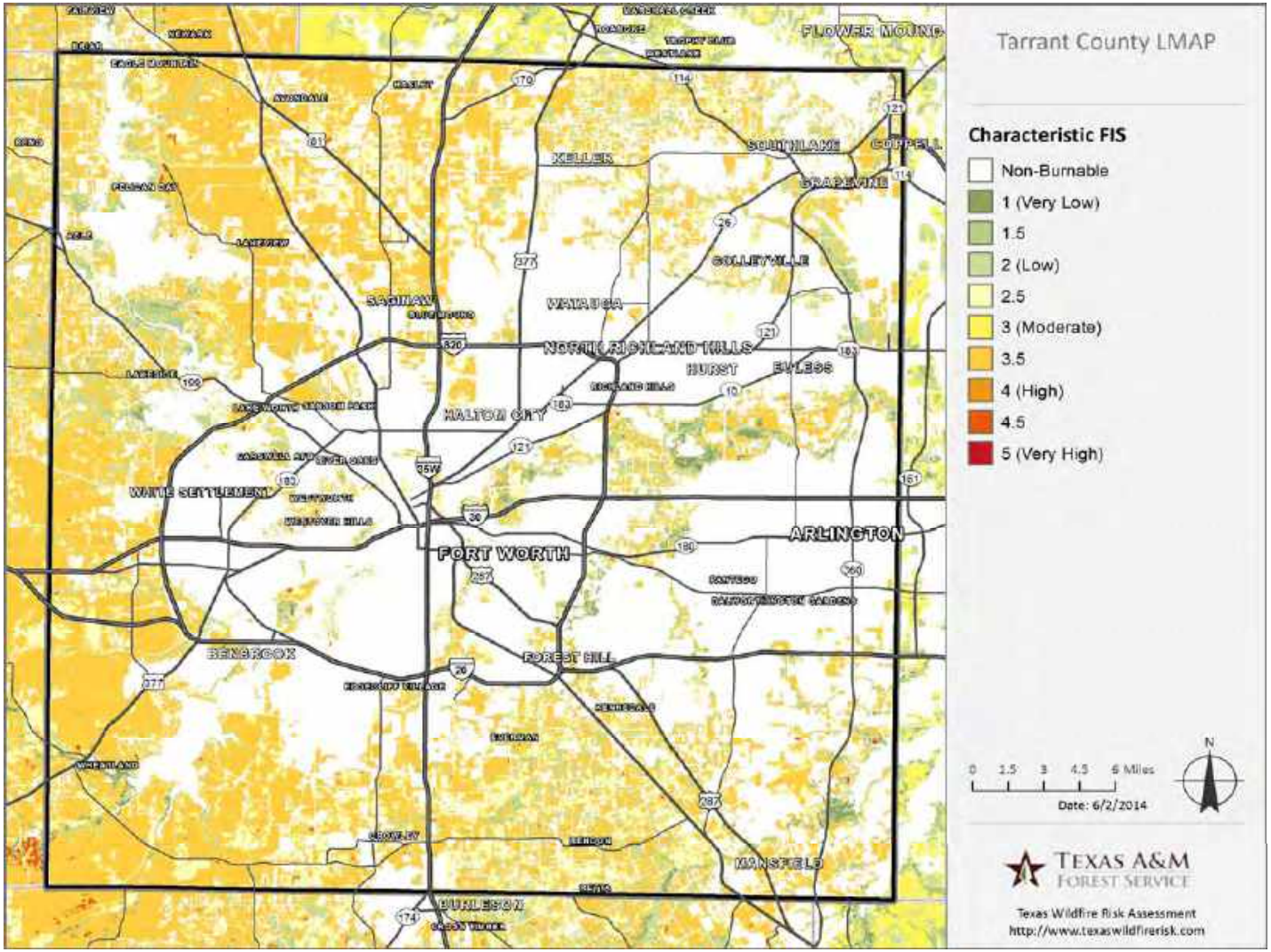


Figure 4-11
Tarrant County Fire Intensity Scale



Assets Exposed to Hazard

- **Property Risk/Vulnerability.** Assets most exposed to wildfires are located in Grapevine. Although Grapevine is 95 percent developed, there are large tracts of U.S. Army Corps of Engineers property, heavily vegetated parklands, and large open tracts of airport "buffer" zones around DFW that are and will remain undeveloped for perpetuity. It is in these areas that tend to have wildfires that rapidly spread, are difficult to get to and extinguish and that butt up against the urban interface. DFW International Airport is also at risk to wildfires. There is little risk to the infrastructure located in other more urban parts of Tarrant County from wildfires.
- **People Risk/Vulnerability.** It was determined that risk/vulnerability includes the entire population of Tarrant County, because there is no way to determine the impact/magnitude of a wildfire incident and no way to predict where a wildfire incident will occur. Much of the risk to people from wildfires in Tarrant County is the result of smoke impacting those with respiratory diseases when smoke from wildfires in other areas of the state moves over the County.
- **Environment Risk/Vulnerability.** Risks to the environment are high for a wildfire incident, although there is a low frequency of occurrence. Environmental concerns would be loss of vegetation and risk of erosion in areas that are affected by wildfires.

The risk and vulnerability for wildfires for each participating jurisdiction are detailed below. It should be noted that the North Central Texas Council of Governments (NCTCOG) is an association of local governments that works to assist in planning and coordination efforts of 16 counties in North Central Texas. It is a government authority but does not hold or own any land or property, nor does it have any constituents. Therefore, there is minimal vulnerability to the NCTCOG.

Vulnerability to Wildfires	
City of Arlington	
Critical Asset Vulnerability	City facilities located in or adjacent to woody or grassy areas could be susceptible from damage due to wildfires.
Vulnerable Populations	Individuals living in woody or grassy areas of the city could be vulnerable from wildfires.
Environmental Vulnerability	Woody or grassy areas of the city are vulnerable to damage to vegetation and soil erosion as a result of wildfire.
City of Azle	
Critical Asset Vulnerability	City facilities located in or adjacent to woody or grassy areas could be susceptible from damage due to wildfires.
Vulnerable Populations	Individuals living in woody or grassy areas of the city could be vulnerable from wildfires.
Environmental Vulnerability	Woody or grassy areas of the city are vulnerable to damage to vegetation and soil erosion as a result of wildfire.
City of Bedford	
Critical Asset Vulnerability	City facilities located in or adjacent to woody or grassy areas could be susceptible from damage due to wildfires.

Vulnerability to Wildfires	
Vulnerable Populations	Individuals living in woody or grassy areas of the city could be vulnerable from wildfires.
Environmental Vulnerability	Woody or grassy areas of the city are vulnerable to damage to vegetation and soil erosion as a result of wildfire.
City of Blue Mound	
Critical Asset Vulnerability	City facilities located in or adjacent to woody or grassy areas could be susceptible from damage due to wildfires.
Vulnerable Populations	Individuals living in woody or grassy areas of the city could be vulnerable from wildfires.
Environmental Vulnerability	Woody or grassy areas of the city are vulnerable to damage to vegetation and soil erosion as a result of wildfire.
City of Colleyville	
Critical Asset Vulnerability	City facilities located in or adjacent to woody or grassy areas could be susceptible from damage due to wildfires.
Vulnerable Populations	Individuals living in woody or grassy areas of the city could be vulnerable from wildfires.
Environmental Vulnerability	Woody or grassy areas of the city are vulnerable to damage to vegetation and soil erosion as a result of wildfire.
City of Crowley	
Critical Asset Vulnerability	City facilities located in or adjacent to woody or grassy areas could be susceptible from damage due to wildfires.
Vulnerable Populations	Individuals living in woody or grassy areas of the city could be vulnerable from wildfires.
Environmental Vulnerability	Woody or grassy areas of the city are vulnerable to damage to vegetation and soil erosion as a result of wildfire.
Dallas Fort Worth International Airport	
Critical Asset Vulnerability	Wildfires could damage airport facilities and impede airport operations.
Vulnerable Populations	NA
Environmental Vulnerability	Woody or grassy areas of the airport are vulnerable to damage to vegetation and soil erosion as a result of wildfire.
City of Euless	
Critical Asset Vulnerability	City facilities located in or adjacent to woody or grassy areas could be susceptible from damage due to wildfires.
Vulnerable Populations	Individuals living in woody or grassy areas of the city could be vulnerable from wildfires.
Environmental Vulnerability	Woody or grassy areas of the city are vulnerable to damage to vegetation and soil erosion as a result of wildfire.
City of Forest Hill	
Critical Asset Vulnerability	City facilities located in or adjacent to woody or grassy areas could be susceptible from damage due to wildfires.
Vulnerable Populations	Individuals living in woody or grassy areas of the city could be vulnerable from wildfires.
Environmental Vulnerability	Woody or grassy areas of the city are vulnerable to damage to vegetation and soil erosion as a result of wildfire.
City of Fort Worth	

Vulnerability to Wildfires	
Critical Asset Vulnerability	City facilities located in or adjacent to woody or grassy areas could be susceptible from damage due to wildfires.
Vulnerable Populations	Individuals living in woody or grassy areas of the city could be vulnerable from wildfires.
Environmental Vulnerability	Woody or grassy areas of the city are vulnerable to damage to vegetation and soil erosion as a result of wildfire.
City of Grapevine	
Critical Asset Vulnerability	City facilities located in or adjacent to woody or grassy areas could be susceptible from damage due to wildfires.
Vulnerable Populations	Individuals living in woody or grassy areas of the city could be vulnerable from wildfires.
Environmental Vulnerability	Woody or grassy areas of the city are vulnerable to damage to vegetation and soil erosion as a result of wildfire.
City of Haltom City	
Critical Asset Vulnerability	City facilities located in or adjacent to woody or grassy areas could be susceptible from damage due to wildfires.
Vulnerable Populations	Individuals living in woody or grassy areas of the city could be vulnerable from wildfires.
Environmental Vulnerability	Woody or grassy areas of the city are vulnerable to damage to vegetation and soil erosion as a result of wildfire.
City of Haslet	
Critical Asset Vulnerability	City facilities located in or adjacent to woody or grassy areas could be susceptible from damage due to wildfires.
Vulnerable Populations	Individuals living in woody or grassy areas of the city could be vulnerable from wildfires.
Environmental Vulnerability	Woody or grassy areas of the city are vulnerable to damage to vegetation and soil erosion as a result of wildfire.
City of Hurst	
Critical Asset Vulnerability	City facilities located in or adjacent to woody or grassy areas could be susceptible from damage due to wildfires.
Vulnerable Populations	Individuals living in woody or grassy areas of the city could be vulnerable from wildfires.
Environmental Vulnerability	Woody or grassy areas of the city are vulnerable to damage to vegetation and soil erosion as a result of wildfire.
City of Keller	
Critical Asset Vulnerability	City facilities located in or adjacent to woody or grassy areas could be susceptible from damage due to wildfires.
Vulnerable Populations	Individuals living in woody or grassy areas of the city could be vulnerable from wildfires.
Environmental Vulnerability	Woody or grassy areas of the city are vulnerable to damage to vegetation and soil erosion as a result of wildfire.
City of Kennedale	
Critical Asset Vulnerability	City facilities located in or adjacent to woody or grassy areas could be susceptible from damage due to wildfires.
Vulnerable Populations	Individuals living in woody or grassy areas of the city could be vulnerable from wildfires.
Environmental Vulnerability	Woody or grassy areas of the city are vulnerable to damage to vegetation and soil erosion as a result of wildfire.

Vulnerability to Wildfires	
City of Lake Worth	
Critical Asset Vulnerability	City facilities located in or adjacent to woody or grassy areas could be susceptible from damage due to wildfires.
Vulnerable Populations	Individuals living in woody or grassy areas of the city could be vulnerable from wildfires.
Environmental Vulnerability	Woody or grassy areas of the city are vulnerable to damage to vegetation and soil erosion as a result of wildfire.
City of Lakeside	
Critical Asset Vulnerability	City facilities located in or adjacent to woody or grassy areas could be susceptible from damage due to wildfires.
Vulnerable Populations	Individuals living in woody or grassy areas of the city could be vulnerable from wildfires.
Environmental Vulnerability	Woody or grassy areas of the city are vulnerable to damage to vegetation and soil erosion as a result of wildfire.
City of North Richland Hills	
Critical Asset Vulnerability	City facilities located in or adjacent to woody or grassy areas could be susceptible from damage due to wildfires.
Vulnerable Populations	Individuals living in woody or grassy areas of the city could be vulnerable from wildfires.
Environmental Vulnerability	Woody or grassy areas of the city are vulnerable to damage to vegetation and soil erosion as a result of wildfire.
City of Richland Hills	
Critical Asset Vulnerability	City facilities located in or adjacent to woody or grassy areas could be susceptible from damage due to wildfires.
Vulnerable Populations	Individuals living in woody or grassy areas of the city could be vulnerable from wildfires.
Environmental Vulnerability	Woody or grassy areas of the city are vulnerable to damage to vegetation and soil erosion as a result of wildfire.
City of Saginaw	
Critical Asset Vulnerability	City facilities located in or adjacent to woody or grassy areas could be susceptible from damage due to wildfires.
Vulnerable Populations	Individuals living in woody or grassy areas of the city could be vulnerable from wildfires.
Environmental Vulnerability	Woody or grassy areas of the city are vulnerable to damage to vegetation and soil erosion as a result of wildfire.
City of Southlake	
Critical Asset Vulnerability	City facilities located in or adjacent to woody or grassy areas could be susceptible from damage due to wildfires.
Vulnerable Populations	Individuals living in woody or grassy areas of the city could be vulnerable from wildfires.
Environmental Vulnerability	Woody or grassy areas of the city are vulnerable to damage to vegetation and soil erosion as a result of wildfire.
Tarrant County	
Critical Asset Vulnerability	City facilities located in or adjacent to woody or grassy areas could be susceptible from damage due to wildfires.
Vulnerable Populations	Individuals living in woody or grassy areas of the city could be vulnerable from wildfires.

Vulnerability to Wildfires	
Environmental Vulnerability	Woody or grassy areas of the city are vulnerable to damage to vegetation and soil erosion as a result of wildfire.
City of Watauga	
Critical Asset Vulnerability	City facilities located in or adjacent to woody or grassy areas could be susceptible from damage due to wildfires.
Vulnerable Populations	Individuals living in woody or grassy areas of the city could be vulnerable from wildfires.
Environmental Vulnerability	Woody or grassy areas of the city are vulnerable to damage to vegetation and soil erosion as a result of wildfire.
City of Westlake	
Critical Asset Vulnerability	City facilities located in or adjacent to woody or grassy areas could be susceptible from damage due to wildfires.
Vulnerable Populations	Individuals living in woody or grassy areas of the city could be vulnerable from wildfires.
Environmental Vulnerability	Woody or grassy areas of the city are vulnerable to damage to vegetation and soil erosion as a result of wildfire.
City of Westworth Village	
Critical Asset Vulnerability	City facilities located in or adjacent to woody or grassy areas could be susceptible from damage due to wildfires.
Vulnerable Populations	Individuals living in woody or grassy areas of the city could be vulnerable from wildfires.
Environmental Vulnerability	Woody or grassy areas of the city are vulnerable to damage to vegetation and soil erosion as a result of wildfire.

Vulnerability

Wildfires

Frequency of Occurrence	Likely
Warning Time	6-12 hours
Geographic Extent	Localized
Potential Impact	Minor

Multijurisdictional Concerns

The entire planning area is vulnerable to wildfires and therefore should be included in any prospective mitigation projects. More rural areas of Tarrant County are more prone to wildfires than urban areas. This is obvious from the WUI index provided in Figure 4-10. Haslet, Lakeside, Azle, Saginaw, Blue Mound, Keller, Southlake, Grapevine, Crowley, and Kennedale are most vulnerable to wildfires in Tarrant County. The smoke from the fires may also affect the urban areas as well as the travel on highways and roads throughout Tarrant County.

Land Use and Development Trends

Participating jurisdictions will continue to monitor development in their areas to ensure that the addition of wildfire fuels are monitored and mitigated against. Participating jurisdictions in the planning area have burn ordinances in effect to guard against wildfires during times of drought.

Hazard Summary

Wildfires have the potential to cause extensive property damage and affect many lives in the Tarrant County area, particularly due to smoke in the area from wildfires in other areas of the state. DFW International Airport is most vulnerable to wildfires due to the fields located in the airport as well as the risk of sparks from equipment.

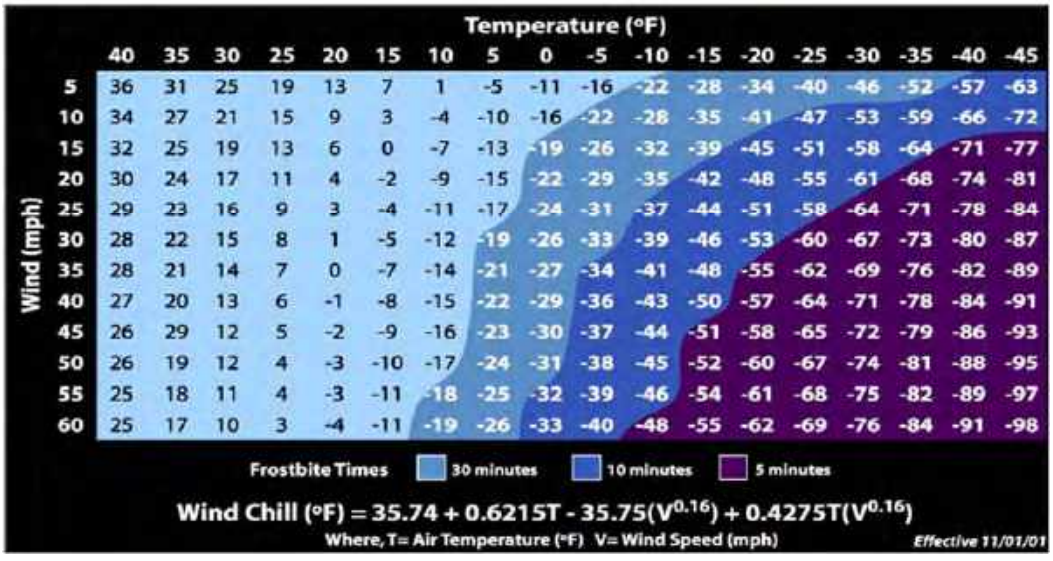
4.1.9 Extreme Temperatures

Hazard Definition

Extreme temperatures include both cold and hot events, which can have a significant impact on human health, commercial/agricultural businesses, and primary and secondary effects on infrastructure (for example, burst pipes and power failure). What constitutes "extreme cold" or "extreme heat" can vary across different areas of the country based on what the population is accustomed to in their respective climates.

What constitutes extreme cold and its effects can also vary across the state of Texas. Tarrant County and the participating jurisdictions typically do not experience extreme cold, but history has shown that Tarrant County and participating jurisdictions are not immune to extreme cold temperatures. The National Weather Service utilizes temperatures and wind speeds to identify how cold temperatures will impact and endanger people. Figure 4-12 illustrates the time it takes for frostbite to set in dependent on wind chill. The planning area may expect cold temperatures that drop below 20 degrees Fahrenheit.

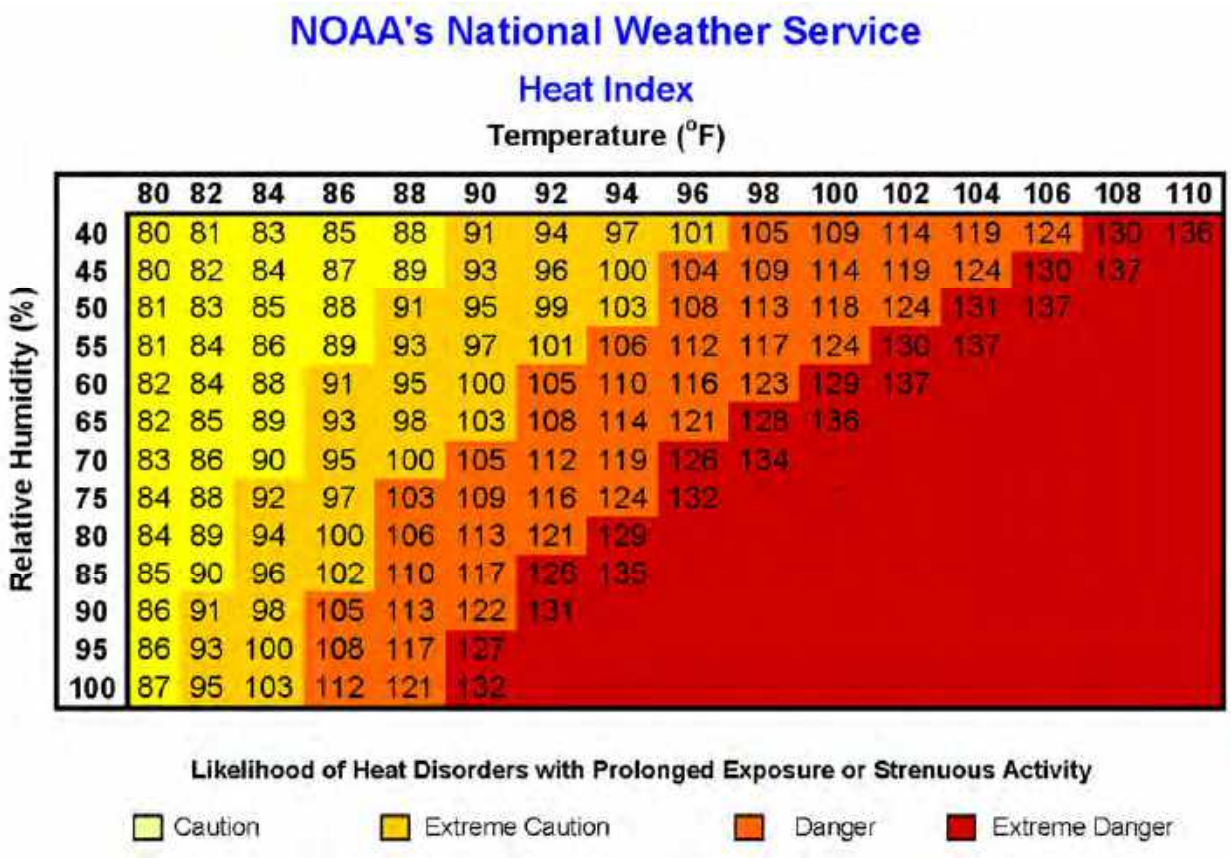
Figure 4-12[21]
Wind Chill Chart



[21] Source: NOAA, http://www.crh.noaa.gov/images/apx/windchill.gif.

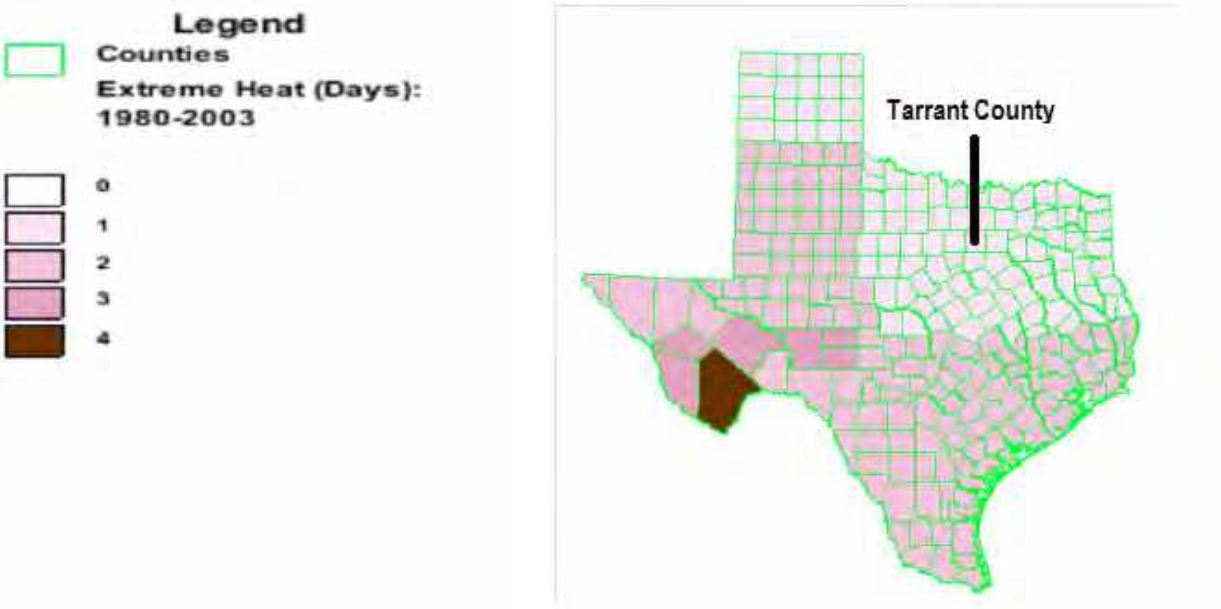
Temperatures that hover 10 degrees or more above the average high temperature for a region and last for several weeks are defined as extreme heat by the Centers for Disease Control and Prevention. Heat is measured by the National Weather Service using the Heat Index found in Figure 4-13. Tarrant County and the participating jurisdictions may expect heat ranging up to and possibly above 116 degrees Fahrenheit.

Figure 4-13
National Weather Service Heat Index[22]



[22] Source: NOAA, http://nws.noaa.gov/os/heat/index.shtml.

Figure 4-14
Extreme Heat in Texas



Hazard Identification

The geographic location of Tarrant County and the participating jurisdictions make it less vulnerable to extreme temperatures than other areas of the country. The average high temperature in July and August, Tarrant County and the participating jurisdiction's hottest months, is 94.5 and 94.8 degrees Fahrenheit, respectively. The average low temperature in July and August is 74.7 and 74.9 degrees Fahrenheit, respectively. Temperatures are likely reach 100 degrees Fahrenheit or more in the summer every year. The record for heat in Tarrant County was set in 1954 with a temperature of 111 degrees Fahrenheit. The citizens of Tarrant County and the participating jurisdictions are more accustomed to heat than cold temperatures, due to the climate.

Texas is known less for extreme cold temperatures than extreme heat. In the winter months, the temperature drops to average low temperatures of 35.4 degrees Fahrenheit and an average high temperature of 56.5 degrees Fahrenheit. Local residents are not accustomed to cold weather; therefore, cold temperatures are more difficult to tolerate. The record cold temperature in the area was set in 1989 when a cold front dropped the temperature to -6 degrees Fahrenheit. Infrastructure in the area was not equipped to handle the cold and as a result, $25 million of damage was incurred via demands for power and frozen pipes. This was only a few years after the December 1983 cold wave that caused a record 295 consecutive hours below freezing, causing $1.5 million in damages in Tarrant County alone. More recently, a January 2007 cold wave caused freezing temperatures at DFW International Airport for four consecutive days.

Extreme weather events that have occurred in Tarrant County and participating jurisdictions since 1996 are listed in the table below.

Table 4-21
Extreme Weather Events

Location	Date	Time	Time Zone	Type	Deaths	Injuries	Property Damage Estimate	Crop Damage Estimate
TARRANT (ZONE)	1/8/1996	9:00	CST	Cold/wind Chill	1	0	0.00K	0.00K
TARRANT (ZONE)	4/12/1997	4:00	CST	Cold/wind Chill	0	0	0.00K	0.00K
TARRANT (ZONE)	12/23/2004	8:00	CST	Cold/wind Chill	1	0	0.00K	0.00K
TARRANT (ZONE)	8/10/2007	8:00	CST-6	Excessive Heat	1	1	0.00K	0.00K
TARRANT (ZONE)	8/1/2011	6:00	CST-6	Excessive Heat	0	63	0.00K	0.00K
Totals:					3	64	0.00K	0.00K

Assets Exposed to Hazard

- **Property Risk/Vulnerability.** It was determined that all critical facilities in Tarrant County and the participating jurisdictions as well as all public, private, and commercial property are vulnerable to being affected by extreme temperatures; however, the risk is very low. Extreme cold may freeze water pipes, causing significant issues for a facility. Extreme heat may affect power supply to a facility.
- **People Risk/Vulnerability.** It was determined that risk/vulnerability includes the entire population of Tarrant County and the participating jurisdictions because there is no way to determine the impact/magnitude of an extreme temperature incident and no way to predict where and when an extreme temperature incident will occur. People are vulnerable to the effects of extreme temperatures, including power outages, effects on transportation routes, establishment of shelters, etc. Those with existing medical conditions are affected by extreme temperatures, and the elderly population may be at higher risk.
- **Environment Risk/Vulnerability.** Risks to the environment are high should an extreme temperature incident occur, and the frequency of extreme temperatures in Tarrant County and the participating jurisdictions is high. Environmental concerns include interruption of water supply (such as water pipes freezing, frozen tree branches, etc.) and secondary events such as fires and hazmat accidents. Extreme heat may be a significant factor in causing droughts.

The risk and vulnerability to extreme temperatures in each participating jurisdiction are detailed below. It should be noted that the North Central Texas Council of Governments (NCTCOG) is an association of local governments that works to assist in planning and coordination efforts of 16 counties in North Central Texas. It is a government authority but does not hold or own any land or property, nor does it have any constituents. Therefore, there is minimal vulnerability to the NCTCOG.

Vulnerability to Extreme Temperatures	
City of Arlington	
Critical Asset Vulnerability	The City of Arlington is home to critical facilities that would be vulnerable to the effects of extreme temperatures. This includes city facilities worth approximately 8.5 million, the Dallas Cowboys Stadium worth $1.6 billion dollars, as well as many U.S. Government office facilities, public schools, a university, a large theme park, and privately-owned facilities that employ a significant number of residents. Power, water and sewer treatment systems could also be affected as a result of extreme temperatures. Effects can include water shortages, burst pipes, and damage to foundations from shrinking or expanding soil.
Vulnerable Populations	As of 2010, 8% of the population in Arlington consists of individuals who were 65 years or older. In addition, approximately 16% of Arlington families live below the poverty line. While extreme temperatures poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of extreme temperatures.
City of Azle	
Critical Asset Vulnerability	The City of Azle is home to critical facilities that would be vulnerable to the effects of extreme temperatures. This includes city structures worth approximately 63.5 million, and public school facilities worth 96 million. Effects can include water shortages, burst pipes, and damage to foundations from shrinking or expanding soil.
Vulnerable Populations	As of 2010, 12.8% of the population in Azle consists of individuals who were 65 years or older. In addition, approximately 6.9% of Azle families live below the poverty line. While extreme temperatures poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of extreme temperatures.
City of Bedford	
Critical Asset Vulnerability	The City of Bedford is home to critical facilities that would be vulnerable to the effects of extreme temperatures. This includes city facilities, schools, and hospitals. In addition, the city is home to employers including Walmart, Transamerica, and Heartland that employ residents of the City of Bedford. Effects can include water shortages, burst pipes, and damage to foundations from shrinking or expanding soil.
Vulnerable Populations	As of 2010, 8.7% of the population in Bedford consists of individuals who were 65 years or older. In addition, approximately 3.7% of Bedford families live below the poverty line. While extreme temperatures poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of extreme temperatures.
City of Blue Mound	
Critical Asset Vulnerability	The City of Blue Mound is home to critical facilities that would be vulnerable to the effects of extreme temperatures. This includes city facilities valued at 250,000, a school, and water production facilities that serve the residents of Blue Mound. Effects can include water shortages, burst pipes, and damage to foundations from shrinking or expanding soil.
Vulnerable Populations	Approximately 7.2% of the population in Bedford consists of individuals who are 65 years or older. In addition, approximately 5.9 % of Blue Mound families live below the poverty line. While extreme temperatures poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of extreme temperatures.
City of Colleyville	

Vulnerability to Extreme Temperatures	
Critical Asset Vulnerability	The City of Colleyville is home to critical facilities that would be vulnerable to the effects of extreme temperatures. This includes city facilities valued at 11.7 million, and school facilities valued at 36 million. Effects can include water shortages, burst pipes, and damage to foundations from shrinking or expanding soil.
Vulnerable Populations	Approximately 5.3% of the population in Colleyville consists of individuals who are 65 years or older. In addition, approximately 1.2 % of Colleyville families live below the poverty line. While extreme temperatures poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of extreme temperatures.
City of Crowley	
Critical Asset Vulnerability	The City of Crowley is home to critical facilities that would be vulnerable to the effects of extreme temperatures. This includes city facilities valued at 10.2 million. Effects can include water shortages, burst pipes, and damage to foundations from shrinking or expanding soil.
Vulnerable Populations	Approximately 8.3% of the population in Crowley consists of individuals who are 65 years or older. In addition, approximately 4.3 % of Crowley families live below the poverty line. While extreme temperatures poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of extreme temperatures.
Dallas Fort Worth International Airport	
Critical Asset Vulnerability	The Dallas Fort Worth International Airport is home to critical facilities that would be vulnerable to the effects of extreme temperatures. This includes airport towers, terminals, utilities plants, fuel facilities, water treatment facilities, storage facilities, as well as aircraft. Effects can include water shortages, burst pipes, and damage to foundations from shrinking or expanding soil.
Vulnerable Populations	Water shortages and damage to facilities could impact those individuals working at or traveling through airport facilities.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of extreme temperatures.
City of Euless	
Critical Asset Vulnerability	The City of Euless is home to critical facilities that would be vulnerable to the effects of extreme temperatures. This includes city facilities and public schools. Effects can include water shortages, burst pipes, and damage to foundations from shrinking or expanding soil.
Vulnerable Populations	Approximately 5.8% of the population in Crowley consists of individuals who are 65 years or older. In addition, approximately 5.7 % of Euless families live below the poverty line. While extreme temperatures poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of extreme temperatures.
City of Forest Hill	
Critical Asset Vulnerability	The City of Forest Hill is home to critical facilities that would be vulnerable to the effects of extreme temperatures. This includes city facilities valued at $875,220. Effects can include water shortages, burst pipes, and damage to foundations from shrinking or expanding soil.
Vulnerable Populations	Approximately 9.1% of the population in Forest Hill consists of individuals who are 65 years or older. In addition, approximately 16.0 % of Forest Hill families live below the poverty line. While extreme temperatures poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of extreme temperatures.

Vulnerability to Extreme Temperatures	
City of Fort Worth	
Critical Asset Vulnerability	The City of Fort Worth is home to critical facilities that would be vulnerable to the effects of extreme temperatures. This includes city buildings, water pumps stations, water storage facilities, water treatment facilities, convention facilities, and radio towers valued at $571 million. The City also has school facilities, hospitals, a naval air station, as well as employers that employ many of the residents of the city. Effects can include water shortages, burst pipes, and damage to foundations from shrinking or expanding soil.
Vulnerable Populations	Approximately 8.2% of the population in Fort Worth consists of individuals who are 65 years or older and approximately 18.7 % of individuals in Fort Worth live below the poverty line. In addition, there is a homeless population in in Fort Worth estimated at 2,000 individuals. While extreme temperatures poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of extreme temperatures.
City of Grapevine	
Critical Asset Vulnerability	The City of Grapevine is home to critical facilities that would be vulnerable to the effects of extreme temperatures. This includes city buildings, water storage facilities, and water treatment facilities, valued at 33.4 million. Effects can include water shortages, burst pipes, and damage to foundations from shrinking or expanding soil.
Vulnerable Populations	Approximately 7.9% of the population in Grapevine consists of individuals who are 65 years or older. In addition, approximately 7.9 % of individuals in Grapevine live below the poverty line. While extreme temperatures poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of extreme temperatures.
City of Haltom City	
Critical Asset Vulnerability	The City of Haltom City is home to critical facilities that would be vulnerable to the effects of extreme temperatures. This includes city buildings valued at 10.8 million. Effects can include water shortages, burst pipes, and damage to foundations from shrinking or expanding soil.
Vulnerable Populations	Approximately 10.0% of the population in Grapevine consists of individuals who are 65 years or older. In addition, approximately 16.7 % of individuals in Haltom City live below the poverty line. While extreme temperatures poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of extreme temperatures.
City of Haslet	
Critical Asset Vulnerability	The City of Haslet is home to critical facilities that would be vulnerable to the effects of extreme temperatures. This includes a city building housing fire and emergency management, and an elementary school. The City also is home to an Amazon Incorporated distribution center that employs approximately 1500 people. Effects can include water shortages, burst pipes, and damage to foundations from shrinking or expanding soil.
Vulnerable Populations	A breakdown of vulnerable populations was not available for the city of Haslet as of the writing of this document.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of extreme temperatures.
City of Hurst	
Critical Asset Vulnerability	The City of Hurst is home to critical facilities that would be vulnerable to the effects of extreme temperatures. This includes city buildings valued at 34.6 million and a children's medical center valued at 15 million. In addition, there is a Mall in Hurst whose property is valued at 155 million.

Vulnerability to Extreme Temperatures	
	Effects can include water shortages, burst pipes, and damage to foundations from shrinking or expanding soil.
Vulnerable Populations	Approximately 12.4% of the population in Hurst consists of individuals who are 65 years or older. In addition, approximately 6.6 % of individuals in Hurst live below the poverty line. While extreme temperatures poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of extreme temperatures.
City of Keller	
Critical Asset Vulnerability	The City of Keller is home to critical facilities that would be vulnerable to the effects of extreme temperatures. This includes city buildings valued at 46.7 million, and school facilities valued at approximately 84.1 million. Effects can include water shortages, burst pipes, and damage to foundations from shrinking or expanding soil.
Vulnerable Populations	Approximately 8.6% of the population in Keller consists of individuals who are 65 years or older. In addition, approximately 3.9 % of individuals in Keller live below the poverty line. While extreme temperatures poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of extreme temperatures.
City of Kennedale	
Critical Asset Vulnerability	The City of Kennedale is home to critical facilities that would be vulnerable to the effects of extreme temperatures. This includes city buildings, water storage tanks, and well pumps valued at 36 million. Effects can include water shortages, burst pipes, and damage to foundations from shrinking or expanding soil.
Vulnerable Populations	Approximately 10.5% of the population in Kennedale consists of individuals who are 65 years or older. In addition, approximately 8.1 % of individuals in Kennedale live below the poverty line. While extreme temperatures poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of extreme temperatures.
City of Lake Worth	
Critical Asset Vulnerability	The City of Lake Worth is home to critical facilities that would be vulnerable to the effects of extreme temperatures. This includes city buildings valued at 4.1 million, schools valued at 58.4 million, and two nursing home facilities valued at 2.3 million. Effects can include water shortages, burst pipes, and damage to foundations from shrinking or expanding soil.
Vulnerable Populations	Approximately 16.1% of the population in Lake Worth consists of individuals who are 65 years or older. In addition, approximately 9.4 % of individuals in Lake Worth live below the poverty line. While extreme temperatures poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of extreme temperatures.
City of Lakeside	
Critical Asset Vulnerability	The City of Lakeside is home to critical facilities that would be vulnerable to the effects of extreme temperatures. This includes a city building, a water pump station, a waste water facility, and two gas wells. Effects can include water shortages, burst pipes, and damage to foundations from shrinking or expanding soil.
Vulnerable Populations	Approximately 18.4% of the population in Lakeside consists of individuals who are 65 years or older. In addition, approximately 3.0 % of individuals in Lakeside live below the poverty line.

Vulnerability to Extreme Temperatures	
	While extreme temperatures poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of extreme temperatures.
City of North Richland Hills	
Critical Asset Vulnerability	The City of North Richland Hills is home to critical facilities that would be vulnerable to the effects of extreme temperatures. This includes city buildings, water storage facilities, sewage lift stations, pump stations and a hospital. Effects can include water shortages, burst pipes, and damage to foundations from shrinking or expanding soil.
Vulnerable Populations	Approximately 12.3% of the population in North Richland Hills consists of individuals who are 65 years or older. In addition, approximately 7.5 % of individuals in North Richland Hills live below the poverty line. While extreme temperatures poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of extreme temperatures.
City of Richland Hills	
Critical Asset Vulnerability	The City of Richland Hills is home to critical facilities that would be vulnerable to the effects of extreme temperatures. This includes city buildings, water storage facilities, sewage lift stations, pump stations and a hospital. Effects can include water shortages, burst pipes, and damage to foundations from shrinking or expanding soil.
Vulnerable Populations	Approximately 18.4% of the population in Richland Hills consists of individuals who are 65 years or older. In addition, approximately 7.8 % of individuals in Richland Hills live below the poverty line. While extreme temperatures poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of extreme temperatures.
City of Saginaw	
Critical Asset Vulnerability	The City of Saginaw is home to critical facilities that would be vulnerable to the effects of extreme temperatures. This includes a city building and a county fire alarm center. The city is also home to several food processing and industrial facilities. Effects can include water shortages, burst pipes, and damage to foundations from shrinking or expanding soil.
Vulnerable Populations	Approximately 6.8% of the population in Saginaw consists of individuals who are 65 years or older. In addition, approximately 4.2 % of individuals in Saginaw live below the poverty line. While extreme temperatures poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of extreme temperatures.
City of Southlake	
Critical Asset Vulnerability	The City of Southlake is home to critical facilities that would be vulnerable to the effects of extreme temperatures. This includes a city buildings valued at 15.2 million, a hospital valued at 10.3 million, and school facilities valued at 284 million. In addition, there are two nursing facilities valued at 16.3 million, as well as several major employers. Effects can include water shortages, burst pipes, and damage to foundations from shrinking or expanding soil.
Vulnerable Populations	Approximately 5.9% of the population in Southlake consists of individuals who are 65 years or older. In addition, approximately 3.3 % of individuals in Southlake live below the poverty line. While extreme temperatures poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.

Vulnerability to Extreme Temperatures	
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of extreme temperatures.
Tarrant County	
Critical Asset Vulnerability	Tarrant County is home to critical facilities that would be vulnerable to the effects of extreme temperatures. This includes county buildings valued at 628.2 million, school district facilities, Dallas Fort Worth International Airport, and healthcare facilities. Effects can include water shortages, burst pipes, and damage to foundations from shrinking or expanding soil.
Vulnerable Populations	Approximately 9.9% of the population in Tarrant County consists of individuals who are 65 years or older. In addition, approximately 14.7 % of individuals in Tarrant County live below the poverty line. While extreme temperatures poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of extreme temperatures.
City of Watauga	
Critical Asset Vulnerability	The city of Watauga is home to critical facilities that would be vulnerable to the effects of extreme temperatures. This includes city buildings valued at 18.1 million. Effects can include water shortages, burst pipes, and damage to foundations from shrinking or expanding soil.
Vulnerable Populations	Approximately 7.4% of the population in Watauga consists of individuals who are 65 years or older. In addition, approximately 8.1 % of individuals in Watauga live below the poverty line. While extreme temperatures poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of extreme temperatures.
City of Westlake	
Critical Asset Vulnerability	The city of Westlake is home to critical facilities that would be vulnerable to the effects of extreme temperatures. This includes a water pump station valued at 4 million, a fire station valued at $300,000, a charter school, and a university. There are also two large employers in the city, Fidelity Investments and the Solana Business Complex. Effects can include water shortages, burst pipes, and damage to foundations from shrinking or expanding soil.
Vulnerable Populations	Approximately 11.6% of the population in Westlake consists of individuals who are 65 years or older. In addition, approximately 2.7 % of individuals in Westlake live below the poverty line. While extreme temperatures poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of extreme temperatures.
City of Westworth Village	
Critical Asset Vulnerability	The city of Westworth Village is home to critical facilities that would be vulnerable to the effects of extreme temperatures. This includes two city facilities valued at 4.9 million, as well as a school. Effects can include water shortages, burst pipes, and damage to foundations from shrinking or expanding soil.
Vulnerable Populations	Approximately 11.5% of the population in Westworth Village consists of individuals who are 65 years or older. In addition, approximately 9.1 % of individuals in Westworth Village live below the poverty line. While extreme temperatures poses a serious threat to any population, issues with housing and mobility could make it difficult for those individuals to seek shelter in response to such a threat.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of extreme temperatures.

Vulnerability

The following chart provides the potential impact of extreme temperatures for all participating jurisdictions. Potential losses should extreme temperatures impact each jurisdiction are provided in Appendix G where the value of each piece of critical infrastructure is detailed for building and contents losses.

Extreme Temperatures

Frequency of Occurrence	Likely
Warning Time	More than 12 hours
Geographic Extent	Countywide
Potential Impact	Minor

Multijurisdictional Concerns

Tarrant County and all participating jurisdictions are vulnerable to extreme temperatures and therefore should be included in any prospective mitigation projects. The probability of extreme temperatures occurring in the future is likely based on previous data. Extreme temperatures affect Tarrant County and the participating jurisdictions equally and uniformly. The entire county is at risk of extreme temperature events.

Land Use and Development Trends

Future development throughout Tarrant County and the participating jurisdictions may be vulnerable to potential damage from extreme temperature because no property or facility is immune to extreme temperature effects.

Hazard Summary

Extreme temperatures have occurred across the entire Tarrant County area. Extreme temperature effects are seen in different regions and vary depending on normal meteorological conditions such as extreme heat or extreme cold. Extreme temperatures are possible throughout the planning area, with the northern portion of the state being vulnerable to extreme cold temperatures during the winter months.

4.1.10 Expansive Soils

Hazard Definition

Expansive soils are soils that expand when water is added and shrink when they dry out. This continuous change in soil volume can cause homes built on the soil to move unevenly and crack. Each year in the United States, expansive soils cause $2.3 billion in damage to houses, other buildings, roads, pipelines, and other structures. This is more than twice the damage from floods, hurricanes, tornadoes, and earthquakes combined.

Hazard Identification

Many of the soils found in the central and eastern portions of the North Central Texas Council of Governments (NCTCOG) region are clay-rich, fine-grained soils. These soils contain a class of clay minerals called smectites, which have the property of exaggerated bulk volume changes in

the presence or absence of water. These smectitic soils in the NCTCOG region originate primarily from the calcareous Cretaceous–aged marls and clay rock formations, notably of the Austin and Taylor Groups. Extreme wetting and drying cycles on this soil accentuate the shrinking and swelling effects, and as a result, these soils are commonly called vertisols due to their distinctive vertical shrink-swell features, clay-like texture, and common large, vertical cracks when dry. One of the best known and classic of these vertisols is the Houston Black, a Blackland Prairie soil that stretches over 2 million acres of land between Dallas and Houston. This soil has been nominated by the Professional Soil Scientists of Texas to be named the State Soil of Texas due to its unique and common influence on the lives of Texans.

Shrinking and swelling of these vertisols can come at a high economic price. Some of the most expansive of soils may gain or lose up to 75% of its original soil volume, causing radical gain and loss of a structure foundation's continuity. In addition, soil expansion and loss is rarely uniform across large areas; some areas with locally higher clay content may expand much more than a nearby siltier or sandier soil unit.

Other problems are caused by high plasticity soils. When soil has dried and cracked, water can travel along the cracks for several feet in all directions. If the soil around a structure's foundation is dried and cracked, then water placed next to the foundation will run through the cracks and accumulate at the bottom of the grade beam (the thick portion of the foundation that is under the exterior walls). In some cases, an accumulation of water in the soil at the base of a foundation can cause the soil to lose some of its load-bearing capacity. If the soil loses enough load-bearing capacity, the structure will sink into the ground.

In addition, water that collects under the foundation, regardless of origin, is a major problem. "Upheaval" relates to the situation in which the internal and, on rare occasion, external areas of the foundation raises above the "as-built" position. In high plasticity soils, this phenomenon results, almost without exception, from the introduction of moisture underneath the foundation. Once the slab heaves, the reinforcing steel is stressed into what amounts to a permanent elongation.

Expansive soils are one of the nation's most prevalent causes of damage to buildings and construction. Annual losses are estimated in the range of $2 billion to $7 billion. However, because the hazard develops gradually and seldom presents a threat to life, expansive soils hazards have received limited attention, despite their costly effects. The losses include severe structural damage; cracked driveways, sidewalks, and basement floors; heaving of roads and highway structures; condemnation of buildings; and disruption of pipelines and sewer lines. The destructive forces may be upward, horizontal, or both

Design and construction of structures without attention paid to the existence and behavior of expansive soils can worsen a readily manageable situation. Where expansive soils are not recognized, improper building or structure design, faulty construction, inappropriate landscaping, and long-term maintenance practices unsuited to the specific soil conditions can become a continuing and costly problem. Design problems might include improper foundation loading, improper depth or diameter of drilled pier, insufficient reinforcing steel, and insufficient attention to surface and underground water.

Construction problems related to expansive soils include lack of reinforcing steel, insufficient or improperly placed reinforcing steel, mushroom-topped drilled piers, and inadequate void space between soils and grade beams. Allowing clays to dry excessively before pouring concrete and permitting the ponding of water near a foundation during and after construction also are

contributing factors in expansive soil- related construction problems. Building without allowance for basement or ground floor movement in known expansive soils areas is a very common source of property damage. Improper landscaping problems include inadequately managing surface drainage and planting vegetation next to the foundation so irrigation water enters the soil.

Expansive soils are a profound nationwide problem, as shown by Jones and Holtz (1973)[23]: "Each year, shrinking or swelling inflicts at least $2.3 billion in damage to houses, buildings, roads, and pipelines–more than twice the damage from floods, hurricanes, tornadoes, and earthquakes. Over 250,000 new homes are built on expansive soils each year. Of those, 60 percent will experience only minor damage during their useful lives, but 10 percent will experience significant damage, some beyond repair. Flooding affects 1 person in 10; expansive soils affect 1 person in 5. Swelling clays are one of the most significant, widespread, costly, and least publicized geologic hazards."

Although several visual methods for identification of potentially expansive clays exist, only a competent, professional soil engineer and engineering geologist should be relied upon to identify this potential hazard. Some warning signs for swell might include: a) soft, puff, "popcorn" appearance of the surface soil when dry; b) surface soil that is very sticky when wet; c) open cracks (desiccation polygons) in dry surface soils; d) lack of vegetation due to heavy clay soils; e) soils that are very plastic and weak when wet but are "rock-hard" when dry.

Engineering soil tests include index tests and design tests. Rapid, simple index tests are used to determine whether more complex design tests are necessary. Some index properties that may aid in the identification of probable areas of expansive clay include Atterberg limits, plasticity index, grain size determination, activity ratio, dry unit weight, and moisture content (Asphalt Institute, 1964). The primary design tests for expansive soils are the consolidation swell test for buildings, and the California Bearing Ratio swell test for roads (Asphalt Institute, 1964).

Index properties are used to define a "weighted index", identifying the lessening of expansion with increasing depth in soil. Special foundation designs are considered essential when the expansion index is 20 or greater. The scale utilized for expansive soils is therefore rated based on the potential for expansive soils in the following ratings:

Figure 4-15
Expansive Index

Expansive Soils Potential	
0 – 20	Very Low
21 – 50	Low
51 – 90	Medium
91 – 130	High
>130	Very High

[23] *"Jones, D.E. Jr., and Holtz, W.G., "Expansive Soils – The Hidden Disaster," Civil Engineering, Aug. 1973, Vol. 43, Nov. 8"*

Damage from expansive clays can affect, to some extent, virtually every type of structure in Texas. Some structures, such as skyscrapers in downtown Dallas, generally have well engineered foundations that are too heavily loaded for swelling damage to occur. At the opposite extreme are public schools and single-family homes, which are generally constructed on a minimal budget and which may have under-designed lightly loaded foundations that are particularly subject to damage from soil movements.

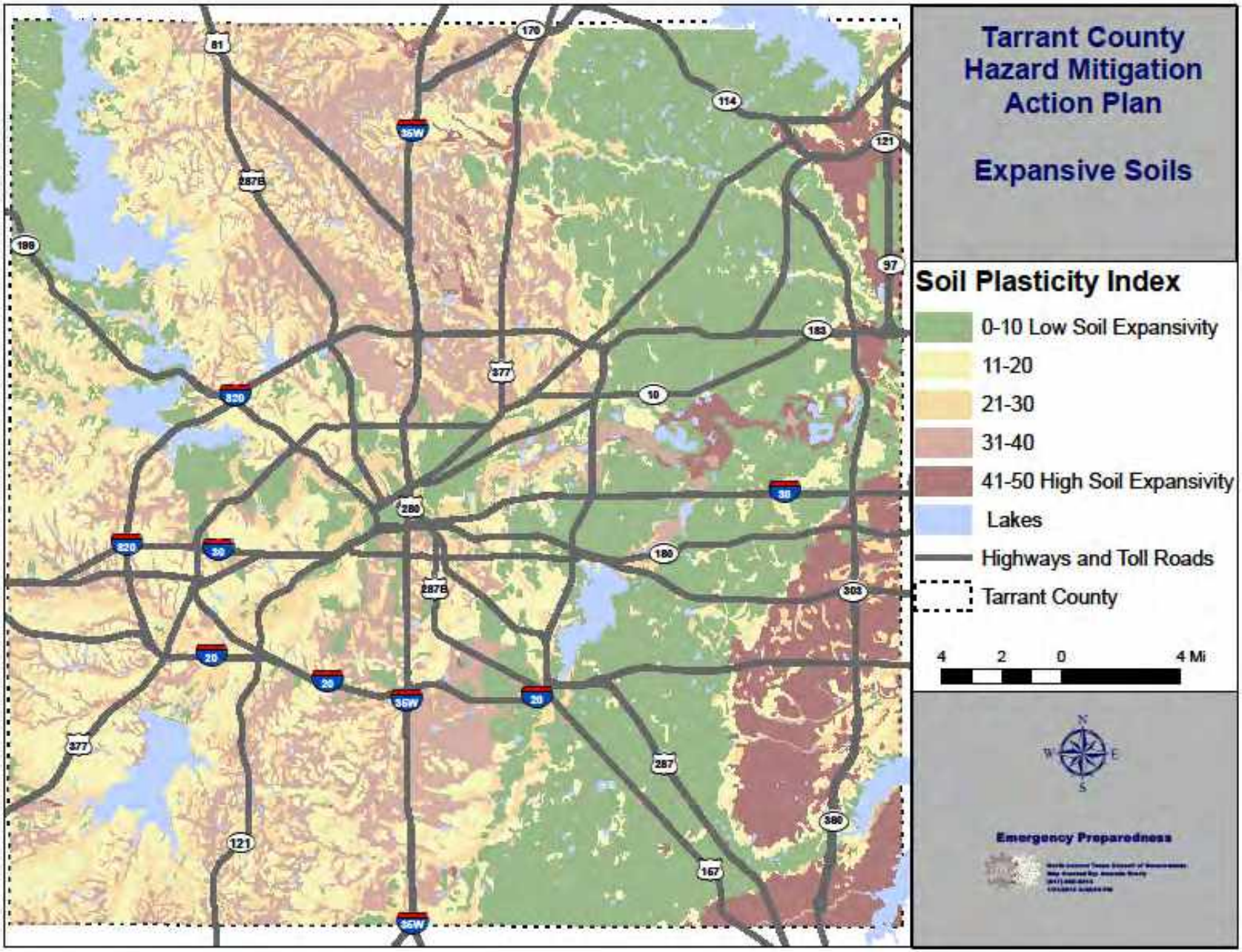
Homeowners and public agencies that assume they cannot afford more costly foundations and floor systems often incur the largest percentage of damage and costly repairs from expansive soil.

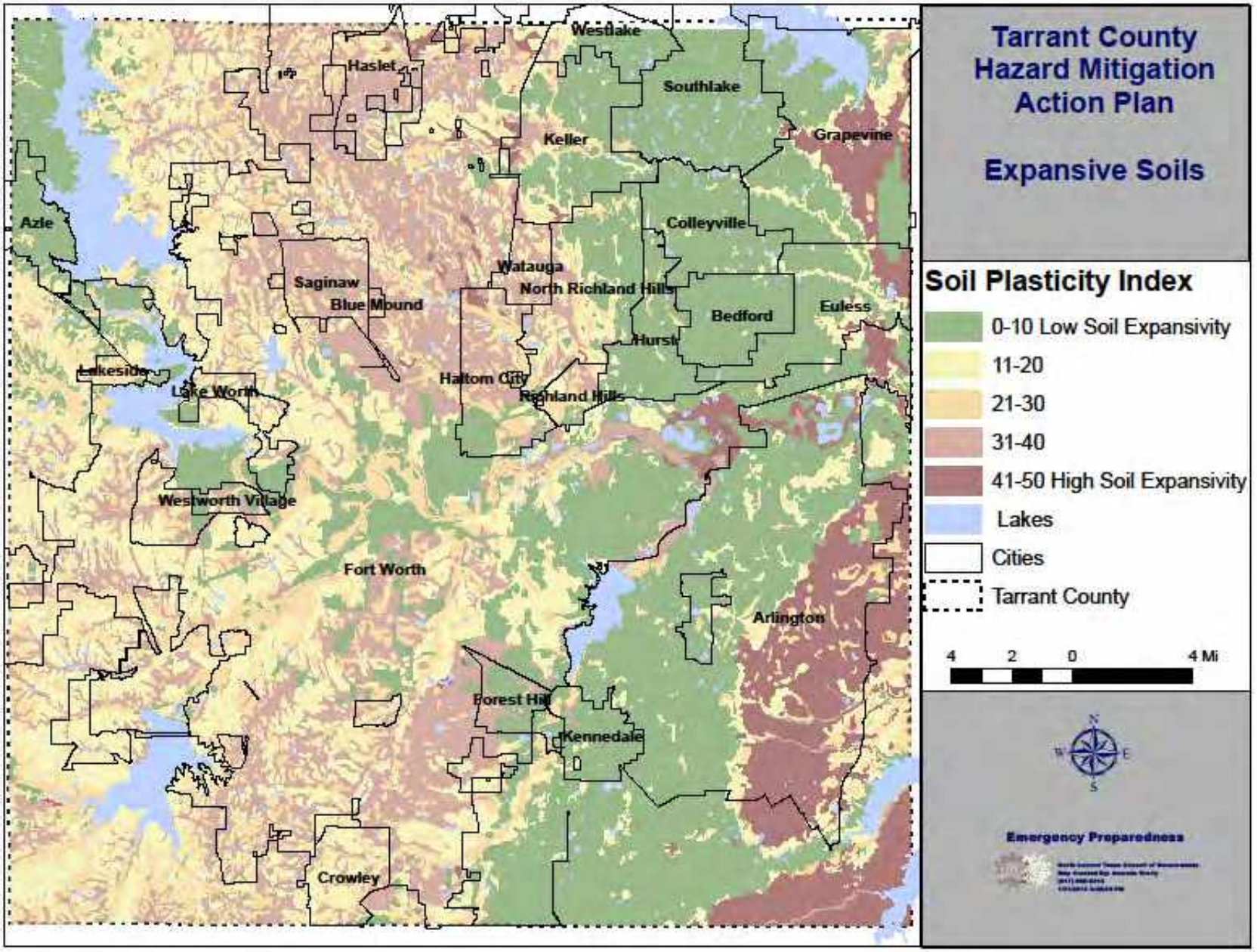
No figures are available for the total damage to homes and infrastructure in Tarrant County and the participating jurisdiction from expansive clays or soils. Reports detailing previous occurrences of expansive soil damage have been completed by the participating jurisdictions, but they have identified the conduct of expansive soils studies and development of plans in their mitigation actions.

The extent of expansive soils in the County are known to range between very low and low, as defined in the above expansive index. The participating jurisdictions have identified the gathering of more information regarding expansive soils in their mitigation strategies.

The location and extent of expansive soils in Tarrant County and the participating jurisdictions are shown in the map below. The information used to develop this map is from 2009 but will be updated when new information is obtained. Specific information for each participating jurisdiction was not available but the jurisdictions have identified the conduct of expansive soils studies and development of plans as mitigation actions.

The following two maps depict the extent of expansive soils in Tarrant County and the participating jurisdictions.


Tarrant County
Hazard Mitigation
Action Plan
Expansive Soils
Soil Plasticity Index
0-10 Low Soil Expansivity
11-20
21-30
31-40
41-50 High Soil Expansivity
Lakes
Highways and Toll Roads
Tarrant County
4 2 0 4 Mi
N
W
E
S
Emergency Preparedness


Tarrant County
Hazard Mitigation
Action Plan
Expansive Soils
Soil Plasticity Index
0-10 Low Soil Expansivity
11-20
21-30
31-40
41-50 High Soil Expansivity
Lakes
Cities
Tarrant County
4 2 0 4 Mi
Emergency Preparedness
Westlake
Haslet
Southlake
Keller
Grapevine
Azle
Colleyville
Saginaw
Watauga
North Richland Hills
Blue Mound
Bedford
Euless
Hurst
Lakeside
Haltom City
Lake Worth
Richland Hills
Westworth Village
Fort Worth
Arlington
Forest Hill
Kennedale
Crowley

Assets Exposed to Hazard

- **Property Risk/Vulnerability.** All structures within the NCTCOG region are vulnerable to expansive soils, but those within the central and eastern portions of the region are most susceptible. Pipelines and pavements are vulnerable to expansive soils and should be check regularly for cracks and breaks.
- **People Risk/Vulnerability.** It was determined that risk/vulnerability includes the entire population of Tarrant County because there is no way to determine where expansive soils will occur.
- **Environment Risk/Vulnerability.** Risks to the environment are low for expansive soils.

The risk and vulnerability to expansive soils in each participating jurisdiction are detailed below. It should be noted that the North Central Texas Council of Governments (NCTCOG) is an association of local governments that works to assist in planning and coordination efforts of 16 counties in North Central Texas. It is a government authority but does not hold or own any land or property, nor does it have any constituents. Therefore, there is minimal vulnerability to the NCTCOG.

Vulnerability to Expansive Soils	
City of Arlington	
Critical Asset Vulnerability	The City of Arlington is home to critical facilities that would be vulnerable to the effects of expansive soils. This includes city facilities worth approximately 8.5 million, the Dallas Cowboys Stadium worth $1.6 billion dollars, as well as many U.S. Government office facilities, public schools, a university, a large theme park, and privately-owned facilities that employ a significant number of residents. Power, water and sewer treatment systems could also be affected as a result of expansive soils. Effects can include damage to foundations from shrinking or expanding soil.
Vulnerable Populations	All homeowners and business owners are at potential risk from the damage to their homes and businesses caused by expansive soils.
Environmental Vulnerability	Severe damage to roads can occur as a result of expansive soils.
City of Azle	
Critical Asset Vulnerability	The City of Azle is home to critical facilities that would be vulnerable to the effects of expansive soils. This includes city structures worth approximately 63.5 million, and public school facilities worth 96 million. Effects can include damage to foundations from shrinking or expanding soil.
Vulnerable Populations	All homeowners and business owners are at potential risk from the damage to their homes and businesses caused by expansive soils.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of expansive soils.
City of Bedford	
Critical Asset Vulnerability	The City of Bedford is home to critical facilities that would be vulnerable to the effects of expansive soils. This includes city facilities, schools, and hospitals. In addition, the city is home to employers including Walmart, Transamerica, and Heartland that employ residents of the City of Bedford. Effects can include damage to foundations from shrinking or expanding soil.
Vulnerable Populations	All homeowners and business owners are at potential risk from the damage to their homes and businesses caused by expansive soils.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of expansive soils.

Vulnerability to Expansive Soils	
City of Blue Mound	
Critical Asset Vulnerability	The City of Blue Mound is home to critical facilities that would be vulnerable to the effects of expansive soils. This includes city facilities valued at 250,000, a school, and water production facilities that serve the residents of Blue Mound. Effects can include damage to foundations from shrinking or expanding soil.
Vulnerable Populations	All homeowners and business owners are at potential risk from the damage to their homes and businesses caused by expansive soils.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of expansive soils.
City of Colleyville	
Critical Asset Vulnerability	The City of Colleyville is home to critical facilities that would be vulnerable to the effects of expansive soils. This includes city facilities valued at 11.7 million, and school facilities valued at 36 million. Effects can include damage to foundations from shrinking or expanding soil.
Vulnerable Populations	All homeowners and business owners are at potential risk from the damage to their homes and businesses caused by expansive soils.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of expansive soils.
City of Crowley	
Critical Asset Vulnerability	The City of Crowley is home to critical facilities that would be vulnerable to the effects of expansive soils. This includes city facilities valued at 10.2 million. Effects can include damage to foundations from shrinking or expanding soil.
Vulnerable Populations	All homeowners and business owners are at potential risk from the damage to their homes and businesses caused by expansive soils.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of expansive soils.
Dallas Fort Worth International Airport	
Critical Asset Vulnerability	The Dallas Fort Worth International Airport is home to critical facilities that would be vulnerable to the effects of expansive soils. This includes airport towers, terminals, utilities plants, fuel facilities, water treatment facilities, storage facilities, as well as aircraft. Effects can include damage to foundations from shrinking or expanding soil.
Vulnerable Populations	NA
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of expansive soils.
City of Euless	
Critical Asset Vulnerability	The City of Euless is home to critical facilities that would be vulnerable to the effects of expansive soils. This includes city facilities and public schools. Effects can include damage to foundations from shrinking or expanding soil.
Vulnerable Populations	All homeowners and business owners are at potential risk from the damage to their homes and businesses caused by expansive soils.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of expansive soils.
City of Forest Hill	
Critical Asset Vulnerability	The City of Forest Hill is home to critical facilities that would be vulnerable to the effects of expansive soils. This includes city facilities valued at $875,220. Effects can include damage to foundations from shrinking or expanding soil.
Vulnerable Populations	All homeowners and business owners are at potential risk from the damage to their homes and businesses caused by expansive soils.

Vulnerability to Expansive Soils	
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of expansive soils.
City of Fort Worth	
Critical Asset Vulnerability	The City of Fort Worth is home to critical facilities that would be vulnerable to the effects of expansive soils. This includes city buildings, water pumps stations, water storage facilities, water treatment facilities, convention facilities, and radio towers valued at $571 million. The City also has school facilities, hospitals, a naval air station, as well as employers that employ many of the residents of the city. Effects can include damage to foundations from shrinking or expanding soil.
Vulnerable Populations	All homeowners and business owners are at potential risk from the damage to their homes and businesses caused by expansive soils.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of expansive soils.
City of Grapevine	
Critical Asset Vulnerability	The City of Grapevine is home to critical facilities that would be vulnerable to the effects of expansive soils. This includes city buildings, water storage facilities, and water treatment facilities, valued at 33.4 million. Effects can include damage to foundations from shrinking or expanding soil.
Vulnerable Populations	All homeowners and business owners are at potential risk from the damage to their homes and businesses caused by expansive soils.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of expansive soils.
City of Haltom City	
Critical Asset Vulnerability	The City of Haltom City is home to critical facilities that would be vulnerable to the effects of expansive soils. This includes city buildings valued at 10.8 million. Effects can include damage to foundations from shrinking or expanding soil.
Vulnerable Populations	All homeowners and business owners are at potential risk from the damage to their homes and businesses caused by expansive soils.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of expansive soils.
City of Haslet	
Critical Asset Vulnerability	The City of Haslet is home to critical facilities that would be vulnerable to the effects of expansive soils. This includes a city building housing fire and emergency management, and an elementary school. The City also is home to an Amazon Incorporated distribution center that employs approximately 1500 people. Effects can include damage to foundations from shrinking or expanding soil.
Vulnerable Populations	All homeowners and business owners are at potential risk from the damage to their homes and businesses caused by expansive soils.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of expansive soils.
City of Hurst	
Critical Asset Vulnerability	The City of Hurst is home to critical facilities that would be vulnerable to the effects of expansive soils. This includes city buildings valued at 34.6 million and a children's medical center valued at 15 million. In addition, there is a Mall in Hurst whose property is valued at 155 million. Effects can include damage to foundations from shrinking or expanding soil.
Vulnerable Populations	All homeowners and business owners are at potential risk from the damage to their homes and businesses caused by expansive soils.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of expansive soils.

Vulnerability to Expansive Soils	
City of Keller	
Critical Asset Vulnerability	The City of Keller is home to critical facilities that would be vulnerable to the effects of expansive soils. This includes city buildings valued at 46.7 million, and school facilities valued at approximately 84.1 million. Effects can include damage to foundations from shrinking or expanding soil.
Vulnerable Populations	All homeowners and business owners are at potential risk from the damage to their homes and businesses caused by expansive soils.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of expansive soils.
City of Kennedale	
Critical Asset Vulnerability	The City of Kennedale is home to critical facilities that would be vulnerable to the effects of expansive soils. This includes city buildings, water storage tanks, and well pumps valued at 36 million. Effects can include damage to foundations from shrinking or expanding soil.
Vulnerable Populations	All homeowners and business owners are at potential risk from the damage to their homes and businesses caused by expansive soils.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of expansive soils.
City of Lake Worth	
Critical Asset Vulnerability	The City of Lake Worth is home to critical facilities that would be vulnerable to the effects of expansive soils. This includes city buildings valued at 4.1 million, schools valued at 58.4 million, and two nursing home facilities valued at 2.3 million. Effects can include damage to foundations from shrinking or expanding soil.
Vulnerable Populations	All homeowners and business owners are at potential risk from the damage to their homes and businesses caused by expansive soils.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of expansive soils.
City of Lakeside	
Critical Asset Vulnerability	The City of Lakeside is home to critical facilities that would be vulnerable to the effects of expansive soils. This includes a city building, a water pump station, a waste water facility, and two gas wells. Effects can include damage to foundations from shrinking or expanding soil.
Vulnerable Populations	All homeowners and business owners are at potential risk from the damage to their homes and businesses caused by expansive soils.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of expansive soils.
City of North Richland Hills	
Critical Asset Vulnerability	The City of North Richland Hills is home to critical facilities that would be vulnerable to the effects of expansive soils. This includes city buildings, water storage facilities, sewage lift stations, pump stations and a hospital. Effects can include damage to foundations from shrinking or expanding soil.
Vulnerable Populations	All homeowners and business owners are at potential risk from the damage to their homes and businesses caused by expansive soils.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of expansive soils.
City of Richland Hills	
Critical Asset Vulnerability	The City of Richland Hills is home to critical facilities that would be vulnerable to the effects of expansive soils. This includes city buildings, water storage facilities, sewage lift stations, pump stations and a hospital. Effects can include damage to foundations from shrinking or expanding soil.

Vulnerability to Expansive Soils	
Vulnerable Populations	All homeowners and business owners are at potential risk from the damage to their homes and businesses caused by expansive soils.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of expansive soils.
City of Saginaw	
Critical Asset Vulnerability	The City of Saginaw is home to critical facilities that would be vulnerable to the effects of expansive soils. This includes a city building and a county fire alarm center. The city is also home to several food processing and industrial facilities. Effects can include damage to foundations from shrinking or expanding soil.
Vulnerable Populations	All homeowners and business owners are at potential risk from the damage to their homes and businesses caused by expansive soils.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of expansive soils.
City of Southlake	
Critical Asset Vulnerability	The City of Southlake is home to critical facilities that would be vulnerable to the effects of expansive soils. This includes a city buildings valued at 15.2 million, a hospital valued at 10.3 million, and school facilities valued at 284 million. In addition, there are two nursing facilities valued at 16.3 million, as well as several major employers. Effects can include damage to foundations from shrinking or expanding soil.
Vulnerable Populations	All homeowners and business owners are at potential risk from the damage to their homes and businesses caused by expansive soils.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of expansive soils.
Tarrant County	
Critical Asset Vulnerability	Tarrant County is home to critical facilities that would be vulnerable to the effects of expansive soils. This includes county buildings valued at 628.2 million, school district facilities, Dallas Fort Worth International Airport, and healthcare facilities. Effects can include damage to foundations from shrinking or expanding soil.
Vulnerable Populations	All homeowners and business owners are at potential risk from the damage to their homes and businesses caused by expansive soils.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of expansive soils.
City of Watauga	
Critical Asset Vulnerability	The city of Watauga is home to critical facilities that would be vulnerable to the effects of expansive soils. This includes city buildings valued at 18.1 million. Effects can include damage to foundations from shrinking or expanding soil.
Vulnerable Populations	All homeowners and business owners are at potential risk from the damage to their homes and businesses caused by expansive soils.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of expansive soils.
City of Westlake	
Critical Asset Vulnerability	The city of Westlake is home to critical facilities that would be vulnerable to the effects of expansive soils. This includes a water pump station valued at 4 million, a fire station valued at $300,000, a charter school, and a university. There are also two large employers in the city, Fidelity Investments and the Solana Business Complex. Effects can include damage to foundations from shrinking or expanding soil.
Vulnerable Populations	All homeowners and business owners are at potential risk from the damage to their homes and businesses caused by expansive soils.

Vulnerability to Expansive Soils	
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of expansive soils.
City of Westworth Village	
Critical Asset Vulnerability	The city of Westworth Village is home to critical facilities that would be vulnerable to the effects of expansive soils. This includes two city facilities valued at 4.9 million, as well as a school. Effects can include damage to foundations from shrinking or expanding soil.
Vulnerable Populations	All homeowners and business owners are at potential risk from the damage to their homes and businesses caused by expansive soils.
Environmental Vulnerability	Severe damage to vegetation and roads can occur as a result of expansive soils.

Vulnerability

The following chart provides the potential impact of expansive soils for all participating jurisdictions. Potential losses should expansive soils impact each jurisdiction are provided in Appendix G where the value of each piece of critical infrastructure is detailed for building and contents losses.

Expansive Soils

Frequency of Occurrence	Likely
Warning Time	More than 12 hours
Geographic Extent	Localized
Potential Impact	Negligible

Multijurisdictional Concerns

There are no multijurisdictional concerns as they relate to expansive soils.

Land Use and Development Trends

There are no regulations in place regarding land use and development on expansive soils. Slab foundations, commonly found in single-family dwellings, are particularly vulnerable to expansive soil damage. Builders should understand that expansive soils may result in damaged foundations and pavements and pipelines.

Hazard Summary

Expansive soils pose a threat to Tarrant County property owners. The most obvious manifestations of damage to buildings are sticking doors, uneven floors, and cracked foundations, floors, walls, ceilings, and windows. If damage is severe, the cost of repair may exceed the value of the building.

Probably the greatest amount of small building damage has impacted those constructed when clays were dry, such as during a drought, followed by soaking rains that prompt swelling of clays. Other reported cases of damage involve volume increases due to moisture from broken or leaking water and sewer lines, watering of lawns and shrubbery, and modifications of the surface that produce ponding.

4.2 Technological Hazards

Technological hazards are distinct from natural hazards primarily in that they originate from human activity. In contrast, while the risks presented by natural hazards may be increased or decreased as a result of human activity, they are not inherently human-caused. The term "technological hazards" refers to the origins of incidents that can arise from human activities, such as the manufacturing, transportation, storage, and use of hazardous materials.

4.2.1 Power Failure

Hazard Definition

A power outage is the loss of electrical supply to an area. Power failure can result from winter storms, high winds, tornadoes, severe thunderstorms, energy shortages, damage to a power line or other part of the distribution system, a short circuit, or the overloading of electricity mains. If lost entirely, a power loss is referred to as a blackout. A brownout occurs when some power is retained, but the voltage level is below the minimum level specified for the system.

A power failure can last seconds, hours, and in some extreme cases, days. Power failures are particularly hazardous during winter months when they threaten the ability to heat a home or office, directly affecting the health of its inhabitants. Extreme temperatures in summer months can be difficult to manage if power outages affect air conditioning. Transportation routes are affected when traffic signals are disrupted by power outages. Additionally, when power is restored, surges can cause fires.

Hazard Identification

Oncor Electric Delivery (Oncor) is the primary electric company for Tarrant County and most of North Texas. In July 2013, North Texas experienced a wide stream power outage. Tarrant County had more than 1,800 customers without power due to a weather event.

In August 2, 2012, approximately 5,400 customers lost power during rush hour in north Tarrant County. A damaged cable led to the outage at about 5:30 p.m., and by 7:00 p.m., only 3,600 customers were still without power.

Also on August 12, 2012, Oncor reported more than 22,000 customers without power, down from a peak around 50,000. Most were in Tarrant County. This outage caused a local college to close campus.

On July 7, 2012, homes across North Texas lost power due to downed power lines caused by heavy winds. According to Oncor, more than 5,500 customers were out of power in Tarrant County alone.

On September 13, 2011, the City of River Oaks in Tarrant County was affected by powerful storms that caused downed trees and electric lines. Oncor reported that just under 2,000 customers in Fort Worth were without power. Those numbers went down to a county-wide combined 4,700 customers without power by noon the following day.

On May 16, 2010, severe storms caused fierce winds and heavy rain and caused thousands of power outages across the Metroplex. Oncor reported that there were 18,698 customers without power, most of them in Tarrant County.

Assets Exposed to Hazard

- **Property Risk/Vulnerability.** All critical facilities are considered as having the possibility of being affected by a power outage.
- **People Risk/Vulnerability.** It was determined that risk/vulnerability includes the entire population of Tarrant County because there is no way to determine the impact/magnitude of a power outage incident and no way to predict where and when an incident will occur. Effects of power outages include the loss of heat, loss of ability to refrigerate food, accidents that occur due to reduced visibility in the dark, loss of ability to use medical devices that require electricity (such as respirators, etc.).
- **Environment Risk/Vulnerability.** Risks to the environment are low should a power outage occur.

Vulnerability

Power Failure

Frequency of Occurrence	Highly Likely
Warning Time	None-Minimal
Geographic Extent	Localized-Countywide
Potential Impact	Minor

Multijurisdictional Concerns

All of Tarrant County is vulnerable to a power failure.

Land Use and Development Trends

Tarrant County requires certain building codes to be in place to prevent fires in the case of power outages. Additionally, certain facilities are required to store backup generators and fuel. There are requirements for the placement of transmission lines, transformers, and power lines to safeguard the community from long-term power outages.

Hazard Summary

A power failure's greatest effect is disrupting the daily operations of business and government. The economic effects of a power failure affect the entire community. Preparing for power failure includes storing alternative electricity sources such as flashlights in the home and generators in office buildings.

4.2.2 Infectious Disease Outbreak

Hazard Definition

Infectious diseases are caused by organisms, typically bacteria, protozoan, fungi, or viruses that enter the body and grow there. Many of these diseases require continuous monitoring, as they

present seasonal threats to the general population. An epidemic emerges when an infectious disease occurs suddenly in numbers that are in excess of normal expectancy. Infectious disease outbreaks put a strain on the healthcare system, may cause continuity issues for local businesses, and can affect the economy when worker absences decrease overall production. These outbreak incidents are a danger to emergency responders, healthcare providers, schools, and the public. This can include influenza (e.g., H1N1), pertussis, West Nile virus, and many other diseases.

Hazard Identification

Tarrant County has had several different disease-related outbreaks in recent history. In July of this 2013, 11 cases were reported of a Cyclospora outbreak. Cyclospora infection causes watery, and sometimes explosive, diarrhea. The one-celled parasite that causes Cyclospora infection can enter the body when the individual ingests contaminated food or water. In 10 out of the 11 cases, hospitalization was necessary.

There was a 2012 West Nile Virus outbreak that is proving to be a costly disaster. Nearly half of the cases (48 percent) reported in Texas were reported in North Texas counties: 259 in Tarrant (14 percent), 396 in Dallas (21 percent), 183 in Denton (10 percent) and 64 in Collin (3 percent), according to the study. Those four counties had a combined incidence rate of 16 cases per 100,000 population. A conservative estimate of the costs of the outbreak statewide is $47 million spent in acute care and lost productivity time.

Since the beginning of 2008, Tarrant County has experienced a significant increase in number of pertussis cases. In 2008, 130 cases (8.9 cases/100,000 population) of pertussis were reported from January through July, which represents a 165.3 percent increase from 2007 and a 364.3 percent increase in pertussis cases during the corresponding time frame from 2006 to 2008. There were 28 and 49 cases of pertussis reported from January through July of 2006 and 2007.

In July 2008, clusters of laboratory-confirmed cryptosporidiosis cases and reports of gastrointestinal illness in persons who visited a lake were reported to Tarrant County Public Health. In response, epidemiologic, laboratory, and environmental health investigations were initiated. A matched case-control study determined that swallowing the lake water was associated with illness (adjusted odds ratio = 16.3; 95% confidence interval: 2.5-infinity). The environmental health investigation narrowed down the potential sources of contamination. Laboratory testing detected Cryptosporidium hominis in case-patient stool specimens and Cryptosporidium species in lake water. It was only through the joint effort that epidemiologic, laboratory, and environmental health investigators could determine that >1 human diarrheal fecal incidents in the lake likely led to contamination of the water. This same collaborative effort will be needed to develop and maintain an effective national Model Aquatic Health Code.24

Assets Exposed to Hazard

- **Property Risk/Vulnerability.** It was determined that all critical facilities as well as all public, private, and commercial properties are vulnerable to being affected by an infectious disease incident due to employees being ill and possibly being unable to maintain the facilities.
- **People Risk/Vulnerability.** It was determined that risk/vulnerability includes the entire population of Tarrant County because there is no way to determine the impact/magnitude of an infectious disease incident and no way to predict which target group(s) will be the most

[24] http://www.ncbi.nlm.nih.gov/pubmed/23210393

vulnerable to a virus or bacteria. In addition to sickness (morbidity) and death (mortality), 40 percent of the workforce could become ill.

- **Environment Risk/Vulnerability.** Risks to the environment are low should an infectious disease incident occur.

Vulnerability

Infectious Disease Outbreak

Frequency of Occurrence	Highly Likely
Warning Time	More than 12 hours
Geographic Extent	Countywide
Potential Impact	Negligible-Major

Multijurisdictional Concerns

The more densely populated the area is, the greater threat of the spread of the infectious disease because there is more contact between potentially ill individuals. Therefore, Tarrant County is at greater risk than its surrounding counterparts are due to population.

The impact of living in a more globalized world has shown itself through infectious disease. Our ability to quickly travel far distances promotes travel, specifically for business needs. As a result, disease from foreign countries that are unfamiliar to the United States can more easily be transferred here. Additionally, close encounters on mass transit systems, such as the ones in Fort Worth, Arlington, and the rest of the Metro area increase the amount of germ spread, increasing vulnerability for those jurisdictions connected to mass transit lines.

Land Use and Development Trends

There are no land use and development trends related to infectious disease outbreak.

Hazard Summary

Infectious disease outbreaks pose a threat to all of Tarrant County. Many infectious diseases do not pose a great economical threat, but there are infectious diseases (West Nile virus and influenza virus such as H1N1), that threaten to destabilize the economy by decreasing work production and increasing strain on the health system. Fortunately, Tarrant County has a robust public health system in place to quickly identify infectious disease and mitigate its existence.

4.2.3 Hazardous Materials Release

Hazard Definition

Hazardous materials (Hazmat) are substances that are harmful to the health and safety of people and property. Hazmat releases often occur along roadways, highways, and railways. Facilities that produce, process, or store hazardous materials are at risk, as are facilities that treat or dispose of hazardous waste. Tarrant County is required by the State of Texas to regulate generators of hazardous waste.

Hazard Identification

Tarrant County has experienced many hazmat releases and is likely to be impacted by them in the future. With several highways and trains carrying hazardous materials, the potential is always there for an accident. Although each jurisdiction may not experience a hazardous materials release every year, a jurisdiction in Tarrant County will experience a hazardous materials release every year, thus giving a 100% chance for a hazardous materials release in a given year in Tarrant County.

The incidents listed below do not represent all hazardous materials releases that happened in Tarrant County. They are a representative sample based on information given during the planning process.

Table 4-22
Significant Hazmat Releases in Tarrant County

Jurisdiction	Hazard Date	Location or Map Reference	Impact Description (spill/release type, area impacted, evacuation, etc.)	Fatalities	Injuries	Assets Damaged	Asset or Structure Loss	Contents Loss
Arlington	2/13/2006	1100 113th St/Avenue E East, Arlington, TX	Chemical Spill	Unknown	Unknown	Unknown	Unknown	100 Gallons
Arlington	7/17/2006	1206 W. Park Row Dr Arlington, TX	Natural Gas Leak	Unknown	Unknown	Unknown	Unknown	160000 Cubic Feet
Arlington	8/3/2006	900 N. Watson Arlington, TX	Diesel Fuel Leak	Unknown	Unknown	Unknown	Unknown	50 Gallons
Arlington	9/1/2006	1105 N. Watson Arlington, TX	Diesel Fuel Leak	Unknown	Unknown	Unknown	Unknown	100 Gallons
Arlington	12/17/2006	3300 E. Park Row Dr Arlington, TX	Refrigeration Leak	Unknown	Unknown	Unknown	Unknown	1000 lbs.
Arlington	1/25/2007	2000 E I20 Arlington, TX	Diesel Fuel Leak	Unknown	Unknown	Unknown	Unknown	100 Gallons
Arlington	2/6/2007	9226 Water Oak Dr Arlington, TX	Oil Spill	Unknown	Unknown	Unknown	Unknown	2000 Barrels
Arlington	2/9/2008	1500 N SH 360 Arlington, TX	Diesel Fuel Leak	Unknown	Unknown	Unknown	Unknown	100 Gallons
Arlington	9/29/2008	2500 E. Mayfield Rd, Arlington, TX	Gasoline Spill	Unknown	Unknown	Unknown	Unknown	7600 Gallons
Arlington	9/29/2008	2500 E. Mayfield Rd, Arlington, TX	Diesel Spill	Unknown	Unknown	Unknown	Unknown	1200 Gallons
Arlington	10/13/2009	525 113th St	Diesel Spill	Unknown	Unknown	Unknown	Unknown	75 Gallons
Arlington	2/14/2010	1001 E Abram St Arlington, TX	Oil Spill	Unknown	Unknown	Unknown	Unknown	240 Gallons
Arlington	12/16/2010	2933 E. I30 Arlington, TX	Diesel Fuel Leak	Unknown	Unknown	Unknown	Unknown	100 Gallons
Arlington	7/13/2012	1200 Gambrel Rd #104 Arlington, TX	Chemical Spill	Unknown	Unknown	Unknown	Unknown	2000 Gallons
Colleyville	6/13/2012	Mapsco 40B	Sulfuric acid was spilled	0	2	0	0	Unknown
International Airport	8/8/2010	Terminal B	Overheating Battery	0	0	0	0	Unknown
International Airport	8/26/2010	1930 W Airfield Dr	Fluid Leak	0	0	0	0	Unknown

Jurisdiction	Hazard Date	Location or Map Reference	Impact Description (spill/release type, area impacted, evacuation, etc.)	Fatalities	Injuries	Assets Damaged	Asset or Structure Loss	Contents Loss
International Airport	8/31/2010	2311 N Service Rd	Suspicious Powder	0	0	0	0	Unknown
International Airport	1/5/2011	2460 W Airfield Dr	Biohazard	0	0	0	0	Unknown
International Airport	1/18/2011	W19th & W Airfield Dr	Battery Acid Spill	0	0	0	0	Unknown
International Airport	3/24/2011	1639 W 23rd St	Radioactive Material	0	0	0	0	Unknown
International Airport	4/13/2011	Terminal C	Suspicious Powder	0	0	0	0	Unknown
International Airport	5/3/2011	1639 W 23rd St	Flammable Liquid	0	0	0	0	Unknown
International Airport	6/4/2011	Terminal E, Entry 7	Suspicious Powder	0	0	0	0	Unknown
International Airport	9/19/2011	3075 N Airfield Dr.	Flammable Liquid	0	0	0	0	Unknown
International Airport	12/19/2011	2334 N International Pkwy	Suspicious Powder	0	0	0	0	Unknown
International Airport	2/3/2012	Terminal D	Suspicious Powder	0	0	0	0	Unknown
DFW International Airport	10/18/2012	Terminal E	Suspicious Powder	0	0	0	0	Unknown
International Airport	6/20/2012	Terminal D	Suspicious Powder	0	0	0	0	Unknown
International Airport	5/1/2013	North Service Road	Flammable Liquid	0	1	0	0	Unknown
Forest Hill	4/22/2006	4400 Lon Stephenson	Natural Gas Release	1	0	0	0	0
Grapevine	10/30/1998	Grapevine	60 Gallon Diesel spill	0	0	0	0	0
Grapevine	4/30/1999	Grapevine	100 Gallon Unknown Petroleum Product Spill	0	0	0	0	0
Grapevine	7/1/1999	Grapevine	50 Gallon Diesel spill	0	0	0	0	0
Grapevine	7/15/1999	Grapevine	3,400 Gallon Fuel Oil spill	0	1	0	$20,000	$10,000
Grapevine	10/15/1999	Grapevine	Natural Gas line rupture, 100,000 cubic feet released	0	0	0	0	0
Grapevine	1/25/2000	Grapevine	20 Gallon Azatrine spill	0	0	0	$1,000	$1,000
Grapevine	4/23/2000	Grapevine	300 Gallon Gasoline spill	0	0	0	0	0
Grapevine	5/24/2000	Grapevine	Natural Gas line rupture, 20,000 cubic feet released	0	0	0	0	0
Grapevine	6/30/2000	Grapevine	100 Gallon Diesel spill	0	0	0	0	0

Jurisdiction	Hazard Date	Location or Map Reference	Impact Description (spill/release type, area impacted, evacuation, etc.)	Fatalities	Injuries	Assets Damaged	Asset or Structure Loss	Contents Loss
Grapevine	4/5/2001	Grapevine	60 Gallon Diesel spill	0	0	0	0	0
Grapevine	9/29/2001	Grapevine	2500 spill from gasoline tank	0	0	0	0	0
Grapevine	9/28/2003	Grapevine	1 Gallon Hydrochloric acid spill	0	0	0	$500	$1,000
Grapevine	3/22/2004	Grapevine	200 Gallon Diesel spill	0	0	0	$1,500	$1,500
Grapevine	7/20/2004	Grapevine	100 Gallon propane spill	0	0	0	0	0
Grapevine	6/1/2005	Grapevine	100 Gallon sodium hydroxide spill	0	0	0	$5,000	0
Grapevine	2/23/2012	Grapevine	100 Gallon Diesel spill	0	0	0	$1,000	$500
Haltom City	8/2007	4601 Old Denton	Structure fire with a material release.	0	0	Yes	$500,000	$40,000
Keller	Annual	Keller	Small gasoline spills associated with gas stations and automobile accidents	N/A	N/A	N/A	N/A	
Keller	Annual	Keller	Natural gas release due to cut lines in construction areas	N/A	N/A	N/A	N/A	

Assets Exposed to Hazard

- **Property Risk/Vulnerability.** With multiple highway system, all critical facilities have the possibility of being affected by a hazmat release.
- **People Risk/Vulnerability.** It was determined that risk/vulnerability includes the entire population of Tarrant County because there is no way to determine the impact/magnitude of a hazmat release and no way to predict where and when a hazmat release will occur. People are vulnerable to hazmat releases through effects on transportation routes, establishment of shelters, etc.
- **Environment Risk/Vulnerability.** Risks to the environment are high should a hazmat release occur. Environmental concerns would be interruption of water supply and secondary events such as fires and hazmat accidents (such as gas pipelines rupturing, rupture of hazmat containers at facilities, etc.). When hazmat releases do occur, whether inside or outside facilities or along roadways, shutdowns, lost time, and expended man-hours are all factors mitigation planners must take into account. Tarrant County Emergency Management can provide a listing of facility locations throughout Tarrant County if requested.

Vulnerability

Hazardous Materials Release

Frequency of Occurrence	Highly Likely
Warning Time	None-Minimal
Geographic Extent	Localized-Community-wide
Potential Impact	Moderate

Multijurisdictional Concerns

All of Tarrant County is vulnerable to both fixed location and transportation-related hazmat releases. The highways are most vulnerable to transportation-related release. Fixed location releases are possible in all areas of Tarrant County.

Land Use and Development Trends

Future development throughout Tarrant County will be vulnerable to potential damage of property due to hazardous materials releases because no property is immune to the effects of a hazardous materials release.

Hazard Summary

Hazmat releases are a relatively common occurrence in Tarrant County. The number of incidents experienced in the past dictates that mitigation measures be considered. The types of hazardous materials passing through Tarrant County are varied. The presence of multiple highways with an unknown quantity of hazardous materials traveling through Tarrant County on a daily basis poses a challenge in the development of adequate mitigation measures.

4.2.4 Terrorism

Hazard Definition

Terrorism is defined in the Code of Federal Regulations as, "The unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives". Many people associate terrorism with large events like the Oklahoma City Federal Building bombing of 1995 or the September 11, 2001 attacks on the World Trade Center in New York City. However, terrorism can come in the form of a school shooting or a car bomb.

Cyber-terrorism is a large threat to the United States and its local communities. The Center for Strategic and International Studies (CSIS) has defined it as the “use of computer network tools to shut down critical national infrastructures or to coerce or intimidate a government or civilian population”. The threat of cyber terror is that it can be utilized in any community, no matter the size, because of our reliance on computer programming for our most critical assets such as energy and government operations.

An “active shooter” is an individual actively engaging in killing or attempting to kill people in a confined and populated area; in most cases, active shooters use firearm(s) and there is no pattern or method to their selection of victims. Active shooter situations are unpredictable and evolve

quickly. Typically, the immediate deployment of law enforcement is required to stop the shooting and mitigate harm to victims. They have increasingly been considered an act of terror as political, religious, and other ideologies are factoring into the reasoning behind the shootings.

Hazard Identification

Due to the potential for terrorism, Tarrant County jurisdictions are part of the Dallas/Fort Worth/ Arlington Urban Area Security Initiative (UASI), which is a federally funded planning unit to prevent terrorist attacks in the top ten metropolitan statistical areas in the United States.

Tarrant County is the home to several well-known and very populated buildings such as Tarrant County Courthouse, Rangers Ballpark, Cowboys Stadium, Dallas/Fort Worth International Airport, Fort Worth Convention Center, Six Flags Theme Park, Texas Motor Speedway, Naval Air Station Fort Worth Joint Reserve Base, and several schools that include colleges and universities. Many of these venues can hold tens of thousands of people at one time making them all a target for possible terrorist attacks.

Additionally, certain industrial and governmental facilities have been identified by Tarrant County and their respective jurisdictions as terrorist targets. These include the Bureau of Engraving and Printing, Lockheed Martin, and Bell Helicopter plant.

Though Tarrant County has not had any actual terrorist attacks, they have had several bomb threats. In September 2012, a Fort Worth woman was accused of making a bomb threat to an office at the University of Phoenix campus in the City of Hurst, although no device was found on campus after a thorough search by a northeast Tarrant County explosives team. Hurst police identified the woman, who wrote a note stating there was a bomb in the building that would explode at noon the upcoming Wednesday, as the receptionist at the campus. Authorities say the suspect will be charged with making a terroristic threat.

On February 13, an Arlington woman who shut down Fort Worth freeways during NBA All-Star weekend was sentenced to 10 years in prison. The woman pleaded guilty for having pipe bombs in her vehicle. Her co-defendant was sentenced to 37 months in prison. The suspect sped away as police tried to pull her over, eventually stopping on a Loop 820 ramp and shutting down the highway for hours. The pipe bombs were safely detonated.

In February 1994, a bomb threat was called into the Tarrant County Justice Center. Jury selection for a trial was expected to start, but proceedings were interrupted when a bomb threat forced the evacuation of the Tarrant County Justice Center. The threat involved an unrelated trial of anti-abortion protesters. There was no immediate report of any bomb being found.

Terrorism is a constant threat for DFW International Airport. In the past few years, police and Transportation Security Administration officials have dealt with more than 35 suspicious bag or object calls in and around the airport. This results in disruption to the traffic attempting to access the airport, slows security processes for travelers, and may impact flight schedules.

Assets Exposed to Hazard

- **Property Risk/Vulnerability.** All assets within Tarrant County are vulnerable to being affected by a terrorist incident. Specifically, the large event spaces and urban environment make Tarrant County infrastructure targets.

- **People Risk/Vulnerability.** In evaluating vulnerability of the population in Tarrant County, it was determined that risk/vulnerability includes the entire population of Tarrant County because there is no way to determine the impact/magnitude of a terrorist incident and no way to predict where and when a terrorist incident will occur. People are vulnerable to terrorist events through physical injury or disease, power outages, effects on transportation routes, establishment of shelters, effect of incident on mental state of the public, confidence of public in law enforcement support, contamination of the food supply, etc.
- **Environment Risk/Vulnerability.** Risks to the environment are high should a terrorist incident occur but the frequency of terrorist events in Tarrant County are low. Environmental concerns would be interruption or contamination of water or food supplies, secondary events such as fires and hazmat accidents (such as gas pipelines rupturing, rupture of hazmat containers at facilities, etc.).

Vulnerability

Terrorism

Frequency of Occurrence	Unlikely
Warning Time	None-Minimal
Geographic Extent	Community-wide
Potential Impact	Negligible-Major

Multijurisdictional Concerns

All of the County is vulnerable to terrorist events, and therefore should be included in any prospective mitigation projects.

Land Use and Development Trends

Future development throughout Tarrant County will take into consideration possible terrorist incidents; particularly if new facilities are built that could be potential terrorist targets.

Hazard Summary

The incidents described above demonstrate the need to take terrorism seriously in Tarrant County. Tarrant County officials work with state and federal officials on domestic preparedness efforts, the details of which go beyond the scope of this plan. The community should always remain vigilant to the threat of an attack, whether it is via explosives, agriculture, or a cyber-attack.

4.2.5 Dam Failure

Hazard Definition

A dam failure may occur for multiple reasons such as an overtopping caused by floods that exceed the capacity of the dam, deliberate acts of sabotage, structural failure, movement of the foundation supporting the dam, soil erosion in embankment dams, and inadequate maintenance and upkeep. The Texas Department of Natural Resources follows the dam hazard classifications of the U.S. Army Corps of Engineers. They are classified as follows:

- **High** - Any loss of life or serious hazard or damage to health, main highways, high-value industrial or commercial properties, major public utilities, or serious direct or indirect economic loss to the public.
- **Significant** - Possible health hazard or probable loss of high-value property; damage to secondary highways, railroads, or other public utilities; or limited direct or indirect economic loss to the public other than that described in Class III.
- **Low** - Property losses restricted mainly to rural buildings and local county and town roads, which are an essential part of the rural transportation system serving the area involved.

Hazard Identification

The jurisdictions in which dam failure is a threat include Arlington, Crowley, Dallas Fort Worth International Airport, Fort Worth, Grapevine, Haltom City, Hurst, Keller, North Richland Hills, Richland Hills, Tarrant County, Watauga, and Westlake. Dam failure is not a threat to Azle, Bedford, Blue Mound, Colleyville, Euless, Forest Hill, Haslet, Kennedale, Lake Worth, Lakeside, North Texas Council of Governments, Saginaw, Southlake, and Westworth Village.

Tarrant County does not have any recorded dam or levee failures. However, major dam or levee failures have occurred in the Texas, including 35 dam failures in Texas in the past 10 years. In the past, 10 dams collapsed near Woodville and 2 dams have failed in the Nueces River watershed.

A major dam failure happened in 1900 near Austin, Texas (Travis County) known as the McDonald Dam (aka “The Great Granite Dam”). The destruction of the dam drained the Lake McDonald reservoir and left the City of Austin without electrical power for a number of months. The failure also killed several dozen people.

The Dam at Nix Club Lake in Rusk County near Henderson, Texas failed On March 29, 1988. The cause of the dam failure was water over flowed the dam wall. One man drowned when he drove down a road that had been flooded when water backed up against a railroad trestle after the failure.

On September 27, 1997, 10 dams, including the Charmaine, Galahad, Tristan, Urland dams near Woodville, Texas (Tyler County), failed due to an excess amount of rain in a short amount of time.

The Callaway Dam and the McGuire Dam near Hearne, Texas (Robertson County) failed on May 13, 2004. McGuire Dam is located downstream of Callaway Dam. It was overtopped by at least 3 feet before failure and the Callaway Dam was overtopped by about 1.5 feet before it failed.

On January 1, 2008, the Pure Oil (aka Rhine) Lake Dam failed in Van Zandt County in east Texas. County roads were closed and it was reported that the dam failed due to both the age and climate.

Kaufman County residents were put on alert for a levee failure on December 8, 2009. Residents of Combine, 20 miles southeast of Dallas, were warned that the Trinity River levee was in danger of failure, an event that could lead to the possibility of a "life-threatening situation." It was recommended that residents make evacuation plans. The Bois D'Arc Island Levee was built in 1918, but necessary repairs have been lacking. Residential and commercial structures on the Triple R Ranch, Dawson Road, and Harlan Road were at risk when the levee **b**reached. Flood conditions could have lasted for up to two weeks.

Below is a list of dams located in Tarrant County and the identified affected participating jurisdictions that require an emergency action plan (EAP). Only dams that have been identified as being at a hazard rating of high or significant are required to have an EAP. Smaller dams or ones

that do not require an EAP exist in Tarrant County and the identified affected participating jurisdictions as well but do not pose the hazard that these do.

Table 4-23
Tarrant County Dams

Location	Dam Name	Longitude	Latitude	River or Creek	Owner	Maximum Storage	Hazard Level
ALEDO	LOST CREEK GOLF CLUB DAM	-97.525706	32.715433	TR-SOUTH MARYS CREEK	SOMERSET LOST CREEK GOLF LTD	8	Significant
ARLINGTON	LAKE ARLINGTON DAM	-97.194032	32.718357	VILLAGE CREEK	CITY OF ARLINGTON	130000	High
ARLINGTON	ARLINGTON SOUTHWEST NATURE PRESERVE DAM	-97.221121	32.661562	VILLAGE CREEK	CITY OF ARLINGTON	69.1	High
ARLINGTON	ALAN SAXE POND	-97.163902	32.635927	TR-RUSH CREEK	CITY OF ARLINGTON	3.09	High
BISBEE	EAST BALANCING RESERVOIR DAM	-97.205277	32.619965	OFF CH-TR-VILLAGE CREEK	TARRANT REGIONAL WATER DISTRICT	488	High
BISBEE	WEST BALANCING RESERVOIR DAM	-97.208157	32.619961	OFF CH-TR-VILLAGE CREEK	TARRANT REGIONAL WATER DISTRICT	568	High
CARROLLTON	GRAPEVINE LAKE	-97.050003	32.966671	DENTON CREEK	CESWF	788000	High
COULD NOT BE DETERMINED	TIMBERLAKE PHASE 5	-97.1625	32.929167	TR-BIG BEAR CREEK	TIMBER LAKE RESIDENTIAL ASSOCIATION INC	37	Significant
CROWLEY	DEER CREEK ESTATES DAM	-97.355802	32.558972	TR-DEER CREEK	ALTON ISBELL	126	High
DALLAS FORT WORTH INTERNATIONAL AIRPORT	TRIGG LAKE DAM	97.044283W	32.853392 N	BEAR CREEK	DALLAS FORT WORTH INTERNATIONAL AIRPORT	45	High
FORT WORTH	EAGLE MOUNTAIN DAM	#VALUE!	32.8739	WEST FORK TRINITY RIVER	TARRANT REGIONAL WATER DISTRICT	680335	High
FORT WORTH	LAKE WORTH DAM	-97.415045	32.791127	WEST FORK TRINITY RIVER	CITY OF FORT WORTH	116000	High
FORT WORTH	LAKE COMO DAM	-97.398171	32.726777	TR-CLEAR FORK	CITY OF FORT WORTH	327	High

Location	Dam Name	Longitude	Latitude	River or Creek	Owner	Maximum Storage	Hazard Level
				TRINITY RIVER			
FORT WORTH	BENBROOK LAKE	-97.449997	32.650002	CLEAR FORK OF TRINITY RIVER	CESWF	410000	High
FORT WORTH	LUTHER LAKE DAM	-97.426872	32.71222	TR-CLEAR FORK TRINITY RIVER	CITY OF FORT WORTH	295	High
FORT WORTH	MARINE CREEK DAM	-97.392795	32.824122	MARINE CREEK	TARRANT REGIONAL WATER DISTRICT	16491	High
FORT WORTH	WHITE LAKE DAM	-97.256171	32.765375	TR-WEST FORK TRINITY RIVER	CITY OF FORT WORTH	294	High
FORT WORTH	WILLOW CREEK LAKE DAM	-97.389711	32.686695	WILLOW CREEK	CITY OF FORT WORTH	76	High
FORT WORTH	CEMENT CREEK DAM	-97.368087	32.829137	CEMENT CREEK	TARRANT REGIONAL WATER DISTRICT	4200	High
FORT WORTH	EDEN LAKE DAM	-97.097113	32.864315	TR-LITTLE BEAR CREEK		68	High
FORT WORTH	BAL LAKE DAM	-97.430637	32.707033	UN TR-TRINITY RIVER	JEARL WALKER	31.128	High
FORT WORTH	ECHO LAKE DAM	-97.313687	32.698002	TR-SYCAMORE CREEK	TARRANT COUNTY	780	High
FORT WORTH	RIDGLEA COUNTRY CLUB ESTATES DAM	-97.431853	32.696082	TR-MARYS CREEK	MIKE WILLIAMS ET AL	22.8	High
FORT WORTH	FOSDIC LAKE DAM	-97.259485	32.756112	TR-WEST FORK TRINITY RIVER	CITY OF FORT WORTH	55	Significant
FORT WORTH	FRENCH LAKE DAM	-97.387637	32.639397	FRENCH LAKE CREEK	CITY OF FORT WORTH	67.4	Significant
FORT WORTH	GLEN GARDEN GOLF AND COUNTRY CLUB DAM	-97.289235	32.701381	TR-SYCAMORE CREEK	GLEN GARDEN GOLF & COUNTRY CLUB	29	Significant
FORT WORTH	RIVERBEND WEST LEVEE	-97.231352	32.779875	WEST FORK	TARRANT REGIONAL	350	Significant

Location	Dam Name	Longitude	Latitude	River or Creek	Owner	Maximum Storage	Hazard Level
				TRINITY RIVER	WATER DISTRICT		
FORT WORTH	GREENBRIAR DAM	-97.335008	32.669308		CITY OF FORT WORTH	11	Significant
GRAPEVINE	DFW391 DAM	-97.099541	32.927572	TR-BIG BEAR CREEK	DALLAS FORT WORTH INTERNATIONAL AIRPORT BOARD		High
HALTOM CITY	KNAPP LAKE DAM	-97.264236	32.837317	TR-BIG FOSSIL CREEK	TEXAS DEPARTMENT OF TRANSPORTATION	154	High
HURST	CHISHOLM PARK LAKE DAM	-97.172389	32.856578		CITY OF HURST	40.1	High
IRVING	TRIGG LAKE DAM	-97.044118	32.853317	TR-BEAR CREEK	DALLAS FORT WORTH INTERNATIONAL AIRPORT BOARD	1803	Significant
KELLER	MCPHERSON RANCH DAM	-97.279998	32.9622	TRI-HARRIET CREEK	MCPERSON RANCH OWNERS ASSOCIATION	44	High
NORTH RICHLAND HILLS	MEADOWS LAKES WEST LAKE DAM	-97.251372	32.832691	TR - BIG FOSSIL CREEK	MEADOW LAKES COMMUNITY IMPROVEMENT ASSOCIATION	26	High
PANTEGO	WOODLAND WEST LAKE DAM	-97.16004	32.73137	TR-RUSH CREEK	WOODLAND WEST LAKE ASSOC	69	Significant
RICHLAND HILLS	MEADOWS LAKES EAST LAKE DAM	-97.247767	32.833216	TR-BIG FOSSIL CREEK	RICHMOND RAY DEVELOPMENT	129	High
WATAUGA	CAPP SMITH PARK RETENTION LAKE DAM	-97.258768	32.875518	BUNKER HILL CREEK	CITY OF WATAUGA	287	High
WESTLAKE	FIDELITY NORTH LAKE DAM	-97.190734	32.984642	TR-MARSHALL BRANCH	FMR TEXAS LIMITED PARTNERSHIP	81	High
WESTLAKE	LAKE MB3 DAM	-97.216413	32.98627	TR-MARSHALL BRANCH	HILLWOOD PROPERTIES CORP	15	High
WESTLAKE	LAKE MB 3A DAM	-97.214466	32.983907	TR-MARSHALL BRANCH	HILLWOOD PROPERTIES CORP	66	High
WESTLAKE	PD3 1 EAST LAKE DAM 1	-97.189842	32.964417	KIRKWOOD BRANCH	THE VAQUERO CLUB INC	100.2	High

Location	Dam Name	Longitude	Latitude	River or Creek	Owner	Maximum Storage	Hazard Level
WESTLAKE	FIDELITY SOUTH LAKE DAM	-97.1935	32.981869	TR-MARSHALL BRANETT	FMR TEXAS LIMITED PARTNERSHIP;FMR TEXAS LINITED PARTNERSHIP	58.3	High

The extent of dam failure in the planning area has not yet been determined as a result of a lack of data regarding inundation levels. In the case of dams with a maximum storage capacity of 100,000 acre-feet or more, all census blocks within five miles are considered to be at risk to potential dam failure hazards. Those located within three miles of a dam with a maximum storage capacity of 10,000 to 100,000 acre-feet are at risk. Dams with a maximum storage capacity of less than 10,000 acre-feet are a potential threat to those within 1 mile of the dam. The participating jurisdictions in which dams are located, including Arlington, Crowley, Dallas Fort Worth International Airport, Fort Worth, Grapevine, Haltom City, Hurst, Keller, North Richland Hills, Richland Hills, Tarrant County, Watauga, and Westlake, have identified dam inundation studies as a mitigation action for high hazard dams in their jurisdiction.

Assets Exposed to Hazard

- **Property Risk/Vulnerability.** It was determined that critical facilities as well as public, private, and commercial properties are vulnerable to being affected by a dam failure if they are located in the inundation area.
- **People Risk/Vulnerability.** It was determined that risk/vulnerability includes the population of Tarrant County that is located in the dam failure inundation area. People are vulnerable to the effects of dam failure through power outages, effects on transportation routes, establishment of shelters, flooding, etc.
- **Environment Risk/Vulnerability.** Risks to the environment are high should a dam failure occur, but the frequency of dam failures in Tarrant County is low. Environmental concerns would be interruption of water supply, water contamination, and loss of properties.

The risk and vulnerability to dam failure for each participating jurisdiction identified as being at risk is detailed below. It should be noted that the North Central Texas Council of Governments (NCTCOG) is an association of local governments that works to assist in planning and coordination efforts of 16 counties in North Central Texas. It is a government authority but does not hold or own any land or property, nor does it have any constituents. Therefore, there is minimal vulnerability to the NCTCOG.

Vulnerability to Dam Failure	
City of Arlington	
Critical Asset Vulnerability	Critical facilities as well as public, private, and commercial properties are vulnerable to being affected by a dam failure if they are located in the inundation area.
Vulnerable Populations	Individuals in the inundation area vulnerable to the effects of dam failure through power outages, effects on transportation routes, establishment of shelters, flooding, etc.
Environmental Vulnerability	Environmental issues that might arise as a result of a dam failure include interruption of water supply, water contamination, and damage to properties.
City of Crowley	
Critical Asset Vulnerability	Critical facilities as well as public, private, and commercial properties are vulnerable to being affected by a dam failure if they are located in the inundation area.
Vulnerable Populations	Individuals in the inundation area vulnerable to the effects of dam failure through power outages, effects on transportation routes, establishment of shelters, flooding, etc.
Environmental Vulnerability	Environmental issues that might arise as a result of a dam failure include interruption of water supply, water contamination, and damage to properties.
Dallas Fort Worth International Airport	
Critical Asset Vulnerability	Critical facilities as well as public, private, and commercial properties are vulnerable to being affected by a dam failure if they are located in the inundation area.
Vulnerable Populations	Individuals in the inundation area vulnerable to the effects of dam failure through power outages, effects on transportation routes, establishment of shelters, flooding, etc.
Environmental Vulnerability	Environmental issues that might arise as a result of a dam failure include interruption of water supply, water contamination, and damage to properties.
City of Fort Worth	
Critical Asset Vulnerability	Critical facilities as well as public, private, and commercial properties are vulnerable to being affected by a dam failure if they are located in the inundation area.
Vulnerable Populations	Individuals in the inundation area vulnerable to the effects of dam failure through power outages, effects on transportation routes, establishment of shelters, flooding, etc.
Environmental Vulnerability	Environmental issues that might arise as a result of a dam failure include interruption of water supply, water contamination, and damage to properties.
City of Grapevine	
Critical Asset Vulnerability	Critical facilities as well as public, private, and commercial properties are vulnerable to being affected by a dam failure if they are located in the inundation area.
Vulnerable Populations	Individuals in the inundation area vulnerable to the effects of dam failure through power outages, effects on transportation routes, establishment of shelters, flooding, etc.
Environmental Vulnerability	Environmental issues that might arise as a result of a dam failure include interruption of water supply, water contamination, and damage to properties.
City of Haltom City	
Critical Asset Vulnerability	Critical facilities as well as public, private, and commercial properties are vulnerable to being affected by a dam failure if they are located in the inundation area.
Vulnerable Populations	Individuals in the inundation area vulnerable to the effects of dam failure through power outages, effects on transportation routes, establishment of shelters, flooding, etc.
Environmental Vulnerability	Environmental issues that might arise as a result of a dam failure include interruption of water supply, water contamination, and damage to properties.
City of Hurst	
Critical Asset Vulnerability	Critical facilities as well as public, private, and commercial properties are vulnerable to being affected by a dam failure if they are located in the inundation area.
Vulnerable Populations	Individuals in the inundation area vulnerable to the effects of dam failure through power outages, effects on transportation routes, establishment of shelters, flooding, etc.

Vulnerability to Dam Failure	
Environmental Vulnerability	Environmental issues that might arise as a result of a dam failure include interruption of water supply, water contamination, and damage to properties.
City of Keller	
Critical Asset Vulnerability	Critical facilities as well as public, private, and commercial properties are vulnerable to being affected by a dam failure if they are located in the inundation area.
Vulnerable Populations	Individuals in the inundation area vulnerable to the effects of dam failure through power outages, effects on transportation routes, establishment of shelters, flooding, etc.
Environmental Vulnerability	Environmental issues that might arise as a result of a dam failure include interruption of water supply, water contamination, and damage to properties.
City of North Richland Hills	
Critical Asset Vulnerability	Critical facilities as well as public, private, and commercial properties are vulnerable to being affected by a dam failure if they are located in the inundation area.
Vulnerable Populations	Individuals in the inundation area vulnerable to the effects of dam failure through power outages, effects on transportation routes, establishment of shelters, flooding, etc.
Environmental Vulnerability	Environmental issues that might arise as a result of a dam failure include interruption of water supply, water contamination, and damage to properties.
City of Richland Hills	
Critical Asset Vulnerability	Critical facilities as well as public, private, and commercial properties are vulnerable to being affected by a dam failure if they are located in the inundation area.
Vulnerable Populations	Individuals in the inundation area vulnerable to the effects of dam failure through power outages, effects on transportation routes, establishment of shelters, flooding, etc.
Environmental Vulnerability	Environmental issues that might arise as a result of a dam failure include interruption of water supply, water contamination, and damage to properties.
Tarrant County	
Critical Asset Vulnerability	Critical facilities as well as public, private, and commercial properties are vulnerable to being affected by a dam failure if they are located in the inundation area.
Vulnerable Populations	Individuals in the inundation area vulnerable to the effects of dam failure through power outages, effects on transportation routes, establishment of shelters, flooding, etc.
Environmental Vulnerability	Environmental issues that might arise as a result of a dam failure include interruption of water supply, water contamination, and damage to properties.
City of Watauga	
Critical Asset Vulnerability	Critical facilities as well as public, private, and commercial properties are vulnerable to being affected by a dam failure if they are located in the inundation area.
Vulnerable Populations	Individuals in the inundation area vulnerable to the effects of dam failure through power outages, effects on transportation routes, establishment of shelters, flooding, etc.
Environmental Vulnerability	Environmental issues that might arise as a result of a dam failure include interruption of water supply, water contamination, and damage to properties.
City of Westlake	
Critical Asset Vulnerability	Critical facilities as well as public, private, and commercial properties are vulnerable to being affected by a dam failure if they are located in the inundation area.
Vulnerable Populations	Individuals in the inundation area vulnerable to the effects of dam failure through power outages, effects on transportation routes, establishment of shelters, flooding, etc.
Environmental Vulnerability	Environmental issues that might arise as a result of a dam failure include interruption of water supply, water contamination, and damage to properties.

Vulnerability

Dam Failure

Frequency of Occurrence	Unlikely
Warning Time	3-6 hours
Geographic Extent	Community-wide
Potential Impact	Major

Multijurisdictional Concerns

Areas located below and around the aforementioned dams are vulnerable to flooding and therefore should be included in any prospective mitigation projects. The jurisdictions in which dam failure is a threat include Arlington, Crowley, Dallas Fort Worth International Airport, Fort Worth, Grapevine, Haltom City, Hurst, Keller, North Richland Hills, Richland Hills, Tarrant County, Watauga, and Westlake. Dam failure is not a threat to Azle, Bedford, Blue Mound, Colleyville, Dallas Fort Worth International Airport, Euless, Forest Hill, Haslet,, Kennedale, Lake Worth, Lakeside, North Central Texas Council of Governments, Saginaw, Southlake, and Westworth Village. The probability of dam failure occurring in the future is unlikely based on previous data.

Land Use and Development Trends

In accordance with Title 30 Texas Administrative Code (TAC) Chapter 299, Dams and Reservoirs, §299.61(b), owners of significant and high hazard dams were required to submit an Emergency Action Plan, which may be a draft version, to the executive director for review by January 1, 2011. If you have any questions about the preparation and submittal of Emergency Action Plans (EAPs), please contact the Texas Commission on Environmental Quality, Dam Safety Section at (512) 239-0326 for assistance.

The Guidelines for Developing Emergency Action Plans for Dams in Texas publication was revised in March 2012. The revised publication includes updates to the notification flowchart, EAP templates, inundation map guidance, and a glossary of dam safety terms.

Hazard Summary

Although Tarrant County has not experienced a dam failure, the possibility is always present. All dams should consistently be monitored for structural integrity. Towns and cities where dams are located should incorporate preparing and responding to a dam failure in their emergency management program. The potential damage caused by a dam failure is major; therefore, even though the probability of occurrence is unlikely, mitigation actions should always be considered to prevent a dam failure incident.

4.3 Vulnerability of Critical Facilities

Requirement 44 CFR 201.6(c) (2) (ii)(A)(B)

The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area. (B) An estimate of the potential dollar losses to vulnerable structures identified in … this section and a description of the methodology used to prepare the estimate.

The Tarrant County LMAPC conducted a review of all critical infrastructures in Tarrant County. Critical infrastructure is a term used to describe assets that are essential for the functioning of Tarrant County and its jurisdictions. This includes but is not limited to those facilities that provide electricity, natural gas, oil products, telecommunications, potable water, public health, transportation systems, emergency response, and schools.

Tarrant County and its participating jurisdictions go to great lengths to ensure their critical facilities are protected from hazards. Plans have been developed to help prevent terrorist incidents from affecting facilities and infrastructure. Security measures are in place to protect critical facilities from infiltration. Mitigation measures are in place to reduce the impacts of flooding and high winds. However, all assets are vulnerable to being affected by natural or technological hazards.

The Tarrant County LMAPC lists the critical facilities and infrastructure owned by both the County and participating jurisdictions in Appendix G. In addition to providing the location, type of facility, and value of the property, this list also identifies if the critical facility is located in a hazard area.

Section 5
MITIGATION STRATEGIES

44 CFR Requirement	
§201.6(c)(3)	The plan shall include the following: 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.
§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.
§201.6(c)(3)(ii)	The hazard 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. All plans approved by FEMA after October 1, 2008, must also address the jurisdiction's participation in the NFIP, and continued compliance with NFIP requirements, as appropriate.
§201.6(c)(3)(iii)	The hazard mitigation strategy shall include an action plan, describing how the action identified in paragraph (c)(3)(ii) of this section 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.
§201.6(c)(3)(iv)	For multijurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.
§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 improvements, when appropriate.

The foundation of the Tarrant County Local Mitigation Action Plan (LMAP) is the identification of strategies through which Tarrant County will implement hazard mitigation goals, objectives, and actions. For each identified hazard, goals and objectives are provided as part of the mitigation strategy. Mitigation actions for the participating cities and towns within Tarrant County are incorporated into Tarrant County's goals, objectives, and actions. Individual jurisdictions adopt specific goals and strategies based on the needs of the jurisdiction.

The following mitigation goals, objectives, and action items have been ranked by the Tarrant County Local Mitigation Action Planning Committee (LMAPC) and participating jurisdictions. The Committee went through a ranking process to determine which strategies they would prioritize

for completion. Each participating jurisdiction, including Tarrant County, recommended strategies that would benefit either the jurisdiction or the county as a whole. The jurisdictions conducted a cost benefit analysis to determine which strategies would most benefit their community.

All project cost estimations were based on agency expertise by those submitting mitigation actions as well as previous project costs. Estimated costs were those calculated to apply for grant funding. However, many projects provided have not yet undergone the official benefit costs analysis provided by FEMA. In these cases, jurisdictions derived the benefit cost per project based on a study conducted by the Multi-hazard Mitigation Council (MMC)[25]. The key findings of the report included that a dollar spent on mitigation saves society an average of $4.00, with positive benefit-cost ratios for all hazard types studied. Therefore, to reflect the benefits of future projects each estimated project was multiplied by 4 to represent the benefit of each mitigation strategy. Utilizing this information in addition to their jurisdictions' priorities, they ranked their mitigation strategies and submitted them to the LMAPC. .

Within each hazard category, the individual goals, objectives, and action items were ranked based on perceived need in the community. Therefore, the mitigation strategies below have been prioritized at both the individual jurisdiction level and the County level.

5.1 Mitigation Goals and Considerations

5.1.1 Goals that Address Multiple Hazards

Tarrant County follows an all-hazards approach to community planning. Many mitigation projects can positively influence the outcomes of multiple types of natural disasters. Mitigation goals that address multiple hazards include improving emergency communications systems, including the installation or improvement of emergency notification systems and emergency response communications systems; enhancing emergency response equipment; and providing the training and technology to ensure responders have the tools necessary to mitigate risk.

Goals that Address Multiple Hazards. The mitigation goals provided in this section are ranked as follows:

1. Enhance warning systems in Tarrant County jurisdictions to ensure timely and accurate information is disseminated in the event of an emergency.
2. Ensure communications systems allow Tarrant County jurisdiction first responders to communicate with each other and other responding agencies.
3. Evaluate whether municipal and Tarrant County emergency operations centers (EOC) are up-to-date with the latest technology required to ensure coordinated response operations.
4. Ensure that municipal and Tarrant County responders have the equipment needed for mobile response.
5. Improve Tarrant County first responder capabilities to prepare for and respond to disasters.

[25] Multihazard Mitigation Council. (2005, December) Natural Hazard Mitigation Saves: An Independent Study to Assess the Future Savings from Mitigation Activities. Retrieved August 28, 2013, from http://c.ymcdn.com/sites/www.nibs.org/resource/resmgr/MMC/hms_vol2_ch1-7.pdf

6. Update computer technology and software to provide the most coordinated, efficient response possible.
7. Conduct public education campaigns to ensure Tarrant County citizens have access to and are aware of emergency preparedness information.

Multijurisdictional Considerations. Some projects cross jurisdictional boundaries. In these cases, the coordinating agency to ensure that projects are implemented is the higher Tarrant County authority. By working through Tarrant County, jurisdictions can better understand how improvements and changes to their own systems will affect their neighbors. Mitigation strategies that address multiple hazards improve the jurisdiction's overall emergency response capabilities, thus making the County stronger as a whole.

Public Information and Awareness Strategies. Many projects identified specifically identify the need for increased public awareness. By enhancing jurisdiction websites and other communication methods, the public is not only better inF formed during an emergency but also about important planning, preparedness, and mitigation steps they can take.

5.1.2 Tornadoes and Severe Thunderstorms and High Winds

Tornadoes, severe thunderstorms, and high winds have the potential to cause high winds**,** cause numerous injuries and deaths, and cause millions of dollars in property damage in Tarrant County. There is a great need to reduce the risk to lives and property due to these hazards. Identified mitigation actions in this section include the need for providing shelters at public facilities to ensure safety during storms and upgrading critical facilities to be more wind resistant.

Tornadoes and Severe Thunderstorms and High Winds Mitigation Strategy Ranking. The mitigation goals provided in this section are ranked as followed:

1. Provide safe rooms and outdoor shelters to protect Tarrant County citizens against the effects of high winds.
2. Ensure participation in State and Federal funding programs to mitigate the effects of high winds.
3. Promote the construction of high winds-resistant facilities, including the installation of high winds-resistant windows.
4. Educate the public about the danger of high winds and effective preparedness measures.

Multijurisdictional Considerations. All of Tarrant County should be considered when developing mitigation strategies related to high wind damage caused by tornadoes or severe thunderstorms. Due to the isolated nature of these hazards, mitigation improvements made in one jurisdiction will most likely have little effect on other jurisdictions.

Public Information and Awareness Strategies. The Tarrant County public safety community is taking an all-hazards approach to community awareness programs. Thunderstorm and tornado wind events are inclusive of this all-hazards program. All jurisdictions recommend having NOAA weather radios in public buildings, critical infrastructure, major businesses, nursing homes, and day care centers as a public information strategy. All jurisdictions participate in tornado drills as an exercise each year.

5.1.3 Flooding

Flooding may occur in Tarrant County as the result of multiple hazards identified in Section 4. Overland and riverine flooding resulting from extensive rains from severe thunderstorms, hurricanes and tropical storms, and dam or levee failure can all cause flooding. The impacts of flooding in Tarrant County have been extensive and cost billions of dollars in damage. Through the National Flood Insurance Program (NFIP) and in coordination with other Federal programs, Tarrant County attempts to mitigate the costly effects of flooding. Mitigation activities identified include identifying and mitigating repetitive loss properties, ensuring that all communities within Tarrant County are current participants of the NFIP program, upgrading or replacing stormwater or wastewater infrastructure that is ill-equipped to handle large amounts of water, and ensuring rescue equipment is available when floodwaters overwhelm Tarrant County jurisdictions.

Flooding Mitigation Strategy Ranking: The mitigation goals provided in this section are ranked as follows:

1. Ensure the continued participation of Tarrant County and its jurisdictions in the NFIP and the continual review and update of flood insurance rate maps.
2. Reduce jurisdictional vulnerability to flooding by removing repetitive loss properties from identified flood zones.
3. Institute mitigation projects that reduce vulnerability to flooding through the construction or improvement of Tarrant County critical infrastructure or facilities.

Multijurisdictional Considerations. Flooding events have affected all areas of Tarrant County. All of the cities and townships in Tarrant County participate in flood mitigation activities. Tarrant County is part of the NFIP. Tarrant County and the participating cities plan to continue participate in the NFIP by developing and implementing public awareness campaigns, identifying additional critical infrastructure in floodplains, promoting storm water management plans and/or activities, and continuing to update flood maps for all of Tarrant County.

Public Information and Awareness Strategies. The Tarrant County Hazard Mitigation Action Planning Committee has identified public awareness campaigns to ensure that the citizens of Tarrant County are informed of the hazards affecting them and the mitigation efforts taking place to mitigate flooding situations.

5.1.4 Power Failure

Power outages are one of the most likely technological hazards to occur in Tarrant County. They may happen for a variety of reasons, including severe weather, accidents, or extreme temperatures. Mitigation activities against power failure remain the same, regardless of the cause. Mitigation activities in Tarrant County include a review of alternate power sources at critical facilities.

Power Failure Mitigation Strategy Ranking. The mitigation goals provided in this section are ranked as followed:

1. Evaluate Tarrant County, NCTCOG, and jurisdiction critical facilities to ensure alternate power sources are available in the event of a power failure.
2. Develop a public education/preparedness campaign designed towards educating citizens and business community to develop emergency plans in the event of long term power outage.

Multijurisdictional Considerations. All jurisdictions in Tarrant County can experience a power failure. The importance of having alternate power sources in critical facilities cannot be understated. All multijurisdictional considerations should be made to ensure critical facilities are functional during power failure.

Public Information and Awareness Strategies. The Tarrant County Hazard Mitigation Planning Committee has identified public awareness campaigns to ensure that the citizens of Tarrant County are kept abreast of the hazards affecting them and the mitigation efforts to alleviate potential situations.

5.1.5 Hail

Hail is one of the costliest disasters in Tarrant County. The impacts of hail include facility damage to roofs and windows, vehicle damage, and personal injury. As a result of these impacts, hail is a significant threat that must be mitigated to avoid the loss of property and its costly nature. Mitigation strategies against hail include educating the public about its impacts and enforcing hail-resistant construction practices.

Hail Mitigation Strategy Ranking: The mitigation goals provided in this section are ranked as followed:

1. Ensure Tarrant County and jurisdiction facilities institute hail-resistant construction practices.
2. Educate Tarrant County citizens regarding the danger hail poses and how to mitigate its effects.

Multijurisdictional Considerations. Hail, like severe thunderstorms, is a threat for every jurisdiction in Tarrant County. Critical facilities that are exposed in these jurisdictions must be hardened against hail by re-enforcing windows, roof construction, and ensuring critical vehicles are in covered parking spots.

Public Information and Awareness Strategies. Multiple strategies for ensuring public information needs regarding hail have been identified. This includes ensuring the appropriate print material is available, distributing information at community events, and disseminating information via internet and social media resources.

5.1.6 Wildfires

All of Tarrant County is vulnerable to the effects of wildfires, either through the direct threat of fire or the impacts of smoke from neighboring wildfires. Certain areas of Tarrant County, especially those that are near the grass fields of Dallas Fort Worth International Airport, are more vulnerable to wildfires than others. The main areas where mitigation projects are needed for wildfire conditions include expanding and enhancing fire department response capabilities, enhancing wildfire equipment, and increasing the public awareness about wildfires.

Wildfires Mitigation Strategy Ranking. The mitigation goals have been ranked in the following order:

1. Review and implement construction practices and systems at Tarrant County and participating jurisdiction facilities to reduce the impact of wildfires.
2. Increase planning efforts related to wildfires by enacting and enforcing wildfire resistant ordinances and ensuring response plans are in place.

3. Ensure Tarrant County and its participating jurisdictions are Firewise Communities and the public is aware of wildfire risks in their communities.

Multijurisdictional Considerations. Dallas Fort Worth International Airport and its surrounding jurisdictions are most vulnerable to wildfires, and therefore should coordinate wildfire mitigation actions. Planning that occurs at Dallas Fort Worth International Airport and its surrounding communities should be coordinated.

Public Information and Awareness Strategies. The Tarrant County Hazard Mitigation Action Planning Committee has identified and implemented public awareness campaigns to ensure that the citizens of Tarrant County are kept abreast of the hazards affecting them and the mitigation efforts to reduce the effects of potential wildfire situations. These include ordinances for the enforcement of outdoor burning bans.

5.1.7 Winter Storms

Tarrant County does not experience severe winter storms frequently, but they do experience winter weather every year. High winds, cold temperatures, and ice storms affect the area, impacting traffic flow and creating dangerous conditions for Tarrant County citizens. Ensuring the required de-icing equipment and chemicals are available and educating the public about winter storm preparedness are essential mitigation strategies.

Winter Storm Mitigation Strategy Ranking. The mitigation goals have been ranked in the following order:

1. Ensure Tarrant County and jurisdiction public works departments have adequate equipment and programs in place for winter weather operations.
2. Educate the public about the dangers of winter storms and effective preparedness measures.

Multijurisdictional Considerations. Winter storms have affected all areas of Tarrant County. All of the cities in Tarrant County should participate in winter storm mitigation and preparedness activities.

Public Information and Awareness Strategies. The Tarrant County Hazard Mitigation Planning Committee has identified and implemented many public awareness campaigns to ensure that the citizens of Tarrant County are kept abreast of the hazards affecting them and the mitigation efforts to reduce the severity of winter storm situations.

5.1.8 Dam Failure

There are 64 dams in Tarrant County and its participating jurisdictions. Although the likelihood of them failing is small, it is a possibility that must be planned for. The implications of dam failure include flooding, structural damage, population displacement, and critical infrastructure damage. Mitigation strategies to decrease the impact of such issues include reviewing the structural stability of each dam, completing emergency action plans for high hazard dams, and ensuring the population in each inundation zone is prepared.

Dam Failure Mitigation Strategy Ranking. The following goal has been identified for dam failure

1. Reduce jurisdiction vulnerability to flooding by evaluating the structure of Tarrant County dams, reviewing and updating emergency action plans, and educating the public about dam safety and preparedness.

Multijurisdictional Considerations. Only certain participating jurisdictions are threatened by dams and therefore only certain jurisdictions must mitigate against them. .

Public Information and Awareness Strategies. The Tarrant County Hazard Mitigation Planning Committee and participating jurisdictions have identified and implemented many public awareness campaigns to ensure that the citizens of Tarrant County are kept abreast of the hazards affecting them and the mitigation efforts to reduce the severity of dam failure.

5.1.9 Infectious Disease Outbreak

Infectious disease incidents are identified as a hazard in Tarrant County. Infectious diseases are considered a threat to all residents and emergency response personnel in Tarrant County. The identified mitigation strategies for infectious disease response include ensuring that responders are trained and equipped to effectively and efficiently respond to the incident and working in partnership with residents in Tarrant County to plan an effective response strategy to infectious disease incidents.

Infectious Disease Outbreak Mitigation Strategy Ranking. The mitigation goals provided in this section are ranked as followed:

1. Enhance community surveillance and detection in the event of a biological disease outbreak/pandemic incident.
2. Increase medical countermeasure readiness (mass prophylaxis) in the event of a biological disease outbreak/pandemic incident in Tarrant County.
3. Prepare and plan non-pharmaceutical interventions in the event of a biological disease outbreak/pandemic incident in Tarrant County.
4. Educate the public about the dangers of infectious disease outbreaks and effective preparedness measures.

Multijurisdictional Considerations. Infectious disease incidents have occurred throughout Tarrant County. All jurisdictions are vulnerable to the impacts of infectious disease outbreaks.

Public Information and Awareness Strategies. The Tarrant County Hazard Mitigation Planning Committee has identified public awareness campaigns to ensure that the citizens of Tarrant County are kept abreast of current information.

5.1.10 Drought

Tarrant County's climate and an expanding population base create a unique situation regarding drought. Participating jurisdictions are grappling with how to address increasingly arid conditions while increasing water supply to their growing populations. Drought mitigation strategies aim to address these issues through planning and the construction of additional water supply systems.

Tarrant County and its participating jurisdictions consider drought mitigation a priority. Drought has increasingly impacted Tarrant County jurisdictions, causing water restrictions and impacting

critical infrastructure. Unfortunately, the science of estimating drought-related costs is currently undeveloped, and therefore it takes years to estimate the amount of damage by dollars that drought causes in the United States. The prioritization of these mitigation strategies is based on cost, and based on this undeveloped process of estimating costs, drought is fairly low on this list. However, the Tarrant County Hazard Mitigation Planning Committee believes that drought will increasingly be the costliest disaster for their communities and the following mitigation strategies reflect this priority.

Drought Mitigation Strategy Ranking: The mitigation goals provided in this section are ranked as followed:

1. Implement water conservation legislation and contingency plans to mitigate the effects of drought.
2. Mitigate the effects of drought by implementing water conservation practices with critical infrastructure.
3. Educate the public about water conservation techniques and their role in mitigating the effects of drought.

Multijurisdictional Considerations. Coordinating efforts when mitigating drought is of the utmost importance in Tarrant County. The City of Fort Worth uses surface water from six sources. The West Fork system includes Lake Bridgeport, Eagle Mountain Lake, and Lake Worth. The East Texas reservoirs are Cedar Creek and Richland-Chambers. Benbrook Lake is another water source. The City of Fort Worth owns Lake Worth, and Benbrook Lake is the responsibility of the U. S. Army Corps of Engineers. The other four lakes are owned and operated by Tarrant Regional Water District (TRWD); therefore, TRWD is responsible for providing a significant water supply to the City of Fort Worth. The City of Fort Worth buys the raw water from TRWD and treats it, then distributes it to Fort Worth citizens plus a long list of customer cities. TRWD is responsible for securing new water sources for Fort Worth and its other customers in Tarrant County. Current water resources are projected to meet projected growth through the year 2030. The City of Arlington also purchases raw water from TRWD, treats it, then distributes to Arlington residents in addition to a couple other cities. The City of Arlington gets the majority of its water from Cedar Creek and Richland-Chambers Reservoir. The Trinity River Authority pumps raw water from Lake Joe Pool up to its Tarrant Water Plant, treats it, then it gets distributed to several cities in the mid-cities region. (Hurst, Euless, Bedford). A few cities in Tarrant County use groundwater either partly or for their entire supply, but it is a drop in the bucket compared to the reservoir sources.

Public Information and Awareness Strategies. Ensuring the public has access to information is crucial during period of drought. Informing citizens of water restrictions is one of the key ways to mitigate the effects of drought.

5.1.11 Terrorism

Mitigating against terrorism requires advanced surveillance technology, coordinated law enforcement operations, and public vigilance. Terrorist threats come in multiple forms, including bomb threats and active shooter incidents. To mitigate these threats, Tarrant County jurisdictions have identified projects that provide for better surveillance, enhanced response field technology, and public education.

Terrorism Mitigation Strategy Ranking. The mitigation goals provided in this section are ranked as followed:

1. Ensure Tarrant County first responders have all equipment necessary to respond to terror incidents.
2. Ensure an ongoing training, exercise, and planning program is in place to mitigate the effects of terrorism.
3. Develop a standard operating procedure and provide training to Richland Hills officers in the event of an active shooter incident.
4. Implement systems to ensure the public is educated about the effects of terrorism and is ever vigilant.

Multijurisdictional Considerations. All jurisdictions in Tarrant County can experience an act of terrorism. Critical infrastructure and entertainment venues in Fort Worth and Arlington have an increased likelihood of terrorism due to the urban nature and large crowds that frequent them. Additional security procedures are taken to ensure the safety of its citizens.

Public Information and Awareness Strategies. The Tarrant County Hazard Mitigation Planning Committee has identified public awareness campaigns to ensure that the citizens of Tarrant County are kept abreast of the hazards affecting them and the mitigation efforts to alleviate potential situations. Public vigilance is of the utmost importance to ensure that public safety officials have the information needed to stop terrorist attacks.

5.1.12 Lightning

Mitigating against lightning primarily involves ensuring that lightning strikes do not cause fires. Although it is difficult to prevent every occurrence, the installation of lightning rods on buildings and homes assists in the attempt. Additionally, public information ensures that people are educated about lightning safety, such as staying away from trees during severe thunderstorm and lightning storms. The jurisdictions participating in the Tarrant County Local Mitigation Action Plan submitted mitigation strategies that include installing lightning rods on critical infrastructure and conducting public education campaigns about lightning safety.

Lightning Mitigation Strategy Ranking. The mitigation goals provided in this section are ranked as followed:

1. Mitigate lightning risk to critical infrastructure and facilities.
2. Educate the public about effective preparedness measures to mitigate the effects of lightning.

Multijurisdictional Considerations. All of Tarrant County should be considered when developing mitigation strategies related to lightning. Thunderstorms with associated lightning have caused significant damage in all areas of Tarrant County.

Public Information and Awareness Strategies. The Tarrant County public safety community is taking an all hazards approach to community awareness programs. Lightning events are included in this all hazards program.

5.1.13 Hazardous Materials Release

A hazardous materials release is identified as a technological hazard in the Tarrant County community. Historical trends suggest that there will be multiple hazardous material incidents in Tarrant County during any given year. This includes both fixed facility and transportation-related incidents. The identified mitigation strategies for hazardous materials include ensuring that first responders are trained and equipped to effectively and efficiently respond to the incident and to work in partnership with industry to plan an effective response strategy to hazardous materials incidents.

Hazardous Materials Release Mitigation Strategy Ranking. The mitigation goals provided in this section are ranked as followed:

1. Ensure Tarrant County response personnel have the equipment and training necessary to respond to hazardous materials incidents.
2. Educate the public about the dangers of hazardous material releases and effective preparedness measures.
3. Identify shelters to be used in the event of a hazardous materials release evacuation in the Tarrant County.
4. Develop a plan for alternative access/egress from areas potentially impacted by railroad incidents in Tarrant County.
5. Incorporate Tier II software into Grapevine information technology systems.

Multijurisdictional Considerations. Hazardous materials releases may occur due to a transportation accident or due to an incident at a factory or facility that manufactures, uses, or stores hazardous materials. Each jurisdiction is responsible for identifying areas and facilities most vulnerable to hazardous materials releases. Many jurisdictions within Tarrant County have trained first responders in hazardous materials response and also have the appropriate equipment. Those jurisdictions that do not have the needed training and equipment rely on mutual aid agreements with other jurisdictions for coordinated response.

Public Information and Awareness Strategies. The Tarrant County Hazard Mitigation Planning Committee has identified public awareness campaigns to ensure that the citizens of Tarrant County are kept abreast of the hazards affecting them and the mitigation efforts to alleviate potential situations.

5.1.14 Extreme Temperatures

Extreme temperatures are a concern for Tarrant County and participating jurisdictions, specifically for vulnerable populations such as those with serious medical conditions and the elderly. Mitigation strategies for extreme heat include comprehensive planning and public education.

Extreme Temperatures Mitigation Strategy Ranking. The mitigation goals provided in this section are ranked as followed:

1. Develop and implement extreme heat or extreme cold response plans for Tarrant County and its jurisdictions.

2. Educate the public about the dangers of extreme heat and cold and effective preparedness measures.

Multijurisdictional Considerations. All jurisdictions are equally affected by extreme heat.

Public Information and Awareness Strategies. The Tarrant County Hazard Mitigation Planning Committee has identified public awareness campaigns to ensure that the citizens of Tarrant County are kept abreast of the hazards affecting them and the mitigation efforts to alleviate potential situations.

5.1.15 Expansive Soils

Expansive soils poise a risk to both critical facilities and the homes and businesses of Tarrant County citizens. Expansive soils cause foundations to shift, cracking foundations and causing buildings to sink into the ground. Public education is essential to ensuring that contractors account for the event impacts of expansive soils when building new developments.

Extreme Heat Mitigation Strategy Ranking. The mitigation goals provided in this section are ranked as followed:

1. Mitigate expansive soils by educating the public about and enforcing building codes that aim to reduce their effects.

Multijurisdictional Considerations. All jurisdictions are equally affected by expansive soils.

Public Information and Awareness Strategies. The Tarrant County Hazard Mitigation Planning Committee has identified public awareness campaigns to ensure that the citizens of Tarrant County are kept abreast of the hazards affecting them and the mitigation efforts to alleviate potential situations.

5.2 City of Arlington Mitigation Strategy

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
Multiple Hazards (MH) - 1	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires	Continue to test the emergency warning system in the City of Arlington regularly and upgrade equipment as appropriate.	Perform a sound reflective study on the emergency siren system. Upgrade and expand the siren system.	Within 2 years	Emergency Management	$100,000 for the sound reflective study plus $300,000 for 12 to 15 additional sirens (including installation)		General Funds, Grants
			Develop a program to distribute weather radios at a reduced rate.	3-4 years	Emergency Management			General Funds, Grants
MH - 4	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding	Mitigate damage to existing structures as a result of natural hazards using cost effective approaches in the City of Arlington.	Provide awnings as a cover for emergency response vehicles located outside.	5 or more years	Public Safety			TBD
Flooding (F) - 7	Flooding	Educate the public regarding the natural hazards present	Continue to promote public education/hazard mitigation programs, including:	Currently implementing	Office of Emergency Management, Public Works and Transportation/Citywide	$10,000	$40,000	General Fund, Grants

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
		in the City of Arlington.	• flood insurance (NFIP) • flood hazard information • potential mitigation measures • "KnoWhat2Do" campaign • other information related to flood hazard					
Severe Thunderstorms (ST) - 3, Tornadoes (T) - 3	Severe Thunderstorms and High Winds, Tornadoes	Enact and enforce City of Arlington ordinances to minimize the impact of natural threats to people or property.	Review, update, and enforce City ordinances, as appropriate, to address wind damage.	3-4 years	Community Development and Planning, Building Inspection, Code Compliance			General Fund, Grants
F - 1	Flooding	Maximize flood insurance coverage of property owners as a mitigation measure in the City of Arlington.	Continue to implement programs and take action to improve the City's Community Rating System (CRS) rating, including opportunities to reduce flood insurance premiums through NFIP activities.	3 or more years	Public Works and Transportation Department			To be determined, Grants

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
F - 2	Flooding	Continue to reduce repetitive flooding losses in the City of Arlington.	Identify the most appropriate mitigation measure, structural or non-structural, for each repetitive flood loss structure. Establish a priority system that ranks each repetitive loss structure in order of priority for mitigation activity. Address each structure in the order in which it was ranked.	Within 2 years	Public Works and Transportation Department	$6,000,000 (assuming $75,000 per structure and 80 known structures)	$24,000,000	HMGP, storm water utility fees for the 25% match, grants
Dam Failure (DF) - 4	Dam Failure	Protect critical facilities and services in the City of Arlington from flooding.	Undertake a comprehensive facility review of Lake Arlington Dam and implement recommend improvements.	3-4 years	Public Works and Transportation Department	Approximately $10,000	$40,000	TBD
			Address infrastructure in developing/updating roadways.	3-4 years	Public Works and Transportation Department	Unknown		TBD
F - 5	Flooding	Incorporate hazard mitigation in long-range planning and development in the City of Arlington.	Develop, review, update and enforce City ordinances to address activities that impact flooding, including: • runoff associated with construction projects, • wet-flood proofing in existing commercial structures, and	3-4 years	Public Works and Transportation Department			General Fund, Grants

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			• compensation for partial rights, such as an easement, to prevent property from being developed contrary to a community's plan to maintain open spaces.					
Terrorism (TR) - 2	Terrorism	Train first responders to locate suspicious devices in the City of Arlington.	Train officers who locate suspicious devices.	Complete	Arlington Police Department	-	-	General Funds
TR - 2	Terrorism	Preserve crime scene integrity in the City of Arlington.	Train all officers on importance of scene management for further criminal investigation.	Complete	Arlington Police Department	-	-	General Funds
TR - 3	Terrorism	Train on suspicious activity reporting in the City of Arlington.	Establish suspicious activity reporting procedures.	Complete	Arlington Police Department	-	-	General Funds

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
Lightning (L) - 1	Lightning	Prioritize hazard mitigation projects to best utilize available City of Arlington and non-City funding.	Install lightning rods on existing and future communication infrastructure and other critical facilities, including City Hall, the elevated storage tanks, Emergency Management Operations Facility (Public Safety Building), fueling facilities for City vehicles, fire stations, police stations, power facilities, and the water treatment plants. The lightning rods will provide additional protection against damage to these facilities if struck by lightning.	3-4 years	Emergency Management			Enterprise Funds, Grants
Extreme Temperatures (ET) - 1	Extreme Temperatures	Ensure City of Arlington has the ability to open cooling centers.	Open cooling centers and provide public information.	6 months - ongoing	Arlington Office of Emergency Management	$10,000	Increased public safety	General Fund and Grants (EMPG and UASI)

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ET - 1	Extreme Temperatures	Identify extreme heat mitigation plans for critical infrastructure in City of Arlington.	Develop extreme heat mitigation program to ensure essential functions continue in the event of high temperatures.	1 year	Arlington Office of Emergency Management	$20,000	Increased public safety	General Fund and Grants (EMPG and UASI)
ET - 2	Extreme Temperatures	Develop an extreme heat outreach program for City of Arlington citizens.	Develop an extreme heat outreach program that provides tips and pertinent information for ensuring the health and safety of citizens during extreme heat.	1 year-ongoing	Public Information Office; Office of Emergency Management	$30,000	Increased public knowledge of various forms of assistance; increased public health and safety	General Fund
ET - 2	Extreme Temperatures	Distribute extreme heat information to City of Arlington citizens.	Provide extreme heat information to Arlington citizens through a social media campaign.	6 month-ongoing	Public Information Office; Fire Department	$15,000	Increased public knowledge of various forms of assistance; increased public health and safety	General Fund
			Provide extreme heat information through the Arlington website.	6 month-ongoing	Public Information Office; Fire Department	$15,000	Increased public knowledge of various forms of assistance; increased public health and safety	General Fund

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
T - 1	Tornado	Support the construction of safe rooms in the City of Arlington	Promote the safe room rebate program to increase number of participates in the City of Arlington	Annually	OEM	$50,000	$180,000	City General Fund, HMGP,
F - 3	Flooding	Conduct drainage improvements to Little Creek Court location in Arlington	Promote the safe room rebate program to increase number of participates in the City of Arlington	Annually	OEM	$50,000	$180,000	City General Fund, HMGP,
Hail (H) - 2	Hail	Provide educational materials on the hazards associated with hail to the citizens of Arlington.	Research existing public information material on hail available.	6 months	OEM	$1,000	$3,000,000	DHS Funds, City General Funds
			Provide public education materials to public.	1 year	OEM	$800	$4,000,000	DHS Funds, City General Funds
			Promote the safe room rebate program to increase number of participants in the City of Arlington.	Annually	OEM	$50,000	$180,000	City General Fund, HMGP,
L - 2	Lightning	Enhance current public education program in the City of Arlington to include information on surge protectors, lightning rods, safe rooms, safety tips, “Knowhat2Do” campaign and other elements.	Conduct public education campaign on the hazards associated with lighting hazards and protective measures.	1 years	OEM	$800	$1,000,000	DHS Funds, City General Funds

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
Winter Storms (WS) - 2	Winter Storms	Provide education materials to Arlington citizens on the hazards of winter storms and effective mitigation activities.	Conduct public education campaign on mitigating the hazards associated with winter storms.	6 months	OEM	$5,000	$80,000	City General Funds, EMPG, DHS
Drought (D) - 2	Drought	Continue to update and implement the City of Arlington water conservation and drought contingency plans.	In 2015, AWU will install 9,000 meters and MIU's through an ongoing meter replacement program and water line renewals.	2 years	Water Department	$5, 289,000	$12,000,000	City General and Capitol Project Funds
			Create Water Conservation Specialist/Leak Detection Position.	6 months	Water Department	$98,000	$1,000,000	City General Funds
			Create a comprehensive water conservation program.	1 year	Water Department	$100,000	$20,000,000	City General Funds
Wildfire (W) - 2	Wildfire	Protect the City of Arlington critical facilities and vulnerable populations from the effects of wildfire incidents.	Ordinances will be followed to maintain minimum distances from fuels.	Continuously	Community Development and Planning, Building Inspection and Code Compliance	$150,000	$500,000	City General Funds
Wildfire (W) - 3	Wildfire	Increase public awareness of mitigating activities to prevent and	Increase distribution of public information about wildfires.	6 months	OEM/ Fire Department	$25,000	$80,000	City General Fund; DHS; EMPG

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
		safeguard property from wildfires.						
ET - 2	Extreme Temperatures	Improve extreme heat public education distribution in the City of Arlington.	Use multiple modes of communication to distribute extreme heat information to the public.	6 months	OEM	$500	$100,000	DHS and City General Funds
Expansive Soils (ES) - 1	Expansive Soils	Mitigate against expansive soil in the City of Arlington.	Continue to research and incorporate subgrade stabilization methods on street projects such as street reclamation and repairs.	On-going	Public Works and Transportation	$4,000,000	$100,000,000	Streets Maintenance Fund
			Distribute broadly homeowner information brochures on the do's and don'ts of maintaining constant moisture around residential foundations.	1 year	OEM	$800.00	$120,000	DHS Funds

5.3 City of Azle Mitigation Strategy

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
MH - 1	Winter Storms, High Winds, Tornadoes, Severe Storms, & Power Failure	Enhance warning systems to help warn	Implement OWS upgrades to address potential areas where growth	Project will be implemente d as	Fire Department	$10,000	The impact of warning our population of the	General Fund

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
		the citizens of Azle, concerning the potential of tornadic activity.	has and will occur that may impact the ability of the system to reach its intended service area.	developmen t occurs.			impending Tornado is difficult to measure with the impact to life and property. This number could be in the millions of dollars.	
MH - 5	Winter Storms, High Winds, Tornadoes, Severe Storms, Flooding & Power Failure.	Add a full time emergency manager/GI S specialist.	Our emergency management program is managed by a part time administrator and the fire chief. In an effort to dedicate 40 hours of staff time per week we will need to hire an emergency manager that can commit 100% of their time to preparedness and response.	1 year	Fire Department	$90,000	As our community grows so does our need to prepare for and respond effectively to emergency situations. There is a tremendous benefit to having staff that is experienced and able to effectively prepare for and guide our organization through a wide variety of emergency situations.	General Fund

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
MH - 5	Winter Storms, High Winds, Tornadoes, Severe Storms & Power Failure	Conduct annual ICS and NIMS refresher training for all city employees.	Initial training in ICS and NIMS training is beneficial only if we continue to educate our personnel. It is important to ensure that everyone in the city maintains competency in their specific area of responsibility during an emergency.	1 year	Fire Department	$30,000	The benefit of this program is hard to predict since the size and type of incidents that we will have are hard to predict. This program will enhance our effectiveness with any incident that we should be called to respond.	General Fund
MH - 5	Tornado, Flooding, Wildfire & Infectious disease	Provide damage assessment training to all emergency responders within the police and fire department.	Annually train our police and fire personnel on how to accurately assess the effects that our community is exposed to after a large event.	1 year	Fire Department	$30,000	The main benefit with this program will come through effectiveness in our response, accurate damage reporting and timely assessments.	General Fund
MH - 5	Winter Storms, High Winds, Tornadoes, Severe Storms, Flooding, & Power Failure	Review current monthly inspection of emergency power	Task the emergency manager with evaluating our past maintenance and testing program for	6 mos.	EM	$15,000	The benefit of having power during an emergency cannot be quantified in	

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
		generators & implement changes as needed.	all of our emergency power generators.				a dollar value. The benefit will be clear when we are able to properly utilize the generators during an emergency.	
MH - 3	Winter Storms, High Winds, Tornadoes, Severe Storms, Power Failure, & Flooding	Evaluate all critical facilities within the city and ensure that they have proper back up operating power.	Ensure that all critical facilities i.e. water department, EOC, Fire, Police and administration maintain the ability to operate during a power failure. This action item includes the procurement and installation of new generators for critical facilities.	2-5 year project.	Fire Department	$200,000	800000	General Fund
W-2	Wildfire	Protect the City of Azle critical facilities and vulnerable populations from the effects of wildfire incidents.	Implement defensive space practices and enforce ordinances to maintain minimum distances from fuels.	Continuously	Community Development and Planning, Building Inspection and Code Compliance	$150,000	$500,000	City General Funds
W - 3	Wildfire	Implement FIREWISE community program.	Coordinate with TFS, our city and community to establish a	3 years	Fire Department	$50,000	The primary benefit will come in the form of life	General Fund/Grants

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			FIREWISE community program. This program will assist us with preplanning for a fire, during and after.				and property conservation	
IDO - 2	Infectious Disease Outbreak	Train first responders in POD procedures.	Establish and train our responders on the proper distribution of medical supplies/medications during an emergency.	1 year	Fire Department	$20,000	The benefit is not able to be quantified. However, the benefit of being prepared to provide medications or medical supplies to our community will be extremely valuable.	General Fund/Grants
IDO - 3	Infectious Disease Outbreak	Implement continuity of operation procedures for essential personnel during a long term employee shortage.	Establish specific procedures for dealing with long term employee absence due to infectious disease within our city. The program will address essential functions that need to continue during a pandemic.	2 years	Fire Department	$25,000	Our responders will benefit by getting to actually perform the POD exercise after their training.	General Fund/Grants
IDO - 2	Infectious Disease Outbreak	Conduct a POD	Conduct a multi-agency,	1 year	Fire Department	$50,000	Our responders	General Fund/Grants

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
		exercise every other year	multijurisdictional exercise with our area responders specific to POD.				will benefit by getting to actually perform the POD exercise after their training.	
IDO - 4	Infectious Disease Outbreak	Develop a public information campaign to educate the city of Azle public about infectious disease.	This effort would be to better inform our population of actions they can take to better prepare and ultimately survive the effects of a pandemic.	1 year	Fire Department	$50,000	Difficult to predict but will be aimed at saving lives.	General Fund/Grants
D - 3	Drought	Educate our public about water conservation and the cities policies.	Use of PSAs to educate our public about water conservation. Specific communication about our current status and ways to prevent wasting water.	1 year	EM	$50,000	The impact is difficult to measure.	General Fund/Grants
D - 1	Drought	Develop contingency plans in the city that address potential impacts of drought.	Three specific areas will need contingency plans. #1 power and drinking water plan, #2 Suppression plan and #3 Medical plan.	3-5 year project.	EM	$600,000	The impact of these three programs cannot be quantified but they need to be addressed if we are going to be successful in being	General Fund or bond issuance.

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
							prepared under drought conditions.	
TR - 1	Terrorism	Train all hazardous material technicians on response to CBRNE incidents	Send two Hazmat Technicians per year to a CBRNE specialty class. The purpose is to increase their knowledge base on these specific incidents.	10 years	Fire Department	$80,000	We will see a significant impact to our preparedness for CBRNE incidents. Funding is aimed at back fill and the program tuition will be covered under a grant.	General Fund/Grants
TR - 1	Terrorism/Hazardous Materials	Protect Azle utilities from terrorism.	Hire a 3rd party contractor to conduct a risk assessment of all city infrastructure and property, including water distribution system. The goal is to identify and recommend protective measures.	5-8 year	EM	$400,000	We will benefit by raising the level of preparedness of our organization as it relates to terrorism.	General Fund/Grants
TR - 4	Terrorism/Hazardous Materials	Increase our citizen and school districts awareness of	Design and develop a brief 4 hour training and awareness program to administer at the ISD's and to the	1-5 years	EM	$90,000	This will benefit our community by preparing them to take protective	General Fund/Grants

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
		hazardous materials & CBRNE incidents through the use of public training sessions.	public. The focus is on what to do in the event of a hazardous materials or CBRNE emergency.				measures during a hazardous materials or CBRNE event.	
TR - 1	Terrorism/Hazardous Materials	Train first responders hazardous materials mitigation.	Train three firefighters per year to the hazardous materials technician level.	continuing	Fire Department	$100,000	Benefit our community as well as our neighboring communities providing us with the ability to mitigate hazardous materials emergencies.	General Fund/Grants
H-2	Hail, Flooding	Provide educational materials on the hazards associated with hail and flooding to the citizens of Azle.	Research existing public information material on hail and flooding available. Provide public education materials to public.	6 months 1 year	OEM OEM	$1,000 $800	$3,000,000 $4,000,000	DHS Funds, City General Funds DHS Funds, City General Funds
H-2	Hail	Mitigate damage to existing structures as a result of hail using cost effective	Provide awnings as a cover for emergency response vehicles located outside.	5 or more years	Public Safety			TBD

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
		approaches in the City of Azle.						
L-2	Lightning	Enhance current public education program in the City of Azle to include information on surge protectors, lightning rods, safe rooms, safety tips, "Knowhat2Do" campaign and other elements.	Conduct public education campaign on the hazards associated with lighting hazards and protective measures.	1 year	OEM	$800	$1,000,000	DHS Funds, City General Funds
L-2	Lightning	Prioritize hazard mitigation projects to best utilize available City of Azle and non-City funding.	Install lightning rods on existing and future communication infrastructure and other critical facilities, including City Hall, the elevated storage tanks, Emergency Management Operations Facility (Public Safety Building), fueling facilities for City	3-4 years	Emergency Management			Enterprise Funds, Grants

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			vehicles, fire stations, police stations, power facilities, and the water treatment plants. The lightning rods will provide additional protection against damage to these facilities if struck by lightning.					
ET - 1	Extreme Temperatures	Identify extreme heat mitigation plans for critical infrastructure in City of Azle.	Develop extreme heat mitigation program, to ensure essential functions continue in the event of high temperatures.	1 year	OEM	$20,000	Increased public safety	General Fund and Grants (EMPG and UASI)
ET - 2	Extreme Temperatures	Develop an extreme heat outreach program for City of Arlington citizens.	Develop an extreme heat outreach program that provides tips and pertinent information for ensuring the health and safety of citizens during extreme heat.	1 year-ongoing	Public Information Office; OEM	$30,000	Increased public knowledge of various forms of assistance; increased public health and safety	General Fund
ES - 1	Expansive soils	Annually monitor expansive soil insurance claims.	The purpose of this item is to track and monitor the impact that expansive soils has on our residents and	long term 1-10 years	Building Official	$25,000	Our community will benefit by identifying past expansive	Grant

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			businesses. This information will be used to implement mitigation efforts in the future.				soil claims and enacting new prevention measures.	
ES - 1	Expansive Soils	Increase citizen awareness in regards to expansive soils.	Develop a PSA addressing expansive soils in our area. This can be given in the form of a mailer, PSA or town hall type meeting.	3-5 years as funding is available.	Building Official	$125,000	Our community can be impacted by saving the value of our property and prevent costly repairs to structures.	General Fund/Grants
ES - 1	Expansive Soils	Mitigate against expansive soil in the City of Azle.	Continue to research and incorporate subgrade stabilization methods on street projects such as street reclamation and repairs.	Ongoing	Public Works and Transportation	$4,000,000	$100,000,000	Streets Maintenance Fund

5.4 City of Bedford Mitigation Strategy

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
MH - 1	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires	Mitigate the effects of severe weather by increasing the awareness through the ability of mass notification in the City of Bedford.	Purchase and institute a reverse notification system.	24 months	Emergency Management	$40,000/year	$50,000	Grants, General Fund, County Funds,
MH - 3	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires, Extreme Temperatures, Hazardous Materials Spills, Infectious Disease Outbreak	Improve the technology in our EOC to better serve the citizens of the City of Bedford in the event of an emergency.	Remodel EOC.	24 months	Emergency Management	$50,000	$750,000	Grants, General Fund, County Funds
ST - 1, T - 1, L - 1	Severe Thunderstorms and High winds,	Ensure outdoors spaces in the City of Bedford have adequate shelter for high-wind events such as	Evaluate current shelters in outdoor spaces in the City of Bedford.	2015	Emergency Management Office, Risk Management	$2,000	NA	Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
	Tornadoes, Lightning	severe thunderstorms or tornadoes.	Determine the size and space needs for shelters in outdoor spaces in the City of Bedford.	2015	Emergency Management Office, Risk Management	$5,000	NA	Budget
			Install outdoor storm shelters at Boys Ranch Park & Activity Center | 2801 Forest Ridge Dr., Brook Hollow Park | 600 Block of Rankin, Monterrey Park | 1000 Block of Monterrey, Central Park / Pool | 1200 Central Drive, Stormie Jones Park | 2500 Block of Brasher, Bedford Trails / Harris Ryals Park / Linear Park, Meadow Park Athletic Complex | 3200 Meadow Park, Carousel Park | 1100 Simpson Terrace	2020	Risk Management	$2,000,000	NA	None
ST - 1, T - 1	Severe Thunderstorms and High winds, Tornadoes	Ensure critical facilities in the city of Bedford have adequate safe rooms to protect against high-wind events and tornadoes.	Evaluate the current conditions of critical facilities to determine which ones, if any, need safe rooms installed.	2016	Emergency Management Office, Risk Management	45,000	NA	None
			Determine the size and space needed to shelter the population of the critical facility.	2016	Emergency Management Office	$5,000	NA	None
			Install safe rooms as needed in critical facilities.	2020	Emergency Management Office	$1,500,000	NA	None

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ST - 3, T - 3	Severe Thunderstorms and High winds, Tornadoes	Ensure the City of Bedford ordinances and building codes reflect the need for high-wind resistant windows in new developments and facilities.	Review current jurisdictional ordinances and building codes related to high winds.	Ongoing	Engineering	$5,000	NA	Budget
			Develop or update ordinances and building codes to recommend new developments or facilities are built with high-wind resistant windows as needed.	Ongoing	Building Development	$5,000	NA	Budget
ST - 3, T - 3	Severe Thunderstorms and High winds, Tornadoes	Ensure the city of Bedford critical facilities, including schools, have high-wind resistant windows in place.	Evaluate the need for high-wind resistant windows in critical facilities.	2018	Risk Management	$5,000	NA	Budget
			Install high-wind resistant windows as necessary in critical facilities, including schools.	2020	Risk Management	$1,000,000	NA	Budget
ST - 4, T - 4	Severe Thunderstorms and High winds, Tornadoes	Develop a severe thunderstorm and tornado preparedness education program for the city of Bedford citizens.	Evaluate the hazards posed by high-wind events in the city of Bedford.	2018	Engineering	$5,000	NA	Budget
			Develop a severe weather preparedness education program that provides tips and pertinent information for protecting property against high-wind damage.	Ongoing	TCEMO	$20,000	NA	Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ST - 4, T - 4	Severe Thunderstorms and High winds, Tornadoes	Distribute severe weather preparedness information to the City of Bedford citizens.	Provide severe weather preparedness information to Bedford citizens through a social media campaign, including severe thunderstorms and tornadoes.	Ongoing	Public Information Office	$5,000	NA	Budget
			Ensure the Bedford city website is updated during tornado season to educate citizens on severe weather preparedness.	Ongoing	Public Information Office	$0	NA	Budget
F - 3	Flooding	Add one 10' x 10' concrete box culvert (CBC) to the four existing CBCs along Sulphur Branch at Circle Lane in the City of Bedford.	Add one 10' x 10' CBC to the four existing CBCs along Sulphur Branch at Circle Lane. This will increase the existing conditions to 100-year flood level of protection in order to protect the traffic flow on streets as well as keep roadways open to allow for emergency vehicles and to protect public safety.	2 years	Public Works	$500,000	$2,000,000	City Budget, CIP Funds, HMGP, PDM

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
F - 3	Flooding	Add one 10' x 10' CBS (concrete box culvert) to the three existing 10' x 8' CBCs along Sulphur Branch at Bedford Road in the City of Bedford.	Add one 10' x 10' CBC to the three existing 10' x 8' CBCs. This will increase the existing conditions to 100-year flood level of protection in order to protect the traffic flow on streets, as well as keep roadways open to allow for emergency vehicles and to protect public safety.	1 year	Public Works	$1,200,000	$4,800,000	City Budget, CIP Funds, HMGP, PDM
F - 3	Flooding	Conduct structure improvements to Sulphur Branch Tributary at Shirley Way in the City of Bedford.	Conduct structure improvements to improve channel degradation caused by erosion include such actions as replacing rip-rap section with gabion basket and regarding steep slopes.	1 year	Public Works	$355,000	$1,420,000	City Budget, CIP Funds, HMGP, PDM
F - 3	Flooding	Conduct structure improvements to Sulphur Branch Tributary at Schumac Lane in the City of Bedford.	Conduct structure improvements to improve channel degradation caused by erosion include such actions as installing concrete retaining walls and reconstructing channel slopes.	1 year	Public Works	$285,000	$1,140,000	City Budget, CIP Funds, HMGP, PDM
F - 3	Flooding	Conduct structure improvements to Sulphur Branch Tributary at Donna Lane in the City of Bedford.	Conduct structure improvements to improve channel degradation caused by erosion. Include such actions as installing	1 year	Public Works	$325,000	$1,300,000	City Budget, CIP Funds, HMGP, PDM

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			concrete retaining walls and reconstructing channel slopes.					
F - 3	Flooding	Conduct structure improvements to Sulphur Branch Tributary at Briar Drive in the City of Bedford.	Conduct structure improvements to improve channel degradation caused by erosion. Include such actions as installing concrete retaining walls and reconstructing channel slopes.	1 year	Public Works	$280,000	$1,120,000	City Budget, CIP Funds, HMGP, PDM
F - 3	Flooding	Conduct structure improvements to Sulphur Branch Tributary at Brookhollow Park in the City of Bedford.	Conduct structure improvements to improve channel degradation caused by erosion. Include such actions as installing concrete retaining walls and reconstructing channel slopes.	1 year	Public Works	$500,000	$2,000,000	City Budget, CIP Funds, HMGP, PDM
PF - 1, WS - 1, ET - 1	Power Failure, Extreme Temperatures Winter Storms, Severe Thunderstorms and High Winds, Tornadoes	Ensure the City of Bedford's facilities have alternate power supply.	Identify appropriate size and type of generator for critical facilities.	Ongoing	Risk Management	$0	NA	Budget
			Purchase/order generator for critical facilities.	Ongoing	Facility Maintenance	$50,000/year	NA	Budget
			Deliver and install critical facility generators.	Ongoing	Facility Maintenance	$50,000/year	NA	Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
PF - 1	Power Failure, Winter Storms, Severe Thunderstorms and High Winds, Tornadoes	Ensure the city of Bedford's critical facilities have emergency lighting systems in place.	Evaluate emergency lighting systems in critical facilities.	Ongoing	EMO/Risk Management	NA	NA	Budget
			Install emergency lighting systems in critical facilities.	Ongoing	Facility Management	NA	NA	Budget
H - 1	Hail	Ensure the City of Bedford critical facilities have hail-resistant roofing and windows installed.	Evaluate which critical facilities need hail-resistant roofing and windows installed.	2016	Risk Management	$2,000	NA	Budget
			Install hail-resistant roofing and windows in identified critical facilities.	2018	Facility Maintenance	$2,000,000	NA	None
H - 1	Hail	Provide hail-resistant parking areas for Bedford's city vehicles.	Evaluate the need for covered parking for city vehicles to protect them against hail.	2016	Risk Management	$2,000	NA	Budget
			Install covered parking areas as needed to protect city vehicles against hail.	2018	Facility Maintenance	$500,000	NA	None
H - 2	Hail	Develop a hail preparedness education program for the City of Bedford citizens.	Evaluate the hazards posed by hail in the city.	Ongoing	EMO/Public Health	$0	NA	Budget
			Develop hail preparedness education program that provides tips and pertinent information for ensuring the protection of property against hail.	Ongoing	EMO/Public Health	$2,000	NA	Budget
H - 2	Hail	Distribute hail preparedness information to the City of Bedford citizens.	Provide hail preparedness information to citizens through a social media campaign.	Ongoing	Public Information Office	$2,000	NA	Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Provide hail preparedness information through the city website.	Ongoing	Public Information Office	$0	NA	Budget
W - 1	Wildfire	Ensure the City of Bedford's water systems are adequate for fighting wildfires.	Evaluate the city of Bedford's water system to ensure capacity for fighting wildfires.	Ongoing	Public Works / Trinity River Authority	$10,000	NA	Budget
			Install or upgrade needed equipment to ensure water systems are adequate.	Ongoing	Public Works / Trinity River Authority	Unknown	NA	Budget
W - 1	Wildfire	Mitigate wildfires by instituting landscaping practices at the City of Bedford's critical facilities.	Prevent wildfires from spreading to critical facilities by landscaping plants and brush away from buildings.	Ongoing	Code Enforcement / Parks Department	$50,000	NA	Budget
W - 2	Wildfire	Review city ordinances and laws to ensure mitigation practices are in effect in the city of Bedford.	Enact building permit process that encourages wildfire resistant construction.	Ongoing	Building & Fire Departments	$20,000	NA	Budget
W - 2	Wildfire	Ensure that adequate Bedford fire department wildfire response plans and procedures are in place.	Review current wildfire response plans and procedures.	Ongoing Regional Plan	Northeast Tarrant County Fire Departments	Unknown	NA	Budget
			Develop or update wildfire response plans and procedures.	Annually	Regional Plan	Unknown	NA	Budget
			Provide wildfire response training to fire personnel.	Annually	Texas Forestry Service	Unknown	NA	State Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
W - 3	Wildfire	Provide information to the city of Bedford citizens regarding the hazards posed by wildfires.	Develop a wildfire preparedness education program that provides tips and pertinent information for ensuring the protection of property against wildfires.	Annually	Tarrant County EMO	Unknown	NA	County Budget
W - 3	Wildfire	Determine the process for becoming a Firewise Community in the city of Bedford.	Work with the Texas Department of Emergency Management to become a Firewise Community.	Annually	State of Texas, Tarrant County EMO	Unknown	NA	State & County Budget
WS - 1	Winter Storms	Evaluate winter weather response capabilities in the City of Bedford.	Conduct an assessment of winter weather response capabilities.	Annually	State / County / City Public Works	Unknown	NA	Budgets
			Acquire equipment needed as determined by assessment.	Annually	State / County / City Public Works	Unknown	NA	Unknown
			Provide safety training to first responders on winter weather hazards.	Annually	State / County / City Public Works & Fire Department	$10,000	NA	Budget
WS - 1	Winter Storms	Evaluate winter weather planning capabilities in the City of Bedford.	Conduct an assessment of winter weather plans in place for jurisdiction public works.	Annually	City EMO / Public Works / Fire	$5,000	NA	Budget
			Develop or update winter weather preparedness plan.	2018	City EMO / Public Works / Fire	$10,000	NA	Budget
WS - 2	Winter Storms	Develop a winter weather preparedness program for Bedford citizens.	Evaluate the hazards posed by severe winter weather in the city of Bedford.	Annually	City EMO / Public Works / Fire / Police	$5,000	NA	Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Develop a winter weather preparedness education program that provides tips and pertinent information for avoiding hypothermia and icy conditions.	Annually	City EMO / Public Information Department. / TCEMO	$10,000	NA	Budget
WS - 2	Winter Storms	Distribute winter weather preparedness information to City of Bedford residents.	Provide winter weather preparedness information to Bedford citizens through a social media campaign.	Annually	Public Information Department & Emergency Management Office	$5,000	NA	Budget
			Ensure the Bedford city website is updated during winter months to educate citizens on winter weather preparedness.	Annually	Public Information Department & Emergency Management Office	$5,000	NA	Budget
IDO - 2	Infectious Disease Outbreak	Prepare City of Bedford first responders for mass prophylaxis distribution.	Train first responders in point of distribution (POD) procedures.	Ongoing	Fire/Tarrant County Public Health	$5,000	NA	Budget
			Conduct a POD exercise to test plans and procedures.	2017	Public Health/Tarrant County Public Health	$10,000	NA	None
IDO - 2	Infectious Disease Outbreak	Provide physical security at the Hurst, Euless, and Bedford (HEB) POD site while treating up to 200,000 people within a 48-hour timeframe.	Develop plans for security needs within the POD site.	Completed	HEB	-	-	HEB, FEMA, Center for Disease Control Public Health Preparedness Funds

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Calculate police personnel requirements and availability and then prepare a viable plan with schedules and assignments.	Completed	HEB	$49,000	$200,000	HEB, FEMA, Center for Disease Control Public Health Preparedness Funds
			Estimate fuel needs for police and ICS vehicles, and generators.	31-Dec-13	HEB	-	-	HEB FEMA
IDO - 2	Infectious Disease Outbreak	Coordinate the effective traffic flow leading into, out of, and within the Hurst, Euless, and Bedford POD site.	Plan for law enforcement personnel needs for traffic control.	Completed	HEB	$35,000	$140,000	HEB, FEMA
			Plan for portable, physical barrier needs (cones, barricades, etc.).	Completed	HEB	-	-	HEB, FEMA
			Determine points of ingress/egress to POD site for management purposes.	Completed	HEB	-	-	HEB, FEMA
IDO - 2	Infectious Disease Outbreak	Complete and disseminate the Hurst, Euless, and Bedford POD site to local agencies, school and hospital district, and Tarrant County officials.	Prepare and disseminate POD plan.	Completed	Bedford	-	-	-
IDO - 3	Infectious Disease Outbreak	Ensure continuity procedures are in place to prepare for a long-term employee shortage at City of Bedford facilities.	Review continuity of operations (COOP) plans and procedures for city employees and facilities.	2017	EMO/Risk Management	$0	NA	Budget
			Provide COOP training for jurisdiction employees.	2017	EMO/HR	$5,000	NA	Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
IDO - 4	Infectious Disease Outbreak	Develop a public information campaign to educate the City of Bedford public about infectious diseases.	Educate the public on pandemics, including isolation, quarantine, triage, and medical care.	6 months	Tarrant County Public Information Office	NA	NA	NA
D - 1	Drought	Review the City of Bedford's water enforcement legislation and update as necessary to mitigate the effects of drought.	Review current legislation for water conservation enforcement in the City of Bedford.	On Going	Code Enforcement	0	NA	Budget
			Develop or update water conservation enforcement legislation to ensure effective practices during periods of drought.	On Going	Code Enforcement	0	NA	Budget
D - 1	Drought	Develop contingency plans for the City of Bedford to ensure adequate power and water supply during prolonged periods of drought.	Review current contingency plans.	2015	Trinity River Authority	0	NA	Budget
			Develop or update potable water contingency plans.	2015	Public Works	$2,000,000	NA	None
			Develop or update power supply contingency plans.	2018	Public Works	$400,000	NA	None
D - 2	Drought	Upgrade water and irrigation systems to conserve water in the City of Bedford.	Upgrading irrigation systems, installing better water fixtures at critical facilities, replace aging/leak delivery systems, upgrade domestic meters.	2020	Public Works	$6,000,000	Reduce usage by 15%	None

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
D - 2	Drought	Upgrade water and irrigation systems to conserve water in the City of Bedford.	(Insert specific projects to be accomplished to mitigate drought. For example, upgrading irrigation systems, installing better water fixtures at critical facilities, etc.).	Annually	Tarrant County, All Participating Jurisdictions	$1,000	$2,000	Tarrant County, Individual Jurisdiction Budgets
D - 3	Drought	Develop a drought awareness education program for the City of Bedford citizens.	Evaluate the hazards posed by drought in the City of Bedford.	2015	Public Works & Fire & Public Health	$5,000	NA	Budget
			Develop a drought awareness education program that provides tips and pertinent information for ensuring the protection of property and the environment against drought.	2014	Public Information Office	$2,000	NA	Budget
D - 3	Drought	Distribute drought awareness information to the City of Bedford citizens.	Provide drought awareness information to the City of Bedford citizens through a social media campaign.	2015	Public Information Office	$20,000	NA	None
			Provide drought awareness information through the Bedford's city website.	2015	Information Services	$0	NA	Budget
TR - 2	Terrorism	Ensure officers provide for the safety of the public in the immediate vicinity of the	Control ingress/egress to the area.	Completed	Bedford Police	$4,500	$18,000	Bedford

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
		investigation/incident in the City of Bedford.	Evacuate area residents/businesses as necessary.	Completed	Bedford Police and Fire			Bedford
			Site security/hazard mitigation during investigation.	Completed	Bedford Police and Fire			Bedford
TR - 2	Terrorism	Provide for the safety of emergency responders in the City of Bedford during investigations.	Plan and implement site security/hazard mitigation during the investigation.	Completed	Bedford Police and Fire	$1,000	$4,000	Bedford
			Develop and utilize a call list for specialized personnel to assist in high-risk incidents/investigations involving hazardous chemicals and/or bomb-making components.	Completed	Bedford Police and Fire			Area Agencies and ATF
TR - 3	Terrorism	Provide security and traffic control for the City of Bedford annual July 4th “4-Fest” event.	Calculate police personnel requirements and availability and then prepare a viable plan with schedules and assignments.	Completed	Bedford	$8,000	$32,000	Bedford
			Determine points of ingress/egress to event site for management purposes.	Completed	Bedford	-	-	-
TR - 3	Terrorism	Provide security and traffic control for the City of Bedford annual Blues Fest event.	Calculate police personnel requirements and availability and then prepare a viable plan with schedules and assignments.	Completed	Bedford	$11,000	$44,000	Bedford

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Determine points of ingress/egress to event site for management purposes.	Completed	Bedford	-	-	-
TR - 4	Terrorism	Increase citizen domestic and international terrorism awareness, preparedness, and response in the City of Bedford for public events.	Increase public terrorism awareness through public speaking engagements.	12 months	Police	$1,000	$5,000	Town Budget
L - 1	Lightning	Protect communication infrastructure in the City of Bedford from lightning.	Evaluate the need for lightning protection on communications infrastructure in the city of Bedford.	2018	Risk Management, Engineering	$5,000	NA	None
			Install lightning rods on existing and future communication infrastructure.	2020	Facility Maintenance	$200,000	$2,000,000	None
L - 1	Lightning	Ensure the City of Bedford critical facilities are protected against lightning.	Evaluate the need for lightning protection for the city of Bedford critical facilities.	2018	Risk Management, Engineering	$5,000	NA	None
			Install lightning rods and other protective equipment on critical facilities.	2020	Facility Maintenance	$300,000	$30,000,000	None
L - 2	Lightning	Develop a lightning outreach program for the City of Bedford citizens.	Evaluate the hazards posed by lightning in the city of Bedford.	Ongoing	Emergency Management Office	$2,000	NA	Budget
			Develop a lightening outreach program for the City of Bedford citizens.	2018	Emergency Management Office, Public Health	$5,000	NA	Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
L - 2	Lightning	Distribute lightning mitigation information to the City of Bedford citizens.	Provide lightning mitigation information to Bedford citizens through a social media campaign.	On Going	Public Information Office	$10,000	NA	Budget
			Provide lightning mitigation information at outdoor spaces throughout the City of Bedford.	On Going	Public Information Office	0	NA	Budget
HM - 1	Hazardous Materials	Provide the City of Bedford fire personnel with the necessary gear to respond to hazmat releases.	Evaluate the hazmat gear currently provided by the city of Bedford Fire Department.	Ongoing	Fire	$2,000	NA	Budget
			Acquire the gear needed as identified in the evaluation.	Ongoing	Fire	$20,000	NA	Budget
HM - 1	Hazardous Materials	Ensure the City of Bedford fire department has the equipment necessary to respond to hazmat releases.	Evaluate the hazmat equipment currently owned by the city of Bedford Fire Department.	Ongoing	Fire	$2,000	NA	Budget
			Acquire the equipment needed as identified in the evaluation.	Ongoing	Fire	Ongoing	NA	Budget, Bonds
HM - 2	Hazardous Materials	Develop a hazardous materials awareness education program for the City of Bedford citizens.	Evaluate hazardous materials that are used or transported in the city of Bedford.	Ongoing	EMO	$2,000	NA	Budget
			Develop a hazardous materials awareness education program that provides tips and pertinent information for ensuring the protection of property and people	Ongoing	TCEMO, Public Health	$2,000	NA	Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			from hazardous materials.					
HM - 2	Hazardous Materials	Distribute hazardous materials awareness information to the City of Bedford citizens.	Provide hazardous materials awareness information to Bedford's citizens through a social media campaign.	Ongoing	Public Information Office	$2,000	NA	Budget
			Provide hazardous materials awareness information through the Bedford's city website.	Ongoing	Public Information Office	$0	NA	Budget
HM - 3	Hazardous Materials	Improve the evacuation of the City of Bedford citizens during a hazardous event.	Partner with the Red Cross to locate shelter locations within the city of Bedford.	Annually	TCEMO	$0	NA	Budget
			Secure agreements with the Red Cross and the school district for shelters.	Annually	TCEMO	$0	NA	Budget
ET - 1	Extreme Temperatures	Ensure the City of Bedford has an extreme heat plan in place.	Review current plans and procedures related to extreme heat.	2015	Emergency Management	$0	NA	Budget
			Develop or update extreme heat plans and ensure they provide procedures for opening cooling centers and providing public information.	2015	Emergency Management.	$2,000	NA	Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ET - 1	Extreme Temperatures	Identify extreme heat plans for critical infrastructure in the City of Bedford.	Evaluate the need for extreme heat plans for critical infrastructure to ensure essential functions continue in the event of high temperatures.	2016	EMO / Parks / PW	$2,000	NA	Budget
			Develop or update plans and procedures for critical infrastructure when high temperatures are present.	2016	EMO / Parks / PW	$2,000	NA	Budget
ET - 2	Extreme Temperatures	Develop an extreme heat preparedness education program for City of Bedford citizens.	Evaluate the hazards posed by extreme heat in the City of Bedford.	2016	EMO/Tarrant County Public Health	$0	NA	Budget
			Develop an extreme heat preparedness education program that provides tips and pertinent information for ensuring the health and safety of citizens during extreme heat.	2016	EMO/Tarrant County Public Health	$10,000	NA	Budget
ET - 2	Extreme Temperatures	Distribute extreme heat preparedness information to City of Bedford citizens.	Provide extreme heat preparedness information to the City of Bedford citizens through a social media campaign.	Ongoing	Public Information Office	$3,000	NA	Budget
			Provide extreme heat preparedness information through the Bedford's city website.	Ongoing	Public Information Office	$0	NA	Budget
ES - 1	Expansive Soils	Mitigate expansive soils in the City of Bedford.	Improve construction techniques through	Ongoing	Building Department	$5,000	N/A	Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			building code enhancements.					
			Educate construction contractors, homeowners, and business owners about mitigation techniques.	Ongoing	Building Department	$5,000	N/A	Budget

5.5 City of Blue Mound Mitigation Strategy

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
MH - 7	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Wildfires, Extreme Temperatures, Hazardous Materials Spills, Infectious Disease Outbreak	Provide hazard awareness, preparedness, and training information to citizens of Blue Mound.	Develop/maintain a web site for citizen information: shelter locations, shelter-in-place, safe room information, and links to awareness web sites.	2 years	City Hall	$1,500	$6,000	City Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ST - 1, T -1	Severe Thunderstorms and High Winds, Tornadoes	Ensure outdoors spaces in Blue Mound have adequate shelter for high-wind events such as severe thunderstorms or tornadoes.	Review current jurisdictional ordinances and building codes related to high winds.	Ongoing	Engineering	$5,000	NA	Budget
			Develop or update ordinances and building codes to recommend new developments or facilities are built with high-wind resistant windows as needed.	Ongoing	Building Development	$5,000	NA	Budget
ST - 1, T -1	Severe Thunderstorms and High Winds, Tornadoes	Ensure critical facilities in Blue Mound have adequate safe rooms to protect against high-wind events and tornadoes.	Evaluate the current conditions of critical facilities to determine which ones, if any, need safe rooms installed.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$500	Tarrant County, Individual Jurisdiction Budgets
			Determine the size and space needed to shelter the population of the critical facility.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$500	Tarrant County, Individual Jurisdiction Budgets
			Install safe rooms as needed in critical facilities.	Annually	Tarrant County, All Participating Jurisdictions	$5,000	$5,000	HMGP
ST - 3, T -3	Severe Thunderstorms and High Winds, Tornadoes	Ensure Blue Mound ordinances and building codes reflect the need for high-wind resistant windows in new developments and facilities.	Review current jurisdictional ordinances and building codes related to high winds.	Annually	Tarrant County, All Participating Jurisdictions	$5,000	$5,000	Tarrant County, Individual Jurisdiction Budgets
			Develop or update ordinances and building codes to recommend new developments or facilities are built with	Annually	Tarrant County, All Participating Jurisdictions	$5,000	$5,000	Tarrant County, Individual Jurisdiction Budgets

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			high-wind resistant windows as needed.					
ST - 3, T -3	Severe Thunderstorms and High Winds, Tornadoes	Ensure Blue Mound critical facilities, including schools, have high-wind resistant windows in place.	Evaluate the need for high-wind resistant windows in critical facilities.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$ -	Tarrant County, Individual Jurisdiction Budgets
			Install high-wind resistant windows as necessary in critical facilities, including schools.	Annually	Tarrant County, All Participating Jurisdictions	$10,000	$10,000	HMGP
ST - 4, T - 4	Severe Thunderstorms and High Winds, Tornadoes	Develop a severe thunderstorm and tornado preparedness education program for Blue Mound citizens.	Evaluate the hazards posed by high-wind events in Blue Mound.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$ -	Tarrant County, Individual Jurisdiction Budgets
			Develop a severe weather preparedness education program that provides tips and pertinent information for protecting property against high-wind damage.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$ -	Tarrant County, Individual Jurisdiction Budgets
ST - 4, T - 4	Severe Thunderstorms and High Winds, Tornadoes	Distribute severe weather preparedness information to Blue Mound citizens.	Provide severe weather preparedness information to Blue Mound citizens through a social media campaign, including severe thunderstorms and tornadoes.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$ -	Tarrant County, Individual Jurisdiction Budgets

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Ensure the Blue Mound website is updated during tornado season to educate citizens on severe weather preparedness.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$ -	Tarrant County, Individual Jurisdiction Budgets
F - 1	Flooding	Decrease flood insurance premiums in Blue Mound by participating in the Federal Emergency Management Agency's (FEMA) Community Rating System (CRS) program.	Work with city officials to become a member of the CRS program.	Annually	Tarrant County, All Participating Jurisdictions	$1,000	$5,000	Tarrant County, Individual Jurisdiction Budgets
F - 2	Flooding	Review and remove repetitive loss properties in Blue Mound.	Review repetitive loss properties and work with homeowners to remove them using FEMA funding.					Tarrant County, Individual Jurisdiction Budgets
PF - 1	Power Failure, Winter Storms, Severe Thunderstorms and High Winds, Tornadoes	Have automatic emergency power generators for both stations in the event that the main power supply is disrupted in the City of Blue Mound.	Identify appropriate size and type of generator for Police and fire station.	2 years	City Hall	$20,000	$80,000	FEMA, City Budget
H - 1	Hail	Ensure Blue Mound critical facilities have hail-resistant roofing and windows installed.	Evaluate which critical facilities need hail-resistant roofing and windows installed.	Annually	Tarrant County All Participating Jurisdictions	$ -	$5,000	Tarrant County Individual Jurisdiction Budgets
			Install hail-resistant roofing and windows in identified critical facilities.	Annually	Tarrant County All Participating Jurisdictions	$10,000	$10,000	Tarrant County Individual Jurisdiction Budgets

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
H - 1	Hail	Provide hail-resistant parking areas for Blue Mound's city vehicles.	Evaluate the need for covered parking for city vehicles to protect them against hail.	Annually	Tarrant County All Participating Jurisdictions	$ -	$5,000	Hazard Mitigation Grant Program
			Install covered parking areas as needed to protect city vehicles against hail.	Annually	Tarrant County All Participating Jurisdictions	$ -	$5,000	Hazard Mitigation Grant Program
H - 1	Hail	Develop a hail preparedness education program for Blue Mound citizens.	Evaluate the hazards posed by hail in the city.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$ -	Tarrant County, Individual Jurisdiction Budgets
			Develop hail preparedness education program that provides tips and pertinent information for ensuring the protection of property against hail.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$ -	Tarrant County, Individual Jurisdiction Budgets
H - 1	Hail	Distribute hail preparedness information to Blue Mound citizens.	Provide hail preparedness information to citizens through a social media campaign.	Annually	Tarrant County, All Participating Jurisdictions	$500	$500	Tarrant County, Individual Jurisdiction Budgets
			Provide hail preparedness information through the city website.	Annually	Tarrant County, All Participating Jurisdictions	$500	$500	Tarrant County, Individual Jurisdiction Budgets
W - 1	Wildfire	Ensure Blue Mound water systems are adequate for fighting wildfires.	Evaluate the Blue Mound water system to ensure capacity for fighting wildfires.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$ -	Tarrant County, Individual Jurisdiction Budgets

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Install or upgrade needed equipment to ensure water systems are adequate.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$ -	Tarrant County, Individual Jurisdiction Budgets
W - 1	Wildfire	Mitigate wildfires by instituting landscaping practices at Blue Mound critical facilities.	Prevent wildfires from spreading to critical facilities by landscaping plants and brush away from buildings.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$ -	Tarrant County, Individual Jurisdiction Budgets
W - 2	Wildfire	Review city ordinances and laws to ensure mitigation practices are in effect in Blue Mound.	Enact building permit process that encourages wildfire resistant construction.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$ -	Tarrant County, Individual Jurisdiction Budgets
W - 2	Wildfire	Ensure adequate Blue Mound wildfire response plans and procedures are in place.	Review current wildfire response plans and procedures.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$ -	Tarrant County, Individual Jurisdiction Budgets
W - 2	Wildfire		Develop or update wildfire response plans and procedures.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$ -	Tarrant County, Individual Jurisdiction Budgets
W - 2	Wildfire		Provide wildfire response training to fire personnel.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$ -	Tarrant County, Individual Jurisdiction Budgets
W - 3	Wildfire	Provide information to Blue Mound citizens regarding the hazards posed by wildfires.	Develop a wildfire preparedness education program that provides tips and pertinent information for ensuring the protection of	Annually	Tarrant County, All Participating Jurisdictions	$ -	$ -	Tarrant County, Individual Jurisdiction Budgets

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			property against wildfires.					
W - 3	Wildfire	Determine the process for becoming a Firewise Community in Blue Mound.	Work with the Texas Department of Emergency Management to become a Firewise Community.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$ -	Tarrant County, Individual Jurisdiction Budgets
WS - 1	Winter Storm	Evaluate winter weather response capabilities in Blue Mound.	Conduct an assessment of winter weather response capabilities.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$ -	Tarrant County, Individual Jurisdiction Budgets
			Acquire equipment needed as determined by assessment.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$ -	Tarrant County, Individual Jurisdiction Budgets
			Provide safety training to first responders on winter weather hazards.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$ -	Tarrant County, Individual Jurisdiction Budgets
WS - 1	Winter Storm	Evaluate winter weather planning capabilities in Blue Mound	Conduct an assessment of winter weather plans in place for jurisdiction public works.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$ -	Tarrant County, Individual Jurisdiction Budgets
			Develop or update winter weather preparedness plan.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$ -	Tarrant County, Individual Jurisdiction Budgets

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
WS - 2	Winter Storm	Develop a winter weather preparedness program for Blue Mound citizens.	Evaluate the hazards posed by severe winter weather in the city of Blue Mound.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$ -	Tarrant County, Individual Jurisdiction Budgets
			Develop a winter weather preparedness education program that provides tips and pertinent information for avoiding hypothermia and icy conditions.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$ -	Tarrant County, Individual Jurisdiction Budgets
WS - 2	Winter Storm	Distribute winter weather preparedness information to Blue Mound residents.	Provide winter weather preparedness information to Blue Mound citizens through a social media campaign.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$ -	Tarrant County, Individual Jurisdiction Budgets
			Ensure the Blue Mound website is updated during winter months to educate citizens on winter weather preparedness.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$ -	Tarrant County, Individual Jurisdiction Budgets
IDO - 2	Infectious Disease Outbreak	Prepare Blue Mound first responders for mass prophylaxis distribution.	Train first responders in point of distribution (POD) procedures.					Tarrant County, Individual Jurisdiction Budgets
			Conduct a POD exercise to test plans and procedures.					Tarrant County, Individual Jurisdiction Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
IDO - 3	Infectious Disease Outbreak	Ensure continuity procedures are in place to prepare for a long-term employee shortage at Blue Mound facilities.	Review continuity of operations (COOP) plans and procedures for city employees and facilities.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$ -	Tarrant County, Individual Jurisdiction Budgets
			Provide COOP training for jurisdiction employees.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$ -	Tarrant County, Individual Jurisdiction Budgets
IDO - 4	Infectious Disease Outbreak	Develop a public information campaign to educate Blue Mound public about infectious diseases.	Educate the public on pandemics, including isolation, quarantine, triage, and medical care.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$ -	Tarrant County, All Participating Jurisdiction Budgets
D - 1	Drought	Review Blue Mound's water enforcement legislation and update as necessary to mitigate the effects of drought.	Review current legislation for water conservation enforcement in Blue Mound.	Annually	Tarrant County, All Participating Jurisdictions	$2,000	$10,000	Tarrant County, Individual Jurisdiction Budgets
			Develop or update water conservation enforcement legislation to ensure effective practices during periods of drought.					
D - 1	Drought	Develop contingency plans for Blue Mound to ensure adequate power and water supply during prolonged periods of drought.	Review current contingency plans.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$ -	Tarrant County, Individual Jurisdiction Budgets
			Develop or update potable water contingency plans.	" "	" "	" "	" "	" "

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Develop or update power supply contingency plans.	“ “	“ “	“ “	“ “	“ “
D - 3	Drought	Develop a drought awareness education program for Blue Mound citizens.	Evaluate the hazards posed by drought in Blue Mound.	Annually	Tarrant County, All Participating Jurisdictions	$1,000	$5,000	Tarrant County, Individual Jurisdiction Budgets
			Develop a drought awareness education program that provides tips and pertinent information for ensuring the protection of property and the environment against drought.	Annually	Tarrant County, All Participating Jurisdictions	$1,000	$5,000	Tarrant County, Individual Jurisdiction Budgets
D - 3	Drought	Distribute drought awareness information to Blue Mound citizens.	Provide drought awareness information to Blue Mound citizens through a social media campaign.	Annually	Tarrant County, All Participating Jurisdictions	$1,000	$5,000	Tarrant County, Individual Jurisdiction Budgets
			Provide drought awareness information through the Blue Mound website.	Annually	Tarrant County, All Participating Jurisdictions	$1,000	$5,000	
L - 1	Lightning	Protect communication infrastructure in Blue Mound from lightning	Evaluate the need for lightning protection on communications infrastructure in Blue Mound.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$ -	HMGP
			Install lightning rods on existing and future communication infrastructure.	Annually	Tarrant County, All Participating Jurisdictions	$15,000	$15,000	HMGP

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
L - 1	Lightning	Ensure Blue Mound critical facilities are protected against lightning.	Evaluate the need for lightning protection for Blue Mound critical facilities.	Annually	Tarrant County, All Participating Jurisdictions	$15,000	$15,000	HMGP
			Install lightning rods and other protective equipment on critical facilities.	Annually	Tarrant County, All Participating Jurisdictions	$15,000	$15,000	HMGP
L - 2	Lightning	Develop a lightning preparedness education program for Blue Mound citizens.	Evaluate the hazards posed by lightning in Blue Mound.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$ -	Tarrant County, Individual Jurisdiction Budgets
			Develop a lightning preparedness education program that provides tips and pertinent information for protecting property against lightning damage.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$ -	Tarrant County, Individual Jurisdiction Budgets
L - 2	Lightning	Distribute lightning preparedness information to Blue Mound citizens.	Provide lightning preparedness information to Blue Mound citizens through a social media campaign.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$ -	Tarrant County, Individual Jurisdiction Budgets
			Provide lightning awareness information at outdoor spaces throughout Blue Mound.	Annually	Tarrant County, All Participating Jurisdictions	$ -	$ -	Tarrant County, Individual Jurisdiction Budgets
ET - 1	Extreme Temperatures	Ensure the Blue Mound has an extreme heat plan in place.	Review current plans and procedures related to extreme heat.	Annually	Tarrant County, All Participating Jurisdictions	$1,000	$5,000	Tarrant County, Individual

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
								Jurisdiction Budgets
			Develop or update extreme heat plans and ensure they provide procedures for opening cooling centers and providing public information.	Annually	Tarrant County, All Participating Jurisdictions	$1,000	$5,000	Tarrant County, Individual Jurisdiction Budgets
ET - 1	Extreme Temperatures	Identify extreme heat plans for critical infrastructure in Blue Mound.	Evaluate the need for extreme heat plans for critical infrastructure to ensure essential functions continue in the event of high temperatures.	Annually	Tarrant County, All Participating Jurisdictions	$1,000	$5,000	Tarrant County, Individual Jurisdiction Budgets
			Develop or update plans and procedures for critical infrastructure when high temperatures are present.	Annually	Tarrant County, All Participating Jurisdictions	$1,000	$5,000	Tarrant County, Individual Jurisdiction Budgets
ET - 2	Extreme Temperatures	Develop an extreme heat preparedness education program for Blue Mound citizens.	Evaluate the hazards posed by extreme heat in Blue Mound.	Annually	Tarrant County, All Participating Jurisdictions	$1,000	$5,000	Tarrant County, Individual Jurisdiction Budgets
			Develop an extreme heat preparedness education program that provides tips and pertinent information for ensuring the health and safety of citizens during extreme heat.	Annually	Tarrant County, All Participating Jurisdictions	$1,000	$5,000	Tarrant County, Individual Jurisdiction Budgets

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ET - 2	Extreme Temperatures	Distribute extreme heat preparedness information to Blue Mound citizens.	Provide extreme heat preparedness information to the Blue Mound citizens through a social media campaign.	Annually	Tarrant County, All Participating Jurisdictions	$1,000	$5,000	Tarrant County, Individual Jurisdiction Budgets
			Provide extreme heat preparedness information through the Blue Mound's website.	Annually	Tarrant County, All Participating Jurisdictions	$1,000	$5,000	Tarrant County, Individual Jurisdiction Budgets
ES - 1	Expansive Soils	Mitigate expansive soils in the Blue Mound.	Improve construction techniques through building code enhancements.	Annually	Tarrant County, All Participating Jurisdictions	$1,000	$5,000	Tarrant County, Individual Jurisdiction Budgets
			Educate construction contractors, homeowners, and business owners about mitigation techniques.	Annually	Tarrant County, All Participating Jurisdictions	$1,000	$5,000	Tarrant County, Individual Jurisdiction Budgets
MH - 3	Power Failure, Winter Storms, Severe Thunderstorms and High Winds, Tornadoes Extreme Temperatures	Ensure consistent power supply during outages.	Purchase and install automatic emergency power generators for critical infrastructure in the event that the main power supply is disrupted in the City of Blue Mound.	6 months	Public Works, Fire Department	$300,000	$1,200,000	Local funds, HMGP, PDM

5.6 City of Colleyville Mitigation Strategy

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
MH - 2	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires	Develop and maintain volunteer base to support and operate HAM radios for communications in the City of Colleyville EOC.	Identify the need for an amateur radio club.	4 months	Police	$1,500	$14,000	Local
			Train people to be HAM/RACES members.	4 months	Police	$1,500	$6,000	FEMA, Budget
			Upgrade radios in EOC.	4 months	Police/OEM	$2,000	$8,000	Grants, Budget
MH - 2	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires	Purchase needed communications equipment for the City of Colleyville EOC.	Purchase extra mobile radios to have on hand in the EOC.	5 months	OEM	$37,000	$148,000	Grants, City
			Purchase some earpieces for the radios to have in the EOC.	5 months	OEM	$400	$1,600	City
			Update the radio room in the EOC.	5 months	OEM	$3,000	$12,000	City, Grant
			Purchase satellite phones for the EOC.	15 months	OEM	$4,000	$16,000	Grant
MH - 6	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires, Extreme	Establish a standard business database in the City of Colleyville.	Identify software that will merge tasks between both building and fire departments.	7 months	Colleyville Building Department	$100,000	$400,000	City Budget
			Merge data previously housed in separate databases into one database.	8 months	Colleyville Fire Department, and Building Departments	$5,000	$20,000	City Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
	Temperatures, Hazardous Materials Spills, Infectious Disease Outbreak		Train end users on the proper methods to utilize new software.	9 months	Colleyville Fire Department and Building Departments	$5,000	$20,000	City Budget
MH - 6	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires, Extreme Temperatures, Hazardous Materials Spills, Infectious Disease Outbreak	Implement a multijurisdictional Automatic Vehicle Location (AVL) system for both police and fire from Colleyville, Keller, Southlake, and Westlake (NETCOM).	Survey the eight departments and ascertain need and want as well as determine the number of users needed.	7 months	North East Tarrant County Communications (NETCOM)	-	-	-
			Determine vendor for purchase.	1 year	NETCOM with a representative from all cities	-	-	-
			Purchase hardware for all jurisdictions.	16 months	NETCOM	$90,000	$360,000	Individual City Budgets
			Purchase software for dispatch center and each unit.	2 years	NETCOM	$10,000	$40,000	Individual City Budgets
MH - 7	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms,	Maintain a database for people with special needs for Colleyville emergency response.	Complete a memoranda of agreement (MOA) with Ft. Worth for the Special Needs Assistance Program (SNAP).	4 months	City Manager	$200	$800	Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
	Flooding, Dam Failure, Wildfires, Extreme Temperatures, Hazardous Materials Spills, Infectious Disease Outbreak		Educate the citizens about the program.	1 year	OEM	$1,000	$4,000	Budget
			Enter the information into the Computer Aided Dispatch (CAD) system.	1 year	NETCOM	$1,000	$4,000	Budget
PF - 1	Power Failure, Winter Storms, Severe Thunderstorms and High Winds, Tornadoes	Ensure that the City of Colleyville is able to operate when there is a loss of power to the building.	Hire a consultant to evaluate the power needs to the building.	5 months	Engineering	$700	$2,100	Grant, FEMA, City
			Purchase and install generator.	5 months	Engineering	$60,000	$240,000	Grant, FEMA, City
WS - 1	Winter Storm	Have the needed equipment to clear snow and ice from roads as a result of a winter storm in Colleyville.	Add one snow plow and one spreader to clear roads from ice and snow, to the City of Colleyville's fleet.	Feb-15	Public Works	$10,000	It is hard to place a dollar amount on opening of streets for traffic; It will enable stores to open, and emergency equipment to respond to calls.	General Fund, Grants
D - 1	Drought	Develop contingency plan to ensure that the citizens of	Create plans for alternate potable water sources.	As funding is available	Public Works	Staff time		General Fund

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
		Colleyville have access to potable water.						
D - 3	Drought	Develop a drought awareness program for the citizens of Colleyville. Research and make educational material about drought, a flyer, public service announcements, and social media. Once the education materials are made, distribute the materials to the citizens of Colleyville.	Educate the citizens of Colleyville on negative effects of drought.	As funding is available	Public Works	$2,000+staffs time		General Fund
TR - 1	Terrorism	Commission a study to evaluate additional equipment needed to protect the Citizens of Colleyville from a terror incident resulting in the use of chemical, biological, radiological, nuclear, and explosive (CBRNE) agents.	Evaluate the needs and equipment now in place at the Colleyville Police Department.	5 months	Colleyville Police and Emergency Management	-	-	In-House Resources
			Research vendors for resources identified in the evaluation and prepare request for bids.	7 months	Colleyville Police and Emergency Management	$1,000.00	$1,000.00	City Current Year Budget or Available Grant Funding
			Process bids and issue purchase orders for resources as needed.	9 months	Colleyville Police and Emergency Management	$20,000.00	$20,000.00	City Current Year Budget or Available Grant Funding

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
TR - 1	Terrorism	City of Colleyville Emergency Management and Police Department personnel will implement deployment of additional equipment.	Deploy equipment and resources.	9 months	City current year budget or available grant funding	$1,000.00	$1,000.00	City Current Year Budget or Available Grant Funding
			Train all Police Department personnel in the use of and care for new equipment.	10 months	City current year budget or available grant funding	$3,000.00	$3,000.00	City Current Year Budget or Available Grant Funding
TR - 2	Terrorism	Implement ongoing training on all new equipment in the City of Colleyville.	Provide adequate training to ensure all new officers are proficient in the use of with the new anti-terrorism equipment.	Continual	Colleyville Police Department Training Division	$1,000.00 per year	$1,000.00 per year	City Budget or FEMA Grant
			Provide adequate maintenance to insure continued use of the new anti-terrorism equipment.	Continual	Colleyville Police Department Training Division	$2,000.00 per year	$2,000.00 per year	City Budget or FEMA Grant
HM - 3	Hazardous Materials	Improve the evacuation of City of Colleyville citizens during a hazardous materials incident.	Partner with the Red Cross to locate shelter locations within the City.	5 months	OEM	$200	$800	Budget
			Secure agreements with Red Cross and the school district for shelters.	5 months	OEM	$200	$800	Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ES - 1	Expansive Soils	Develop and enforce city ordinances that will limit development on soils known to have problems with expansion in the City of Colleyville.	When new construction is initiated in the City of Colleyville the construction will adhere to current building standards.	As funding is available	Engineering	$30,000 for soil samples and mapping; other cost to be determined by personnel costs.	Having codes on building on expansive soils will reduce dollar loss from foundation problems in later years.	General Fund
ES - 1	Expansive Soils	Educate homeowners on how to care for the soil their homes are built on, in the City of Colleyville.	Use booklets free of cost to homeowners to advise them how to water their foundation.	As funding is available.	Engineering	$2,000	The amount of money spent on the education materials would be low compared to the cost of repairing foundations.	General Fund and Grants
T - 4, ST - 4	Tornado, Severe Thunderstorms and High Winds	Start a social media outlet for Emergency Management to notify citizens of the potential for tornadic activity.	Start a twitter page that can be linked into an automatic weather alert about the threat of tornadoes.	One year.	EM	Staff time		General Fund
T - 5, ST - 5	Tornado, Severe Thunderstorms and High Winds	Upgrade the Code Red phone notification system platform.	Purchase and institute Code Red phone notifications for tornado warnings.	1-2 years as funding allows	EM	$2,500		General Fund
F - 3	Flooding	Construct a new bridge on Jackson Road that is higher and can withstand flood waters.	Construct the bridge on Jackson Road to withstand high flood waters.	10-15 years as funding is available.	Public Works	$2,000,000		Certificate of obligation Bonds, grants

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
F - 3	Flooding	Enhance our high-water warning system, by adding automatic gates on the streets that normally flood.	Add gates to the roads so that when water is over the flood elevations the gates would slowly close to prevent traffic from traveling the road.	5-10 years as funding becomes available	Engineering	100,000	40,000,000	FEMA HMGP, other grants
D - 2	Drought	Plant vegetation on City properties that requires little water to withstand periods of drought., and provide material to the public on how to grow drought resistant plants.	Plant drought resistant plants on City property to lessen the need to use water on landscape.	1-2 years as funding allows	Parks	$50,000		General Fund
D - 1	Drought	Develop a contingency plan for the delivery of Potable water during times of severe drought.	Institute water saving measures to lessen the demand of potable water. Increase the water storage capability through both above ground storage and portable tanks. Have contracts with private companies to supply potable water if needed.	3-10 year project	Public Works	Staff hours, unknowns	Unknown	General Fund
T - 1, ST - 1	Thunderstorms & High Wind	Increase shelter space at the city parks for people to seek protection when severe thunderstorm is in the area.	Construct storm shelters at City baseball and soccer fields.	2020	Parks	$100,000	NA	Budget, Grants

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
T - 1, ST - 1	Thunderstorms & High Wind	Provide safe locations inside city facilities for people to seek shelter during severe storms.	Evaluate each building owned by the City of Colleyville to locate shelter locations. If there is no safe location within the building install a safe room. Educate occupants of the building where to seek shelter.	2017	Emergency Management	$80,000	NA	Budget, Grants
H - 1	Hail	Provide hail resistant parking for city owned vehicles	Install covered parking at city locations to protect emergency and public works vehicles.	2020	Facility Maintenance	$100,000	NA	Budget
H - 1	Hail	Install hail resistant roofing on City of Colleyville buildings.	Install hail resistant roofing on City of Colleyville facilities when the current roof needs replaced.	2018	Facility Maintenance	$200,000	NA	Budget
H - 2	Hail	Increase awareness to the citizens on how the can protect themselves and their property from the effects of hail.	Distribute educational materials on hail-resistant roofing and windows. Use other forms of media to teach people how to protect themselves from hail.	2019	Emergency Management	$1,500	NA	Budget
L - 1	Lightning	Protect the public safety communication site from lightning	Install lightning safety equipment at the Public Safety Communications Site.	2016	Emergency Management	$25,000	NA	Budget
L - 1	Lightning	Install lightning detection equipment at all parks	Install lightning detection equipment at all city parks so that people using the park will be notified when lightning is in the area.	2017	Parks	$50,000	NA	Budget, Grants

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
L - 2	Lightning	Provide a lightning preparedness education program for the City of Colleyville.	Reach out to community groups and provide a one-hour education program on the dangers of lightning and how to protect themselves from lightning.	2015	Emergency Management	Staff Time	NA	Budget
WS - 1	Winter Storms	Develop an annual tree trimming program to protect power lines during ice storms.	Remove tree limbs near power lines that could cause the power line to be damaged during wind and ice storms.	2015	Public Works	$15,000	NA	Budget
WS - 2	Winter Storms	Provide information to the citizens of Colleyville about road conditions and school and city office closings	Utilize the city web site, emails, Code Red, and social media to keep the people of Colleyville informed on how a winter storm is impacting city services.	2015	PIO/Emergency Management	Staff	NA	Budget
WS - 2	Winter Storms	Conduct an assessment of the winter weather protocols for city departments	Provide training to all employees that work outside on the dangers of winter weather and ways that they need to protect themselves from the effects of the cold, wet, dark, and icy conditions.	2015	Risk Management	$1,000	NA	Budget
W - 1	Wildfire	Reduce the amount of fuel available for the spread of a Wildfire.	Use our high weed and grass ordinance to reduce the fuel load in the community. By keeping the grasses low to the ground the	2015	Code Enforcement	Cost of Staff	NA	Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			growth and spread of a wildfire will be diminished.					
W - 3	Wildfire	Develop a tree trimming program to raise the canopy of trees off the ground and reduce the fuel for spreading wildfires	Plan an annual program to trim trees that will help with the spread of a wildfire. Use the website to educate people on how to protect their homes using tree trimming.	2017	Public Works	$25,000	NA	Budget
W - 2	Wildfire	Ensure the Fire Department wildfire plan and equipment are current.	Review the SOP on wildfire response. Ensure that all equipment and protective gear is ready. Provide annual training to first responders	2015	Fire Department	$2,500	NA	Budget
W - 1	Wildfire	Upgrade the City of Colleyville water system so it is adequate to fight a large wildfire	Upgrade the water systems supply lines. Update mutual aid agreements with other cities for tanker trucks.	2015	Fire Department	Unknown	NA	Budget
ET - 1	Extreme Temps.	Develop an extreme temperature plan for the City of Colleyville.	Work with churches and other volunteer organizations to open cooling centers. This will help the citizens of Colleyville be able to stay safe from the effects of heat.	2016	Parks	$1,500	NA	Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ET - 2	Extreme Temps.	Distribute extreme temperature preparedness/mitigation literature at community events.	Provide safety information to citizens using pamphlets. The pamphlets will provide safety information and include websites to find more information.	2017	Emergency Management	$2,000	NA	Budget
ET - 2	Extreme Temps.	Update the extreme temperature protocols for city departments.	Provide training to all employees that work outside on hot days, to protect themselves from the effects extreme temperatures.	2015	Emergency Management	Staff time	NA	Budget
ES - 1	Expansive Solis	Manage expansive soils in the City of Colleyville through education and building codes.	Improve construction methods through updated building codes. Educate building contractors and building owners on expansive soil mitigation techniques.	2018	Building Department	$5,500	NA	Budget
ES - 1	Expansive Solis	Identify areas of our city that have a history of soil related damage to structures.	Provide information to builders that will be building on those sites of ways to improve the soil before construction starts. Educate the occupants of buildings in the areas that are on expansive soils how to care for the soil to prevent damage to their structure.	2018	Building Department	$2,000	NA	Budget

5.7 City of Crowley Mitigation Strategy

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
MH - 4	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires	Provide Mobile Command Post for City of Crowley multi departmental operations during natural disasters.	Research types of command post along with communication systems.	6 months	Crowley Police Department	$100,000	$400,000	FEMA
MH - 4	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires, Extreme Temperatures, Hazardous Materials Spills, Infectious Disease Outbreak	Provide an emergency response trailer with necessary equipment for responding to disaster sites in the City of Crowley.	Identify suitable trailer for responding needs.	3 months	Crowley Police Department	$44,250	$200,000	FEMA

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
MH - 4	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires, Extreme Temperatures, Hazardous Materials Spills, Infectious Disease Outbreak	Provide barricades, signs, generators, portable lighting, hydration supplies, and fuel to disaster locations. These items will be preloaded for quick response in the City of Crowley.	Research equipment needed and purchase equipment.	3 months	Crowley Police Department	$18,000	$72,000	FEMA
MH - 5	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires, Extreme Temperatures,	Form a multijurisdictional tactical unit with Forest Hill, Kennedale, and Crowley.	Develop ILA and planning.	3 months	Forest Hill Police Department (FHPD), Kennedale Police Department, Crowley Police Department	-	-	Forest Hill, Kennedale, Crowley
			Acquire appropriate equipment.	8 months	FHPD	$25,000	$50,000	Forest Hill

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
	Hazardous Materials Spills, Infectious Disease Outbreak, Terrorism		Train law enforcement officers and implement.	1 year	FHPD	$50,000	$50,000	Forest Hill
SV - 1, T -1	Severe Thunderstorms and High Winds, Tornadoes	Ensure outdoors spaces in Crowley have adequate shelter for high-wind events such as severe thunderstorms or tornadoes.	Evaluate current shelters in outdoor spaces in Crowley	Complete study to determine cost	Emergency Management Team, Fire Department	TBD	TBD	HMGP/PDM
			Determine the size and space needs for shelters in outdoor spaces in Crowley.	Complete study to determine cost	Emergency Management Team, Fire Department	TBD	TBD	
			Install outdoor storm shelters at various locations in the City.	Complete study to determine cost	Emergency Management Team, Fire Department	TBD	TBD	HMGP/PDM
SV - 1, T -1	Severe Thunderstorms and High Winds, Tornadoes	Ensure critical facilities in Crowley have adequate safe rooms to protect against high-wind events and tornadoes.	Evaluate the current conditions of critical facilities to determine which ones, if any, need safe rooms installed.	Complete study to determine cost	Emergency Management Team, Fire Department	TBD	TBD	HMGP/PDM
			Determine the size and space needed to shelter the population of the critical facility.	Complete study to determine cost	Emergency Management Team, Fire Department	TBD	TBD	
			Install safe rooms as needed in critical facilities.	Complete study to determine cost	Emergency Management Team, Fire Department	TBD	TBD	HMGP/PDM
SV - 3, T -3	Severe Thunderstorms and High	Develop a severe thunderstorm and tornado public education program for Crowley citizens.	Evaluate the hazards posed by high-wind events in Crowley.	2 years post study	Emergency Management Team, Fire Department	TBD	TBD	HMGP/PDM

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
	Winds, Tornadoes		Develop a severe weather public education program that provides tips and pertinent information for protecting property against high-wind damage.	2 years post study	Emergency Management Team, Fire Department	TBD	TBD	HMGP/PDM
SV - 3, T -3	Severe Thunderstorms and High Winds, Tornadoes	Distribute severe weather mitigation information to Crowley citizens.	Provide severe weather mitigation information to Crowley citizens through a social media campaign, including severe thunderstorms and tornadoes.	Continual	City Secretary's Office			General Fund
			Ensure the City of Crowley website is updated during tornado season to educate citizens on severe weather mitigation actions.	Continual	City Secretary's Office			General Fund
F - 1	Flooding	Decrease flood insurance premiums in Crowley by participating in the Federal Emergency Management Agency's (FEMA) Community Rating System (CRS) program.	Identify appropriate types of self-contained light/generators	Continual	Crowley Police Department	$25,000	$1,000,000	FEMA
			Identify movable generators for multiple locations within disaster area	Continual	Crowley Police Department	$31,498	$125,992	FEMA
			Research types of command post along with communication systems	Continual	Crowley Police Department	$100,000	$400,000	FEMA

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
F - 2	Flooding	Review and remove repetitive loss properties in the City of Crowley.	Review repetitive loss properties and work with homeowners to remove them using FEMA funding.		Public Works			Tarrant County, Individual Jurisdiction Budgets
PF - 1	Power Failure, Winter Storms, Severe Thunderstorms and High Winds, Tornadoes, Extreme Heat	Have automatic emergency power for the Crowley Recreation Center in the event the main power supply is disrupted.	Identify and purchase appropriate size and type of generator for the Crowley Recreation Center.	1 year	City Building	Could find a set cost after appropriate size and type is determined	$150,000	FEMA, State
PF - 1	Power Failure, Winter Storms, Severe Thunderstorms and High Winds, Tornadoes	Have emergency lighting for catastrophic mass casualty incidents at the City of Crowley Police Station.	Identify appropriate types of self-contained light/generators.	3 months	Crowley Police Department	$25,000	$100,000	FEMA
PF - 1	Power Failure, Winter Storms, Severe Thunderstorms and High Winds, Tornadoes	Ensure access to portable generators in case of emergencies in the City of Crowley.	Identify movable generators for multiple locations within disaster area.	3 months	Crowley Police Department	$31,498	$120,000	FEMA
H - 1	Hail	Ensure the City of Crowley critical facilities have hail-resistant roofing and windows installed.	Evaluate which critical facilities need hail-resistant roofing and windows installed.	Continual	Emergency Management Team/Fire Department	$100,000	$400,000	HMGP/PDM
			Install hail-resistant roofing and windows in identified critical facilities.	Continual	Emergency Management Team/Fire Department	$300,000	$1,200,000	HMGP/PDM

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
H - 1	Hail	Provide hail-resistant parking areas for Crowley's city vehicles.	Evaluate the need for covered parking for city vehicles to protect them against hail.	Continual	Emergency Management Team/Fire Department	$10,000	$ 40,000	HMGP/PDM
			Install covered parking areas as needed to protect city vehicles against hail.	Continual	Emergency Management Team/Fire Department	$200,000	$800,000	HMGP/PDM
H - 2	Hail	Develop a hail mitigation outreach program for the City of Crowley citizens.	Evaluate the hazards posed by hail in the city.	Study + 2 years	Emergency Management Team/Fire Department	TBD	TBD	HMGP/PDM
			Develop hail outreach program that provides tips and pertinent information for ensuring the protection of property against hail, through mitigation activities.	Study + 2 years	Emergency Management Team/Fire Department	TBD	TBD	HMGP/PDM
H - 2	Hail	Distribute hail mitigation information to the City of Crowley citizens.	Provide hail mitigation information to citizens through a social media campaign.	Continual	City Secretary's Office			General Fund
			Provide hail mitigation information through the city website.	Continual	City Secretary's Office			General Fund
W-1	Wildfire	Implement FIREWISE community program.	Coordinate with TFS, our city and community to establish a FIREWISE community program. This program will assist us with	3 years	Fire Department	$50,000	The primary benefit will come in the form of life and property conservation	General Fund/Grants

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			preplanning for a fire, during and after.					
W - 1	Wildfire	Ensure Crowley water systems are adequate for fighting wildfires.	Evaluate the Crowley water system to ensure capacity for fighting wildfires.	Continual	Fire Department, Public Works	$30,000	$120,000	General Fund
			Install or upgrade needed equipment to ensure water systems are adequate.	Continual	Public Works	$300,000	$1,200,000	HMGP/PDM
			Provide wildfire response training to fire personnel.	Continual	Fire Department	$300	$1,200	General Fund
WS - 1	Winter Storm	Evaluate winter weather response capabilities in the City of Crowley.	Conduct an assessment of winter weather response capabilities.	2 yrs. post study	Emergency Management Team/Public Works	TBD	TBD	HMGP/PDM
			Acquire equipment needed as determined by assessment. (need sanding equipment).	2 yrs. post study	Public Works	$250,000	$1,000,000	HMGP/PDM
			Provide safety training to first responders on winter weather hazards.	Continual	Fire Department/Police Department			General Fund
WS - 1	Winter Storm	Evaluate winter weather planning capabilities in the City of Crowley.	Conduct an assessment of winter weather plans in place for jurisdiction public works.	Continual	Emergency Management Team	TBD	TBD	HMGP/PDM
			Develop or update winter weather preparedness plan.	Continual	Emergency Management Team, Public Works	TBD	TBD	HMGP/PDM

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
WS - 2	Winter Storm	Develop a winter weather outreach program City of Crowley citizens.	Evaluate the hazards posed by severe winter weather in the City of Crowley.	Ongoing	Public Works			General Fund
			Develop a winter weather outreach program that provides tips and pertinent information for avoiding hypothermia and icy conditions.	Ongoing	Public Works/City Secretary's Office			General Fund
WS - 2	Winter Storm	Distribute winter weather information to the City of Crowley residents.	Provide winter weather mitigation information to Crowley citizens through a social media campaign.	Ongoing	City Secretary's Office			General Fund
			Ensure the Crowley city website is updated during winter months to educate citizens on winter weather mitigation activities.	Ongoing	City Secretary's Office			General Fund
IDO - 2	Infectious Disease Outbreak	Prepare City of Crowley first responders for mass prophylaxis distribution.	Train first responders in point of distribution (POD) procedures.		Tarrant County			
			Conduct a POD exercise to test plans and procedures.		Tarrant County			
IDO - 3	Infectious Disease Outbreak	Ensure continuity procedures are in place to prepare for a long-term employee shortage at City of Crowley facilities.	Review continuity of operations (COOP) plans and procedures for city employees and facilities.		Tarrant County			
			Provide COOP training for jurisdiction employees.		Tarrant County			

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
IDO - 4	Infectious Disease Outbreak	Develop a public information campaign to educate Crowley public about infectious diseases.	Educate the public on pandemics, including isolation, quarantine, triage, and medical care.		Tarrant County Fire Department, Crowley City Secretary's Office			
D - 1	Drought	Review Crowley water enforcement legislation/Ordinance and update as necessary to mitigate the effects of drought.	Review current legislation/Ordinance for water conservation enforcement in Crowley.	Ongoing	Public Works and Code Compliance	$10,000	$40,000	General Fund
			Develop or update water conservation enforcement legislation/Ordinance to ensure effective practices during periods of drought.	Ongoing	Public Works and City Council	$20,000	$80,000	General Fund
D - 1	Drought	Develop contingency plans for Crowley to ensure adequate power and water supply during prolonged periods of drought.	Review current contingency plans.	Continual	Public Works	$10,000	$40,000	General Fund
			Develop or update potable water contingency plans.	Continual	Public Works	$10,000	$40,000	HMGP
			Develop or update power supply contingency plans.	Continual	Public Works	$600,000	$2.4 M	HMGP
D - 2	Drought	Upgrade water and irrigation systems to conserve water in the City of Crowley.	Maintaining current irrigation systems at City facilities; keeping watering schedules to a minimum.	Continual	Public Works	$500	$2,000	General Fund
D - 3	Drought	Develop a drought awareness education	Evaluate the hazards posed by drought in Crowley.	Continual	Public Works	$100,000	$400,000	HMGP/PDM

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
		program for Crowley citizens.	Develop a drought awareness education program that provides tips and pertinent information for ensuring the protection of property and the environment against drought.	Continual	Public Works and Utility Billing	$100,000	$400,000	HMGP/PDM
D - 3	Drought	Distribute drought awareness information to Crowley citizens.	Provide drought awareness information to Crowley. citizens through a social media campaign	Continual	Public Works.			General Fund
			Provide drought awareness information through the City of Crowley website	Continual	Public Works, City Secretary's Office			General Fund
L - 2	Lightning	Develop a lightning outreach program for City of Crowley citizens.	Evaluate the hazards posed by lightning in Crowley.	2 years post study	Emergency Management Team, Fire Department	$100,000	$400,000	HMGP, PDM
			Develop a lightning outreach program that provides tips and pertinent information for protecting property against lightning damage.	2 years post study	Emergency Management. Team, Fire Department	$300,000	$1,200,000	HMGP, PDM
L - 2	Lightning	Distribute lightning preparedness information to City of Crowley citizens.	Provide lightning mitigation information to Crowley citizens through a social media campaign.		City Secretary's Office			General Fund

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Provide lightning awareness information at outdoor spaces throughout Crowley.		City Secretary's Office			General Fund
PF - 1	Power Failure	Provide mobile auxiliary power, lights, and breathing air for hazardous material release, structure fires, and sub-grade rescues for the Crowley Fire Department. This type of unit could be a power source for mobile command units and emergency power emergency shelters for the surrounding areas.	Identify appropriate size and type of the following: truck, generator, command lights, SCBA compressor, fill station; 150' fill line with reel.	1 year	Crowley Fire Department	$625,000	$625,000	FEMA, State
ES - 1	Expansive Soils	Mitigate expansive soils in Crowley.	Improve construction techniques through building code enhancements.		Public Works			General Fund
			Educate construction contractors, homeowners, and business owners about mitigation techniques.		Public Works			General Fund
F - 1	Flooding, Dam Failure	Participate in FEMA's Community Rating System to lower flood insurance premiums for residents with flood insurance	Participate in FEMA's Community Rating System to lower flood insurance premiums for residents with flood insurance	1 year	Public Works	$10,000	$40,000	Local funds, HMGP, PDM, FMA
F - 2	Flooding, Dam Failure	Develop a buyout program for properties in the floodplain	Develop a buyout program for properties in the floodplain	As funding is available	Public Works	TBD	TBD	Local funds, HMGP, PDM, FMA

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ST - 1, T - 1	Severe Thunderstorms, High Winds, Lightning, and Tornadoes	Ensure outdoors spaces in Crowley have adequate shelter for high-wind events such as severe thunderstorms or tornadoes.	Ensure outdoors spaces in Crowley have adequate shelter for high-wind events such as severe thunderstorms or tornadoes.	As funding is available	Emergency Management	TBD	TBD	Local funds, HMGP, PDM
ST - 4, T - 4	Severe Thunderstorms, High Winds, Lightning, and Tornadoes	Distribute severe weather mitigation information to Crowley citizens.	Distribute severe weather mitigation information to Crowley citizens.	As funding is available	Emergency Management	TBD	TBD	Local funds, HMGP, PDM
WS - 1	Winter Storms	Equip city vehicles and equipment with digital thermometers to identify pavement/asphalt temperatures to determine freeze levels for bridges and overpasses.	Equip city vehicles and equipment with digital thermometers to identify pavement/asphalt temperatures to determine freeze levels for bridges and overpasses.	As funding is available	Emergency Management	TBD	TBD	Local funds, HMGP, PDM
WS - 1	Power Failure, Extreme Heat, and Winter Storm	Ensure access to portable generators in case of emergencies in the City of Crowley.	Ensure access to portable generators in case of emergencies in the City of Crowley.	As funding is available	Emergency Management	TBD	TBD	Local funds, HMGP, PDM
W - 2	Wildfire	Develop a community wildfire protection plan (CWPP) to identify areas at risk for wildfire and identify additional wildland resources.	Develop a community wildfire protection plan (CWPP) to identify areas at risk for wildfire and identify additional wildland resources.	As funding is available	Emergency Management	TBD	TBD	Local funds, HMGP, PDM
W - 3	Wildfire	Develop a wildfire mitigation outreach program City of Crowley citizens.	Develop a wildfire mitigation outreach program City of Crowley citizens.	As funding is available	Emergency Management	TBD	TBD	Local funds, HMGP, PDM

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ET - 2	Extreme Temperature	Develop an extreme heat outreach program for City of Crowley citizens.	Develop an extreme heat outreach program for City of Crowley citizens.	As funding is available	Emergency Management	TBD	TBD	Local funds, HMGP, PDM

5.8 Dallas Fort Worth International Airport Mitigation Strategy

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
MH - 1	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires, Extreme Temperatures, Hazardous Materials Spills, Infectious Disease Outbreak, Terrorism	Update Dallas-Fort Worth (DFW) International Airport warning system to all-hazards threats for all airport property.	Review capabilities of current systems.	3 months	Department of Protective Services (DPS) – Office of Emergency Management (OEM)	$ 2,000	$ 10,000	Department Budget
			Conduct study for expansion and replacement of current systems and/or procurement of new systems.	12 months	DPS – OEM	$ 15,000	$ 100,000	Department Budget
			Procure any updates and/or new systems.	36 months	DPS – OEM	$ 150,000	$ 1,800,000	Capital Budget
			Create strategy to integrate policies for all warning systems.	40 months	DPS – OEM	$ 10,000	$ 55,000	Department Budget
			Implement system for airport-wide warnings, to include education regarding the new system.	48 months	DPS – OEM	$ 5,000	$ 25,000	Department Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
MH - 6	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires, Extreme Temperatures, Hazardous Materials Spills, Infectious Disease Outbreak, Terrorism	Utilize enhanced systems to notify airport employees and stakeholders regarding incidents at DFW International Airport.	Update current DFW International Airport C3 Portal.	6 months	Airport Operations	$ 8,000	$ 52,000	Department Budget
			Expand subscribers to program to warehouse and rental car districts.	12 months	Airport Operations	$ 2,000	$ 15,000	Department Budget
ST - 3, T - 3	Severe Thunderstorms and High Winds, Tornadoes	Harden DFW International Airport facilities to withstand high winds and hail.	Install blast Film on all terminal glass outer-walls (complete as renovations are completed).	5 years	DPS & ADE	$ 1,500,000	$ 25,000,000	Grant Funds
F - 2	Flooding	Dallas Fort Worth International Airport will continue to support surrounding communities that participate in the Federal Emergency Management Agency's (FEMA) Community Rating	Work with surrounding city officials who are members of the CRS program.	Continual	Tarrant County, all Eligible Participating Jurisdictions	$10, 000	$ 40,000	Tarrant County, Individual Jurisdiction Budgets

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
		System (CRS) program.						
F - 3	Flooding	Widen and raise Mid-Cities Road to prevent flooding at Dallas Fort Worth International Airport.	Conduct design phase.	6 months	ADE	$ 750,000	$ 1,500,000	Capital Funds
			Begin construction of South lanes and new bridge.	9 months	ADE	$ 7,500,000	$ 10,000,000	Capital Funds
			Demolish North bridge and begin construction of new lanes and bridge.	12 months	ADE	$ 1,250,000	$ 25,000,000	Capital Funds
F - 3	Flooding	Widen and raise Glade Road to prevent flooding at Dallas Fort Worth International Airport.	Conduct design phase.	6 months	ADE	$ 800,000	$ 1,500,000	Capital Funds
			Begin construction of South lanes and new bridge.	9 months	ADE	$ 9,000,000	$ 12,000,000	Capital Funds
			Demolish North bridge and begin construction of North lanes and bridge.	12 months	ADE	$ 15,000,000	$ 27,000,000	Capital Funds
F - 3	Flooding	Widen and retool West Airfield Drive to prevent flooding at	Conduct design phase.	6 months	ADE	$ 750,000	$ 1,500,000	Capital Funds

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
		Dallas Fort Worth International Airport.	Begin construction of East lanes and new bridge.	9 months	ADE	$ 7,500,000	$ 10,000,000	Capital Funds
			Begin construction of West lanes and bridge.	12 months	ADE	$ 12,500,000	$ 25,000,000	Capital Funds
DF - 4	Dam Failure	Mitigate dam failure at Dallas Fort Worth International Airport.	Conduct a comprehensive review of emergency action plans for dams at DFW Airport.	Continual	Environmental Affairs	No additional cost		Airport Budget
DF - 4	Dam Failure	Mitigate levee failure at Dallas Fort Worth International Airport.	Conduct a breach analysis of levees at DFW Airport.	12 months	Environmental Affairs	No additional cost		Airport Budget
PF - 1	Power Failure, Winter Storms, Severe Thunderstorms and High Winds, Tornadoes	Ensure Dallas Fort Worth International Airport critical facilities have alternate power supply.	Identify appropriate size and type of generator for critical facilities.	6 months	Department of Public Safety, Energy, Transportation, and Asset Management	No additional cost	NA	Airport Budget
			Purchase/order generator for critical facilities.	12 months	Energy, Transportation, and Asset Management	Dependent on evaluation	NA	Capital Funds
			Deliver and install critical facility generators.	3 months	Energy, Transportation, and Asset Management	Dependent on evaluation	NA	Airport Budget
PF - 1	Power Failure, Winter Storms, Severe Thunderstorms and High	Ensure Dallas Fort Worth International Airport critical facilities have	Evaluate emergency lighting systems in critical facilities.	6 months	Department of Public Safety, Energy, Transportation, and Asset Management	No additional cost	NA	Airport Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
	Winds, Tornadoes	emergency lighting systems in place.	Install emergency lighting systems in critical facilities.	12 months	Energy, Transportation, and Asset Management	Dependent on evaluation	NA	Capital Funds
W - 2	Wildfire	Personnel from Fire Prevention will utilize existing systems to maintain grass fire data for Dallas Fort Worth International Airport.	Compile data from past incidents.	3 months	DPS – Fire Prevention	$ 2,500	$ 150,000	Department Budget
			Update current databases to access new data.	6 months	DPS – Fire Prevention	$ -	$ 30,000	Department Budget
			Update databases as new incidents transpire.	Ongoing	DPS – Fire Prevention	$ -	$ 70,000	Department Budget
WS - 1	Winter Storm	Evaluate winter weather response capabilities at Dallas Fort Worth International Airport.	Conduct an assessment of winter weather response capabilities.	Continual	Department of Public Safety, Operations & Energy, Transportation and Asset Management	No additional cost		Airport Budget
			Acquire equipment needed as determined by assessment.	12 months	Department of Public Safety, Operations & Energy, Transportation and Asset Management	Dependent on evaluation		
			Provide safety training to first responders on winter weather hazards.	6 months	Department of Public Safety	No additional cost		Airport Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
WS - 1	Winter Storm	Evaluate winter weather planning capabilities at Dallas Fort Worth International Airport.	Conduct an assessment of winter weather plans in place for jurisdiction public works.	Continual	Department of Public Safety, Operations & Energy, Transportation and Asset Management	No additional cost		Airport Budget
			Develop or update winter weather mitigation plan.	Continual	Department of Public Safety, Operations & Energy, Transportation and Asset Management	No additional cost		Airport Budget
WS - 2	Winter Storm	Develop a winter weather mitigation program at Dallas Fort Worth International Airport.	Evaluate the hazards posed by severe winter weather at DFW.	Continual	Department of Public Safety	No additional costs		Airport Budget
			Develop a winter weather public education program that provides tips and pertinent information for avoiding hypothermia and icy conditions.	Continual	Department of Public Safety & Risk Management	No additional costs		Airport Budget
WS - 2	Winter Storm	Distribute winter weather mitigation information to Dallas Fort Worth International Airport employees and tenants.	Provide winter weather mitigation information to DFW employees and tenants through a social media campaign.	6 months	Department of Public Safety	No additional costs		Airport Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Ensure the DFW website is updated during winter months to educate citizens on winter weather mitigation activities.	6 months	Department of Public Safety & Internal Communications	No additional costs		Airport Budget
D - 2	Drought	Install Purple Pipe (recycled water) throughout Dallas Fort Worth International Airport for irrigation.	Identify areas for installation.	3 months	ADE	$ 250,000	$ 1,500,000	Capital Funds
			Install piping.	8 months	ADE	$ 12,500,000	$ 50,000,000	Capital Funds
			Integrate irrigation into piping.	5 months	ADE	$ 1,500,000	$ 10,000,000	Capital Funds
TR - 1	Terrorism	Provide glass throughout Dallas Fort Worth International Airport terminal areas with anti-explosive properties.	Study new and legacy glass within terminals.	3 months	DPS – Police	$ 1,000	$ 8,000	Department Budget
			Procure blast film for all terminal glass.	12 months	DPS – Police	$ 225,000	$ 2,300,000	Capital Budget
			Apply film to all glass within the terminal area.	15 months	DPS – Police	$ 50,000	$ 1,500,000	Capital Budget
TR - 1	Terrorism	Provide shelter signage within Dallas Fort Worth International Airport terminals.	Review areas that do not have signage.	3 months	DPS – OEM	$ 1,000	$ 5,000	Department Budget
			Procure additional signs.	6 months	DPS – OEM	$ 3,000	$ 25,000	Department Budget
			Post additional signage throughout airport terminals.	12 months	DPS – OEM	$ 1,000	$ 35,000	Department Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
L - 1	Lightning	Protect communication infrastructure at Dallas Fort Worth International Airport from lightning.	Evaluate the need for lightning protection on communications infrastructure at DFW Airport.	6 months	Department of Public Safety, Information Technology Services	$ 25,000	$ 125,000	Airport Budget
			Install lightning rods on existing and future communication infrastructure, as needed.	18-24 months	Department of Public Safety, Energy, Transportation and Asset Mgt.	Dependent on findings		Capital Funds
L - 1	Lightning	Ensure Dallas Fort Worth International Airport critical facilities are protected against lightning.	Evaluate the need for lightning protection for DFW Airport critical facilities.	6 months	Department of Public Safety	No additional costs		Airport Budget
			Install lightning rods and other protective equipment on critical facilities.	18-24 months	Department of Public Safety	Dependent on findings		Capital Funds
			Integrate Airport lightning detection systems throughout the entire Airport.	24-36 months	Department of Public Safety	$ 1,200,000	$ 4,000,000	Capital Funds
L - 2	Lightning	Develop a lightning outreach program for Dallas Fort Worth International Airport	Evaluate the hazards posed by lightning DFW Airport.	6 months	Department of Public Safety	No additional costs		Airport Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
		employees and tenants.	Develop a lightning outreach program that provides tips and pertinent information for protecting property against lightning damage.	12 months	Department of Public Safety	$ 25,000	$ 475,000	Airport Budget
L - 2	Lightning	Distribute lightning mitigation information to Dallas Fort Worth International Airport employees and tenants.	Provide lightning mitigation information through the DFW Airport intranet site.	12 months	Department of Public Safety	No additional costs		Airport Budget
			Provide lightning awareness information at outdoor spaces throughout DFW Airport.	18 months	Department of Public Safety	$ 150,000	$ 500,000	Airport Budget
HM - 1	Hazardous Materials	Provide Dallas Fort Worth International Airport fire personnel with the necessary gear to respond to hazmat releases.	Evaluate the hazmat gear currently provided by DFW Airport Department of Public Safety Fire Services.	Continual	Department of Public Safety	No Additional Cost		Airport Budget
			Acquire the gear needed as identified in the evaluation.	Continual	Department of Public Safety	Dependent upon evaluation		Airport Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
HM - 1	Hazardous Materials	Ensure Dallas Fort Worth International Airport fire department has the equipment necessary to respond to hazmat releases.	Evaluate the hazmat equipment currently owned by DFW Airport.	Continual	Department of Public Safety	No additional cost		Airport Budget
			Acquire the equipment needed as identified in the evaluation.	Continual	Department of Public Safety	Dependent upon evaluation		Airport Budget
HM - 2	Hazardous Materials	Develop a hazardous materials awareness education program for Airport employees and tenants.	Evaluate hazardous materials that are used or transported in DFW Airport.	Continual	Department of Public Safety, Environmental Affairs Department	No additional cost		Airport Budget
			Maintain a hazardous materials awareness education program that provides tips and pertinent information for ensuring the protection of property and people from hazardous materials.	Continual	Department of Public Safety, Environmental Affairs Department	No additional cost		Airport Budget
HM - 2	Hazardous Materials	Distribute hazardous materials awareness information to Dallas Fort Worth International Airport	Provide hazardous materials awareness information to	Continual	Department of Public Safety, Environmental Affairs Department	No additional cost		Airport Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
		employees and tenants.	Airport employees and tenants.					
			Provide hazardous materials awareness information through the DFW Airport intranet site.	Continual	Department of Public Safety, Environmental Affairs Department	No additional cost		Airport Budget
HM - 3	Hazardous Materials	Improve the evacuation of Airport employees and tenants during a hazardous event.	Partner with the Red Cross to locate shelter locations off the Airport.	Continual	Department of Public Safety	No additional cost		Airport Budget
			Secure agreements with the Red Cross for shelters.	Continual	Department of Public Safety	No additional cost		Airport Budget
HM - 4	Hazardous Materials	Identify potential hazard areas surrounding Dallas Fort Worth International Airport associated with a railroad incident.	Partner with surrounding communities to identify materials commonly carried by the railroad that travels through the community.	Continual	Department of Public Safety	No additional cost		Airport Budget
			Partner with surrounding communities to develop hazard incident overlay for the small, medium, and	Continual	Department of Public Safety	No additional cost		Airport Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			worst-case incidents based upon materials commonly carried on the railway.					
			Partner with surrounding communities to identify the roadway infrastructure, residences, commercial buildings, and open land/park areas located within the hazard incident overlay.	Continual	Department of Public Safety	No additional cost		Airport Budget
ET - 1	Extreme Temperatures	Ensure Dallas Fort Worth International Airport can open cooling centers.	Review current plans and procedures related to extreme heat.	6 months	Office of Emergency Management	No additional cost		Airport Budget
			Open cooling centers and provide public information.	12 months	Office of Emergency Management	300 man hours	Reduction in liability and property insurance	Airport Budget
ET - 1	Extreme Temperatures	Identify extreme heat plans for critical infrastructure at Dallas Fort Worth International Airport.	Evaluate the need for extreme heat plans for critical infrastructure to	6 months	Office of Emergency Management/Energy Transportation and Asset Management	No additional costs		Airport Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			ensure essential functions continue in the event of high temperatures.					
			Develop or update plans and procedures for critical infrastructure when high temperatures are present.	12-18 months	Office of Emergency Management/Energy Transportation and Asset Management	500 man hours		Airport Budget
ET - 2	Extreme Temperatures	Develop an extreme heat outreach program for Dallas Fort Worth International Airport Employees and Customers.	Evaluate the hazards posed by extreme heat at DFW International Airport.	3-6 months	Office of Emergency Management	No additional cost		Airport Budget
			Develop an extreme heat outreach program that provides tips and pertinent information for ensuring the health and safety of employees working outside during extreme heat.	12 months	Office of Emergency Management / Internal Communications	300 man hours		Airport Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ES - 1	Expansive Soils	Mitigate expansive soils at Dallas Fort Worth International Airport.	Actively pursue and evaluate updated building codes, primarily through the International Code Council.	12-18 months	Airport Development and Engineering	No additional costs	Dependent on code regulations	Airport Budget
			Educate construction contractors and tenants about mitigation techniques.	12-18 months	Airport Development and Engineering	No additional costs	Dependent on code regulations	Airport Budget
T - 3	Tornado	Harden DFW facilities to withstand the typical tornado threat in North Texas	Harden DFW facilities to withstand the typical tornado threat in North Texas.	5 years	DPS & ADE	$ 1,500,000	$ 25,000,000	Grant Funds
T - 5		Enhance the DFW warning system to better warn stakeholders and the traveling public of tornadic threats.	Enhance the DFW warning system to better warn stakeholders and the traveling public of tornadic threats.	4 years	DPS-OEM	$ 200,000	$ 1,500,000	Capital Budget
		Update and Integrate mass notification into current DFW Airport platforms for warning.	Update and Integrate mass notification into current DFW Airport platforms for warning.	18 months	DPS-OEM & Operations	$ 15,000	$ 2,000,000	Department Budget
ST - 3	Severe Thunderstorms	Harden DFW facilities to withstand the typical windstorm	Harden DFW facilities to withstand the	5 years	DPS & ADE	$ 1,500,000	$ 25,000,000	Grant Funds

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
	and High Winds	threat in North Texas.	typical windstorm threat in North Texas.					
ST - 5		Enhance the DFW warning system to better warn stakeholders and the traveling public of high wind and storm threats.	Enhance the DFW warning system to better warn stakeholders and the traveling public of high wind and storm threats.	4 years	DPS-OEM	$ 200,000	$ 1,500,000	Capital Budget
		Update and Integrate mass notification into current DFW Airport platforms for warning.	Update and Integrate mass notification into current DFW Airport platforms for warning.	18 months	DPS-OEM & Operations	$ 15,000	$ 2,000,000	Department Budget
H - 1	Hail	Harden DFW facilities to withstand the typical the hail threat in North Texas.	Harden DFW facilities to withstand the typical the hail threat in North Texas.	5 years	DPS & ADE	$ 1,500,000	$ 25,000,000	Grant Funds
H - 1		Enhance the DFW warning system to better warn stakeholders and the traveling public of hail threats.	Enhance the DFW warning system to better warn stakeholders and the traveling public of hail threats.	4 years	DPS-OEM	$ 200,000	$ 1,500,000	Capital Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
H - 1		Update and Integrate mass notification into current DFW Airport platforms for warning purposes.	Update and Integrate mass notification into current DFW Airport platforms for warning purposes.	18 months	DPS-OEM & Operations	$ 15,000	$ 2,000,000	Department Budget
D - 2	Drought	Construct Purple Pipe (recycled water) for landscaping and irrigation.	Construct Purple Pipe (recycled water) for landscaping and irrigation.	24 months	ADE	$ 250,000	$ 5,000,000	Capital Budget
		Educate airport staff and stakeholders on water conservation techniques.	Educate airport staff and stakeholders on water conservation techniques.	12 months	Environmental Affairs	$ 15,000	$ 250,000	Departmental Budget
		Plan for delivering potable water to critical facilities in the event of a water emergency.	Plan for delivering potable water to critical facilities in the event of a water emergency.	12 months	Procurement	$ 10,000	$ 50,000	Departmental Budget
W - 1	Wildfire	Collect and analyze wildfire data to determine high hazard areas.	Collect and analyze wildfire data to determine high hazard areas.	12 months	DPS-Fire	$ 15,000	$ 50,000	Departmental Budget
		Train Airport fire fighters on wildland fire mitigation strategies specific to wildland urban interface at airports.	Train Airport fire fighters on wildland fire mitigation strategies specific to	12 months	DPS-Fire	$ 25,000	$ 150,000	Departmental Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			wildland urban interface at airports.					
		Reduce fuels in high hazard areas on airport property.	Reduce fuels in high hazard areas on airport property.	24 months	Energy Transportation & Asset Management	$ 250,000	$ 1,500,000	Departmental Budget
DF - 1	Dam Failure	Review and revise Trigg Lake AEP.	Review and revise Trigg Lake AEP.	Continual	Environmental Affair & DPS-OEM	No additional cost		Departmental Budget
		Conduct levee breach analysis on airport property.	Conduct levee breach analysis on airport property.	Continual	Environmental Affair & DPS-OEM	No additional cost		Departmental Budget
		Improve warning systems ability to warn of dam failure incidents both on airport and down stream	Improve warning systems ability to warn of dam failure incidents both on airport and down stream	12 months	DPS-OEM & Operations	$ 15,000	$ 500,000	Departmental Budget
IDO - 4	Infectious Disease Outbreak	Enhance and expand DFW Airport POD plan to incorporate additional critical private sector stakeholders	Enhance and expand DFW Airport POD plan to incorporate additional critical private sector stakeholders		DPS-OEM	$ 15,000	$ 250,000	Departmental Budget
		Conduct staffing analysis to ensure airport's operation in the event of workforce shortage from a pandemic	Conduct staffing analysis to ensure airport's operation in the event of workforce		DPS-OEM & HR	$ 15,000	$ 350,000	Departmental Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			shortage from a pandemic					
		Educate partners and stakeholders in disease prevention and hygiene practices	Educate partners and stakeholders in disease prevention and hygiene practices		DPS-OEM & Risk Management	$ 25,000	$ 500,000	Departmental Budget

5.9 City of Euless Mitigation Strategy

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
MH - 6	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires	Have accurate real time information to assist in giving timely warnings to citizen population of the City of Euless.	Identify systems or methods for obtaining current and pending weather conditions.	1 month	Emergency Management	-	-	City Budget
			Purchase/order weather/lightning monitoring/warning system.	1 month	Emergency Management	$60,000	$240,000	City Budget
			Deliver and install weather/lightning monitor/warning system.	1 month	Emergency Management	-	-	City Budget
PF - 1	Power Failure, Winter Storms, Severe Thunderstorms and High Winds, Tornadoes	Ensure City of Euless critical facilities have generators as an alternate power supply.	Install emergency lighting systems in critical facilities.	Jan-16	Facilities	$40,000	$75,000	City Budget
IDO - 2	Infectious Disease Outbreak	Provide physical security at the Hurst, Euless, and Bedford (HEB) POD site while treating up to 200,000 people within a 48-hour timeframe.	Develop plans for security needs within the POD site.	Completed	HEB	-	-	HEB, FEMA, Center for Disease Control Public Health Preparedness Funds
			Calculate police personnel requirements and availability and then prepare a viable plan with schedules and assignments.	Completed	HEB	$49,000	$200,000	HEB, FEMA, Center for Disease Control Public Health Preparedness Funds

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Estimate fuel needs for police and ICS vehicles, and generators.	31-Dec-13	HEB	-	-	HEB, FEMA
IDO - 2	Infectious Disease Outbreak	Coordinate the effective traffic flow leading into, out of, and within the Hurst, Euless, and Bedford POD site.	Plan for law enforcement personnel needs for traffic control.	Completed	HEB	$35,000	$140,000	HEB, FEMA
			Plan for portable, physical barrier needs (cones, barricades, etc.).	Completed	HEB	-	-	HEB, FEMA
			Determine points of ingress/egress to POD site for management purposes.	Completed	HEB	-	-	HEB, FEMA
IDO - 2	Infectious Disease Outbreak	Complete and disseminate the Hurst, Euless, and Bedford POD site to local agencies, school and hospital district, and Tarrant County officials.	Prepare and disseminate POD plan.	Completed	Bedford	-	-	-
IDO - 3	Infectious Disease Outbreak	Ensure continuity procedures are in place to prepare for a long-term employee shortage at City of Euless facilities.	Review continuity of operations (COOP) plans and procedures for city employees and facilities.	Jan-16	All	$5,000	$75,000	City Budget
			Provide COOP training for jurisdiction employees.	Jan-17	All	$10,000	$100,000	City Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
IDO - 4	Infectious Disease Outbreak	Develop a public information campaign to educate Euless public about infectious diseases.	Educate the public on pandemics, including isolation, quarantine, triage, and medical care.	Jan-15	PIO/Emergency Management	$3,000	$50,000	City Budget
D - 2	Drought	Upgrade water and irrigation systems to conserve water in the City of Euless	Evaluate feasibility of extending reclaimed water lines and usage to new or existing subdivisions and business districts.	Jan-16	Public Works	$5,000	$500,000	City Budget
D - 3	Drought	Develop a drought awareness education program for Euless citizens.	Evaluate the hazards posed by drought in Euless.	Jun-15	Public Works, Emergency Management	$1,000	$100,000	City Budget
			Develop a drought awareness education program that provides tips and pertinent information for ensuring the protection of property and the environment against drought.	Jun-16	Public Works, PIO, Emergency Management	$5,000	$200,000	City Budget
D - 3	Drought	Distribute drought awareness information to Euless citizens.	Provide drought awareness information to Euless citizens through a social media campaign.	Jun-14	PIO/Emergency Management	$500	$5,000	City Budget
			Provide drought awareness information through	Jun-14	PIO/Emergency Management	$500	$5,000	City Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			the City of Euless website.					
ET - 1	Extreme Temperatures	Ensure the City of Euless has an extreme heat mitigation plan in place.	Review current mitigation plans and procedures related to extreme heat.	Jul-14	All	$1,000	$50,000	City Budget
			Open cooling centers and provide public information.	Jul-14	All	$1,000	$50,000	City Budget
ET - 1	Extreme Temperatures	Identify extreme heat mitigation plans for critical infrastructure in the City of Euless.	Ensure essential functions continue in the event of high temperatures, by implementing mitigation activities.	Jul-14	PW/Facilities/Emergency Management	$1,000	$50,000	City Budget
			Develop or update mitigation procedures for critical infrastructure when high temperatures are present.	Jul-14	PW/Facilities/Emergency Management	$1,000	$50,000	City Budget
ET - 2	Extreme Temperatures	Develop an extreme heat outreach program for Euless citizens.	Develop an extreme heat outreach program that provides tips and pertinent information for ensuring the health and safety of citizens during extreme heat.	Jul-15	FD/PIO/Emergency Management	$3,000	$50,000	City Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ET - 2	Extreme Temperatures	Distribute extreme heat mitigation information to Euless citizens.	Provide extreme heat mitigation information to the Euless citizens through a social media campaign.	Jul-15	FD/PIO/Emergency Management	$3,000	$50,000	City Budget
			Provide extreme heat mitigation information through the City of Euless's website.	Jul-15	FD/PIO/Emergency Management	$500	$10,000	City Budget
ES - 1	Expansive Soils	Mitigate expansive soils in Euless.	Improve construction techniques through building code enhancements.	Jan-17	Planning and Development	$5,000	$50,000	City Budget
			Educate construction contractors, homeowners, and business owners about mitigation techniques.	Jan-17	Planning and Development	$5,000	$50,000	City Budget
F-2	Flooding	Remove repetitive loss properties in Euless	Work with homeowners to purchase and remove repetitive loss properties	Continual	City Engineering, Public Works	$750,000	$1,500,000	City Budget, HMGP
F - 3	Flooding	Provide flood awareness education to citizens of Euless	Develop and print preparedness materials	2 years	Emergency Management, PIO	$3,000	$15,000	City Budget
			Obtaining lightning sensing equipment for city parks not currently covered	5 years	Emergency Management, Parks and Recreation	$50,000	$300,000	City Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
L-1	Lightning	Protect Critical Facilities against lightning	Install lightning rods and other protective equipment on critical facilities	5 years	Emergency Management, Facilities	$200,000	$700,000	City Budget
WS-1,EH-1	Winter Storm, Extreme Temperatures	Develop winter storm ad extreme temperature mitigation plans for City of Euless.	Open public warming or cooling centers.	5 years	Emergency Management	$2,000	$10,000	City Budget
WS-2,EH-2	Winter Storm	Provide winter storm education to citizens of Euless.	Develop and print public outreach materials.	5 years	Emergency Management, PIO	$3,000	$15,000	City Budget
D-2	Drought	Reduce water usage by city facilities.	Install landscaping rain collection systems at city facilities.	5 years	Emergency Management, Facilities	$35,000	$250,000	City Budget
H-1	Hail	Mitigate damage to existing structures as a result of natural hazards using cost effective approaches in the City of Euless.	Provide awnings as a cover for emergency response vehicles located outside.	5 or more years	Public Safety			TBD
W-3	Wildfire	Provide information to Euless citizens regarding the hazards posed by wildfires.	Develop a wildfire mitigation outreach program.	2 years	Emergency Management, Fire Department, PIO	$2,000	$10,000	City Budget
W-1	Wildfire	Implement FIREWISE community program.	Coordinate with TFS, our city and community to establish a FIREWISE community program. This program will assist us with preplanning	3 years	Fire Department	$50,000	The primary benefit will come in the form of life and property conservation	General Fund/Grants

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			for a fire, during and after.					

5.10 City of Forest Hill Mitigation Strategy

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
MH - 5	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Wildfires	Form a multijurisdictional tactical unit with Forest Hill, Kennedale, and Crowley.	Develop ILA and planning.	3 months	Forest Hill Police Department (FHPD), Kennedale Police Department, Crowley Police Department	-	-	Forest Hill, Kennedale, Crowley
			Acquire appropriate equipment.	8 months	FHPD	$25,000	$50,000	Forest Hill
			Train law enforcement officers and implement.	1 year	FHPD	$50,000	$50,000	Forest Hill
ST - 1, T – 1, L-1	Severe Thunderstorms and High Winds, Lightning, Tornadoes	Ensure outdoors spaces in Forest Hill have adequate shelter for high-wind events such as severe thunderstorms or tornadoes.	Evaluate current shelters in outdoor spaces in Forest Hill.	2 weeks	Fire Department, Building	$1,000		City Budget
			Determine the size and space needs for shelters in outdoor spaces in Forest Hill.	2 weeks	Fire Department, Building	$1,000		City Budget
ST - 1, T - 1	Severe Thunderstorms and High Winds, Tornadoes	Ensure critical facilities in Forest Hill have adequate safe rooms to protect against high-wind events and tornadoes.	Evaluate the current conditions of critical facilities to determine which ones, if any, need safe rooms installed.	2 weeks	Fire Department	$1,000		City Budget
			Determine the size and space needed to shelter the population of the critical facility.	2 weeks	Fire Department	$1,000		City Budget
			Install safe rooms as needed in critical facilities.	2 weeks	Fire Department	$1,000		City Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ST - 3, T - 3	Severe Thunderstorms and High Winds, Tornadoes	Ensure Forest Hill ordinances and building codes reflect the need for high-wind resistant windows in new developments and facilities.	Review current jurisdictional ordinances and building codes related to high winds.	2 weeks	Fire Department, Building	$1,000.00		City Budget
			Develop or update ordinances and building codes to recommend new developments or facilities are built with high-wind resistant windows as needed.	2 months	Fire Department, Building	$5,000.00	$25,000.00	FEMA
ST - 3, T - 3	Severe Thunderstorms and High Winds, Tornadoes	Ensure Forest Hill critical facilities, including schools, have high-wind resistant windows in place.	Evaluate the need for high-wind resistant windows in critical facilities.	2 wks.	FD, Building	$1,000.00		City Budget
			Install high-wind resistant windows as necessary in critical facilities, including schools.	2 months	FD, Building	$5,000.00	$25,000.00	FEMA
ST - 4, T - 4	Severe Thunderstorms and High Winds, Tornadoes	Develop a severe thunderstorm and tornado outreach program for Forest Hill citizens.	Evaluate the hazards posed by high-wind events in Forest Hill.	2 weeks	Fire Department, Building	$1,000		City Budget
			Develop a severe weather outreach program that provides tips and pertinent information for protecting property against high-wind damage.	2 months	Fire Department, Building	$5,000	$25,000	FEMA

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ST - 4, T - 4	Severe Thunderstorms and High Winds, Tornadoes	Distribute severe weather mitigation information to Forest Hill citizens.	Provide severe weather mitigation information to Forest Hill citizens through a social media campaign, including severe thunderstorms and tornadoes.	1 month	Fire Department, Court	$2,000	$10,000	FEMA
			Ensure the Forest Hill website is updated during tornado season to educate citizens on severe weather mitigation activities.	2 weeks	Fire Department, Court	$0	N/A	N/A
F - 1	Flooding	Decrease flood insurance premiums in Forest Hill by participating in the Federal Emergency Management Agency's (FEMA) Community Rating System (CRS) program.	Work with city officials to become a member of the CRS program.	6 months	Fire Department, Public Works	$5,000.00	$20,000.00	FEMA
F - 2	Flooding	Review and remove repetitive loss properties in Forest Hill.	Review repetitive loss properties and work with homeowners to remove them using FEMA funding.	1 week	Fire Department, Building	$0	$0	N/A
PF - 1	Power Failure, Winter Storms, Severe Thunderstorms and High Winds, Tornadoes, and Extreme Temperature	Ensure Forest Hill critical facilities have generator as alternate power supply.	Identify appropriate size and type of generator for critical facilities.	2 months	FD & PD	$2,000.00	$20,000.00	FEMA
			Purchase/order generator for critical facilities.	2 months	FD & PD	$4,000.00	$40,000.00	FEMA

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
PF - 1	Power Failure, Winter Storms, Severe Thunderstorms and High Winds, Tornadoes	Ensure Forest Hill critical facilities have emergency lighting systems in place.	Evaluate emergency lighting systems in critical facilities.	4 months	Fire Department, Building	$4,000.00		City Budget
			Install emergency lighting systems in critical facilities.	6 months	Fire Department, Building	$10,000.00		FEMA
H - 1	Hail	Ensure Forest Hills critical facilities have hail-resistant roofing and windows installed.	Evaluate which critical facilities need hail-resistant roofing and windows installed.	1 week	Fire Department, Building	$0	$0	NA
			Install hail-resistant roofing and windows in identified critical facilities.	NA	NA	NA	NA	NA
H - 1	Hail	Provide hail-resistant parking areas for Forest Hill's city vehicles.	Evaluate the need for covered parking for city vehicles to protect them against hail.	2 weeks	Fire Department, Police Department, Building	$2,000	$50,000	City Budget
			Install awnings as needed to protect city vehicles against hail.	NA	NA	NA	NA	NA
H - 2	Hail	Develop a hail outreach program for Forest Hill citizens.	Evaluate the hazards posed by hail in the city.	2 weeks	Fire Department, Building	$0	NA	NA
			Develop hail outreach program that provides tips and pertinent information for ensuring the protection of property against hail.	4 weeks	Fire Department, Building	$1,000	$50,000	FEMA
H - 2	Hail	Distribute hail mitigation information to Forest Hill citizens.	Provide hail mitigation information to citizens through a social media campaign.	4 weeks	Fire Department, Court	$1,000	$50,000	FEMA

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Provide hail mitigation information through the city website.	4 weeks	Fire Department, Court	$1,000	$25,000	FEMA
W - 1	Wildfire	Ensure Forest Hill water systems are adequate for fighting wildfires.	Evaluate the Forest Hill water system to ensure capacity for fighting wildfires.	1 month	Fire Department, Public Works	$1,000.00	$20,000.00	City Budget
			Install or upgrade needed equipment to ensure water systems are adequate.	3 months	Fire Department, Public Works	$20,000.00	$100,000.00	FEMA
W - 1	Wildfire	Mitigate wildfires by instituting landscaping practices at Forest Hill critical facilities.	Prevent wildfires from spreading to critical facilities by landscaping plants and brush away from buildings.	6 months	Fire Department, Building, Public Works	$20,000.00	$100,000.00	Forestry Service
W - 2	Wildfire	Review city ordinances and laws to ensure mitigation practices are in effect in Forest Hill.	Enact building permit process that encourages wildfire resistant construction.	6 months	Building, Fire Department	$4,000.00	$40,000.00	Forestry Service
W - 2	Wildfire	Ensure adequate Forest Hill wildfire response plans and procedures are in place.	Review current wildfire response plans and procedures.	1 month	Fire Department	$1,000.00	$10,000.00	City Budget
			Develop or update wildfire response plans and procedures.	2 months	Fire Department	$4,000.00	$$40,000.00	Forestry Service
			Provide wildfire response training to fire personnel.	2 months	Fire Department, TCC	$2,000.00	$20,000.00	Forestry Service
W - 3	Wildfire	Provide information to Forest Hill citizens regarding the hazards posed by wildfires.	Develop a wildfire outreach program that provides tips and pertinent information for ensuring the protection of property against wildfires.	3 months	Fire Department, TCC	$10,000	$100,000	FEMA

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
W - 3	Wildfire	Determine the process for becoming a Firewise Community in Forest Hill.	Work with the Texas Department of Emergency Management to become a Firewise Community.	6 months	Fire Department	$20,000	$100,000	FEMA
WS - 1	Winter Storm	Evaluate winter weather response capabilities in Forest Hill.	Conduct an assessment of winter weather response capabilities.	2 months	Fire Department, Public Works	$1,000	$50,000	City Budget
			Acquire equipment needed as determined by assessment.	1 year	Fire Department, Public Works	$1,000	$300,000	FEMA
			Provide safety training to first responders on winter weather hazards.	6 months	Fire Department, Public Works, Tarrant County	$2,000	$100,000	FEMA
WS - 1	Winter Storm	Evaluate winter weather mitigation capabilities in Forest Hill.	Conduct an assessment of winter weather plans in place for jurisdiction public works.	2 months	Fire Department, Public Works	$1,000	$50,000	City Budget
			Develop or update winter weather mitigation plan.	3 months	Fire Department, Public Works	$5,000	$25,000	FEMA
WS - 1	Winter Storm	Develop a winter weather outreach program for Forest Hill citizens.	Evaluate the hazards posed by severe winter weather in Forest Hill.	2 months	Fire Department, Police Department	$2,000.00	$20,000.00	City Budget
			Develop a winter weather outreach program that provides tips and pertinent information for avoiding hypothermia and icy conditions.	6 months	Fire Department, Police Department	$20,000.00	$100,000.00	FEMA

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
WS - 1	Winter Storm	Distribute winter weather mitigation information to Forest Hill residents.	Publish winter weather mitigation information to Forest Hill citizens through a social media campaign.	2 months	Fire Department, Court	$2,000.00		FEMA
			Ensure the Forest Hill website is updated during winter months to educate citizens on winter weather mitigation activities.	2 months	Fire Department, Court	$2,000.00		FEMA
IDO - 2	Infectious Disease Outbreak	Prepare Forest Hill first responders for mass prophylaxis distribution.	Train first responders in point of distribution (POD) procedures.	2 months	Fire Department	$2,000		FEMA
			Conduct a POD exercise to test plans and procedures.	2 months	Tarrant County Health Department	$2,000		FEMA
IDO - 3	Infectious Disease Outbreak	Ensure continuity procedures are in place to prepare for a long-term employee shortage at Forest Hill facilities.	Review continuity of operations (COOP) plans and procedures for city employees and facilities.	1 month	Fire Department	$0		City Budget
			Provide COOP training for jurisdiction employees.	2 months	Tarrant County Health Department	$2,000		FEMA
IDO - 4	Infectious Disease Outbreak	Develop a public information campaign to educate Forest Hill public about infectious diseases.	Educate the public on pandemics, including isolation, quarantine, triage, and medical care.		Forest Hill Fire Department	$4,000	$40,000	FEMA
D - 1	Drought	Review Forest Hill water enforcement legislation and update as necessary to mitigate the effects of drought.	Review current legislation for water conservation enforcement in Forest Hill.	2 weeks	FD & PW	$0	N/A	N/A

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Develop or update water conservation enforcement legislation to ensure effective practices during periods of drought.	4 weeks	FD & PW	$200	$50,000	City Budget
D - 1	Drought	Develop contingency plans for Forest Hill to ensure adequate power and water supply during prolonged periods of drought.	Review current contingency plans.	2 weeks	FD & PW	$0	N/A	N/A
			Develop or update portable water contingency plans.	2 weeks	FD & PW	$0	N/A	N/A
			Develop or update power supply contingency plans.	2 weeks	FD & PW	$0	N/A	N/A
D - 2	Drought	Upgrade water and irrigation system to conserve water on Forest Hill.	Upgrade water and irrigation system.	2 months	FD & PW	$1,000.00		City Budget
D - 3	Drought	Develop a drought awareness education program for Forest Hill citizens.	Evaluate the hazards posed by drought in Forest Hill.	2 weeks	FD	$0	N/A	N/A
			Develop a drought awareness education program that provides tips and pertinent information for ensuring the protection of property and the environment against drought.	4 weeks	FD, PW, UB	$2,000	$50,000	FEMA
D - 3	Drought	Distribute drought awareness information to Forest Hill citizens.	Provide drought awareness information to Forest Hill citizens through a social media campaign.	4 weeks	Court	$1,000.00	$25,000.00	FEMA

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Provide drought awareness information through the Forest Hill website.	4 weeks	Court	$1,000.00	$25,000.00	FEMA
L - 1	Lightning	Protect communication infrastructure in Forest Hill from lightning.	Evaluate the need for lightning protection on communications infrastructure in Forest Hill.	1 month	Police Department	$1,000	$50,000	City Budget
			Install lightning rods on existing and future communication infrastructure.	2 months	Police Department	$10,000	$50,000	FEMA
L - 1	Lightning	Ensure Forest Hill critical facilities are protected against lightning.	Evaluate the need for lightning protection for Forest Hill critical facilities.	1 month	Police Department	$1,000.00	$50,000.00	City Budget
			Install lightning rods and other protective equipment on critical facilities.	2 months	Police Department	$10,000.00	$50,000.00	FEMA
L - 2	Lightning	Develop a lightning outreach program for Forest Hill citizens.	Evaluate the hazards posed by lightning in Forest Hill.	2 months	Police Department	$15,000.00	$50,000.00	FEMA
			Develop a lightning outreach program that provides tips and pertinent information for protecting property against lightning damage.	2 months	Fire Department, Police Department	$4,000.00	$50,000.00	FEMA
L - 2	Lightning	Distribute lightning mitigation information to Forest Hill citizens.	Provide lightning mitigation information to Forest Hill citizens through a social media campaign.	1 month	Fire Department, Court	$2,000.00		FEMA

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Provide lightning awareness information at outdoor spaces throughout Forest Hill.	2 months	Fire Department, Public Works	$3,000.00		FEMA
HM - 1	Hazardous Materials Release	Provide Forest Hill fire personnel with the necessary gear to respond to hazmat releases.	Evaluate the hazmat gear currently provided by Forest Hill Fire Department.	2 weeks	Fire Department	$1,000		City Budget
			Acquire the gear needed as identified in the evaluation.	6 months	Fire Department	$25,000		FEMA
HM - 1	Hazardous Materials Release	Ensure Forest Hill fire department has the equipment necessary to respond to hazmat releases.	Evaluate the hazmat equipment currently owned by Forest Hill FD.	2 weeks	Fire Department	$1,000		City Budget
			Acquire the equipment needed as identified in the evaluation.	6 months	Fire Department	$5,000		FEMA
HM - 2	Hazardous Materials Release	Develop a hazardous materials awareness education program for Forest Hill citizens.	Evaluate hazardous materials that are used or transported in Forest Hill.	2 months	Fire Department, Public Works	$2,000		City Budget
			Develop a hazardous materials awareness education program that provides tips and pertinent information for ensuring the protection of property and people from hazardous materials.	2 months	Fire Department	$5,000	$25,000	FEMA
HM - 2	Hazardous Materials Release	Distribute hazardous materials mitigation information to Forest Hill citizens.	Provide hazardous materials mitigation information to Forest Hill citizens through a social media campaign.	2 months	Fire Department, Court	$5,000	$25,000	FEMA

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Provide hazardous materials m information through the Forest Hill website.	2 months	Fire Department, Court	$2,000	$15,000	FEMA
ET - 1	Extreme Temperatures	Ensure the City of Forest Hill has an extreme heat plan in place.	Review current plans and procedures related to extreme heat.	1 week	FHFD	$0	NA	NA
			Open cooling centers and provide public information.	1 month	FHFD	$0	NA	NA
ET - 1	Extreme Temperatures	Identify extreme heat mitigation plan for critical infrastructure in the City of Forest Hill.	Ensure essential functions continue in the event of high temperatures through mitigation activities.	2 weeks	FD	$0	NA	NA
			Develop or update mitigation plan and procedures for critical infrastructure when high temperatures are present.	1 month	FD	$500	NA	NA
ET - 2	Extreme Temperatures	Develop an extreme heat outreach program for Forest Hill citizens.	Evaluate the hazards posed by extreme heat in Forest Hill.	2 weeks	FD	$0	NA	NA
			Develop an extreme heat outreach program that provides tips and pertinent information for ensuring the health and safety of citizens during extreme heat.	2 months	FD	$2,000		FEMA

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ET - 2	Extreme Temperatures	Distribute extreme heat mitigation information to Forest Hill citizens.	Publish extreme heat mitigation information to the Forest Hill citizens through a social media campaign.	4 weeks	Forest Hill Court	$1,000	$25,000	FEMA
			Provide extreme heat mitigation information through the Forest Hill's website.	4 weeks	Forest Hill Court	$1,000	$25,000	FEMA
ES - 1	Expansive Soils	Mitigate expansive soils in City of Forest Hill.	Improve construction techniques through building code enhancements.	6 months	FHFD &FH	$2,000		City Budget
			Educate construction contractors, homeowners, and business owners about mitigation techniques.	6 months	FHFD &FH	$500		City Budget

5.11 City of Fort Worth Mitigation Strategy

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
T - 4, ST, - 4	Severe Thunderstorms and High Winds, Tornadoes	Develop a program to identify mobile and manufactured home parks and work with park managers to prepare the residents for severe thunderstorms in the City of Fort Worth.	Utilize GIS to identify manufactured and mobile homes in Fort Worth.	4 months	OEM, ITS	$3,500	$150,000	City Budget
			Work with manufactured and mobile home park managers to enhance severe weather awareness.	8 months	OEM	$2,500	$150,000	City Budget
MH - 7	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires	Ensure City of Fort Worth citizens have access to emergency communications.	Assist citizens with funding for purchase of Weather Alert Radios through rebate program.	6 months	OEM	$100,000	$2,000,000	City Budget, Private Foundation Grants, Corporate Grants
ST - 1, T - 1	Severe Thunderstorms and High Winds, Tornadoes	Participate in the Metropolitan safe rooms in the City of Fort Worth.	Conduct compliance inspection for the safe room rebate programs applications.	Continual	OEM	$25,000	$5,000,000	Post Disaster Mitigation Grants
ST - 3, T - 3	Severe Thunderstorms and High Winds, Tornadoes	Mandate storm-resistant construction in the City of Fort Worth.	Inspect new and existing construction for the proper installation of storm-resistant construction such as “hurricane clips”.	6 months	Fort Worth OEM, Planning and Development	$10,000	$500,000	City Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
F - 3	Flooding	Improve the watershed on Lebow Channel by elimination of dangerous low water crossings, enlargement of restrictive bridges and culverts, channel enlargement, detention, acquisition of flood prone properties, and stream restoration in the City of Fort Worth.	Complete construction of Dewey Street Crossing Project (increased capacity of Dewey Street Bridge).	2 months	T&PW Storm Water Management, OEM	$2,275,000	$15,000,000	FEMA Pre-Disaster Hazard Mitigation Grant, City Budget
			Complete reimbursement process and close the project.	4 months	T&PW Storm Water Management, OEM	$2,500	$15,000,000	City Budget
F - 3	Flooding	Prevent and decrease damage from stream bank erosion in the City of Fort Worth.	Survey creeks in Fort Worth and develop a database of locations subject to stream bank erosion.	8 months	Transportation and Public Works, ITS, OEM	$5,000	$500,000	City Budget
			Determine erosion control techniques to use on area creek banks.	1 year	Transportation, Public Works	$10,000	$500,000	City Budget
			Implement erosion control techniques to use on area creek banks.	2 months	Transportation, Public Works	$250,000	$500,000	City Budget
DF - 4	Dam Failure	Conduct breach analysis for all high hazard dams in the City of Fort Worth.	Identify high hazard dams. Work with Texas Commission on Environmental Quality (TCEQ) to identify high hazard dams in areas that may be annexed.	Continual	T&PW Storm Water Management	$5,000	$750,000	City Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Conduct breach analysis. • Breach analysis for French Lake completed in 2003. Lake Worth completed in 2009. • Breach analysis pending for Lake Como, Fosdic Lake, Lake Greenbriar, Luther Lake, White Lake, and Willow Creek Lake.	3 years	T&PW Storm Water Management	$300,000	$750,000	City Budget
			Develop emergency action plans for high hazard dams. • Emergency Action Plans for Lake Worth, Lake Como, Fosdic Lake, French Lake, Lake Greenbriar, Luther Lake, White Lake, and Willow Creek Lake completed in 2012 • No known pending as of July 2013	4 years	T&PW Storm Water Management	$10,000 per dam	$750,000	City Budget
DF - 4	Dam Failure	Conduct breach analysis for levees in the City of Fort Worth.	Conduct breach analysis. Tarrant Regional Water District is beginning work on breach analysis.	3 years	Tarrant Regional Water District	$350,000	$500,000	Tarrant Regional Water District
			Develop emergency action plans (EAPs). EAPs to be developed in coordination with Fort Worth OEM.	4 years	Tarrant Regional Water District	$75,000	$500,000	Tarrant Regional Water District

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
F - 5	Flooding	Provide flood preparedness information to City of Fort Worth citizens that address local hazards. Citizens are more likely to read and follow information that is specific to their area.	Determine citizen flood preparedness actions. Actions for flash flooding (as opposed to riverine flooding).	3 months	Fort Worth OEM	$2,500	$100,000	City Budget
			Develop preparedness materials.	6 months	Fort Worth OEM	$500	$100,000	City Budget
			Print preparedness materials.	8 months	Fort Worth OEM	$2,500	$100,000	City Budget
PF - 1	Power Failure, Winter Storms, Severe Thunderstorms and High Winds, Tornadoes	Provide generator backup capability to City of Fort Worth community centers designated as shelter locations.	Determine electrical service requirements for essential operation of community centers.	4 months	Transportation and Public Works, Parks and Community Services	$5,000	$500,000	City Budget
			Evaluate best method to provide generator backup capability: • Install generators at facilities. • Retrofit facilities with connections for portable generators.	6 months	Transportation and Public Works, Parks and Community Services	$10,000	$500,000	City Budget
			Implement generator backup capability.	1 year	Transportation and Public Works, Parks and Community Services	$350,000	$500,000	City Budget
H - 1	Hail	Gather costs for installing hail-resistant roofing and window coverings with a focus on critical infrastructure in the City of Fort Worth.	Retrofit City buildings with hail-resistant roofing.	3 months	Transportation and Public Works Facilities Division	$2,500	$100,000	City Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
H - 2	Hail	Develop a public education campaign to encourage "hail-resistant" roofing in new construction and roof replacements in the City of Fort Worth.	Research existing hail-resistant roofing public education materials.	1 month	OEM	$500	$1,000,000	City Budget
			Research costs/benefits of hail-resistant roofing for private sector structures.	2 months	OEM	$500	$1,000,000	City Budget
			Develop public education materials (if existing materials are not sufficient).	4 months	OEM	$2,500	$1,000,000	City Budget
			Print and begin distribution of public education materials.	5 months	OEM	$25,000	$1,000,000	City Budget
H - 2	Hail	Conduct training on "hail-resistant" roofing in new construction and roof replacements in the City of Fort Worth.	Conduct classes to the general public, home builders and contractors on hail resistant roofing standards and grant programs.	6 months	OEM	$2,500	$10,000	City Budget
W - 1	Wildfire	Ensure City of Fort Worth water systems are adequate for fighting wildfires.	Increase public education on how to reduce the risks from wildfires (construction, landscaping, etc.).	12 months	Fort Worth OEM, Fort Worth Fire Department	$10,000	Unknown	City Funds
W - 1	Wildfire	Mitigate wildfires by encouraging wildfire resistant construction practices in the City of Fort Worth.	Enact building permit process that encourages wildfire resistant construction.	12 months	Fort Worth OEM, Fort Worth Planning and Development	$25,000	Unknown	City Funds
WS - 1	Winter Storms	Improve winter weather winter weather response capabilities in the City of Fort Worth.	Purchase additional street sanding capacity.	6 months	Fort Worth OEM, Fort Worth Transportation and Public Works	$250,000	Unknown	City Funds

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
WS - 2	Winter Storms	Enhance winter weather preparedness program for Fort Worth citizens.	Increase public education concerning winter storm preparedness and mitigation.	9 months	Fort Worth OEM	$12,000	Unknown	City Funds
IDO - 2	Infectious Disease Outbreak	Prepare City of Fort Worth staff for mass prophylaxis distribution.	Train staff in point of distribution (POD) procedures.	12 months	Fort Worth OEM	$35,000	Unknown	City Funds
			Conduct a POD exercise to test plans and procedures.	18 months	Fort Worth OEM	$12,000	Unknown	City Funds
IDO - 4	Infectious Disease Outbreak	Develop a public information campaign to educate Fort Worth public about infectious diseases.	Educate the public on pandemics, including isolation, quarantine, triage, and medical care.		Fort Worth OEM	$15,000	Unknown	City Funds
D - 1	Drought	Develop public education program to mitigate the effects of drought in the City of Fort Worth.	Participate in the design and implementation of the Fort Worth specific water conservation public education efforts to complement existing programs.	6 months	Fort Worth OEM, Fort Worth Water Department	$10,000	$100,000	City Funds
D - 1	Drought	Develop contingency plans to ensure adequate water supply during prolonged periods of drought in the City of Fort Worth.	Develop a contingency plan to identify potential impacts of drought on the community to include utilities such as power generation and drinking water; health & safety including pre-existing health conditions and special needs; and emergency response such as fire suppression operations.	8 months	Fort Worth OEM, Fort Worth Water Department	$40,000	$100,000	City Funds

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
TR - 1	Terrorism	Ensure Fort Worth Police Department has the appropriate equipment to respond to terrorism incidents.	Evaluate the equipment currently in place at Fort Worth Police Department.	6 months	Fort Worth OEM, Fort Worth Police Department	$5,000	Unknown	City Funds
			Acquire the equipment identified in the assessment.	12 months	Fort Worth OEM, Fort Worth Police Department	Unknown	Unknown	Homeland Security Grant Funds
TR - 2	Terrorism	Conduct full scale homeland security scenario exercise for Fort Worth.	Conduct a full scale exercise to test terrorist response plans and procedures.	18 months	Fort Worth OEM	$25,000	Unknown	City Funds
L - 1	Lightning	Protect structures from lightning in the City of Fort Worth.	Provide lightning mitigation materials with building permit packets.	6 months	Fort Worth OEM,	$15,000	Unknown	City Funds
					Fort Worth Planning & Development			
L - 1	Lightning	Ensure Fort Worth critical facilities are protected against lightning.	Ensure all city critical infrastructure has adequate lightning mitigation in place.	1 year	Fort Worth OEM,	$35,000	$1,000,000	City Funds
					Fort Worth Transportation and Public Works			
HM - 1	Hazardous Materials Release	Ensure City of Fort Worth Fire Department has the equipment necessary to respond to hazmat incidents.	Evaluate the hazmat gear currently used by Fort Worth Fire Department.	6 months	Fort Worth Fire Department	$5,000	Unknown	City Funds
			Acquire the gear needed as identified in the evaluation.	12 months	Fort Worth Fire Department	Unknown	Unknown	City Funds

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
HM - 2	Hazardous Materials Release	Develop a hazardous materials awareness education program for Fort Worth citizens.	Develop a hazardous materials awareness education program that provides tips and pertinent information for protection of property and people from hazardous materials.	6 months	Fort Worth OEM,	$25,000	Unknown	City Funds,
					Fort Worth Fire Department			LEPC
ET - 1	Extreme Temperatures	Develop an extreme temperature mitigation plan for City of Fort Worth Citizens.	With Parks and Community Services Department and non-profit organizations provide cooling and warming stations, shelters, assistance with utilities and resources for populations at risk.	1 year	Fort Worth OEM	$5,000	Unknown	City Funds
ET-1	Extreme Temperatures	Develop and extreme temperature outreach program for City of Fort Worth citizens.	Develop an extreme temperature outreach program that provides tips and pertinent information for ensuring the health and safety of citizens during extreme temperatures.	2 months	Fort Worth OEM	$2,000	Unknown	City Funds
ES - 1	Expansive Soils	Mitigate expansive soils in the City of Fort Worth.	Improve construction techniques through building code enhancements.	1 year	Fort Worth OEM, Fort Worth Planning & Development	$25,000	Unknown	City Funds

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Educate construction contractors, homeowners, and business owners about mitigation techniques.	6 months	Fort Worth OEM, Fort Worth Planning & Development	$10,000	Unknown	City Funds

5.12 City of Grapevine Mitigation Strategy

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
MH - 6	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires	Compile a business/entertainment database specific to emergency warning for severe weather in the City of Grapevine.	Create and compile database of restaurant/businesses/entertainment/hotels that need to warn patrons quickly of severe weather.	6 months	CVB	$5,000	$15,000	Departmental Budget
			Maintain/update database annually.	1 year	CVB	$0	$10,000	Departmental Budget
MH - 6	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires	Install new security system in the City of Grapevine police building at allow for better access controls.	Determine appropriate system to meet needs.	1 year	Police Department	$50,000	$150,000	Bonds
			Purchase system.	2 years	Purchasing	$5,000	$15,000	Departmental Budget
			Install system.	3 years	Facility Services	$5,000	$10,000	Departmental Budget
MH - 6	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires	Improve IT system to incorporate laser fiche system into police/fire server systems	Determine appropriate system to meet needs.	1 month	IT Department	$50,000	$150,000	City Budget
			Purchase system.	3 months	Purchasing Department	$5,000	$15,000	Departmental Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
		in the City of Grapevine.	Install system.	5 months	IT Department	$5,000	$15,000	City Budget
MH - 6	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires	Close fiber loop to City of Grapevine police and fire buildings allowing for redundant network.	Determine appropriate system to meet needs.	1 month	IT Department	$2,000,000	$5,000,000	City Bonds
			Purchase system.	7 months	Purchasing Department	$10,000	$20,000	Departmental Budget
			Install system.	1 year	IT Department	$20,000	$35,000	City Bonds
MH - 6	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires	Compile database of all apartment managers/management in the City of Grapevine.	Create and compile apartment management database.	3 months	Police Department	$5,000	$10,000	Departmental Budget
			Maintain and update apartment management database.	Annually	Police Department	$1,000	$2,000	Departmental Budget
MH - 6	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter	Compile database of all neighborhood/homeowner	Create and compile neighborhood association database.	3 months	Police Department	$5,000	$10,000	Departmental Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
	Storms, Flooding, Dam Failure, Wildfires	associations in Grapevine.	Maintain and update neighborhood database.	Annually	Police Department	$1,000	$2,000	Departmental Budget
MH - 6	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires	Develop a program for the low cost purchase of National Oceanic and Atmospheric Administration (NOAA) all-hazard weather radios through utility bills (similar to sprinkler system rain sensor program in place) for City of Grapevine residents.	Identify vendor for bulk purchase of weather radios with SAME technology.	1 year	Emergency Management	-	$5,000	Departmental Budget
			Make bulk purchase of radios.	1 year	Emergency Management	$20,000	$50,000	City Budget
			Distribute to citizens and allow them to purchase at reduce cost through water bill payment.	1 year	Utility Billing	$10,000	$150,000	Departmental Budget
ST - 1, T - 1	Severe Thunderstorms and High Winds, Tornadoes	Install storm shelter safe rooms for fire department personnel and visitors at all five fire stations	Determine appropriate size shelter for each fire station.	7 months	Facility Services	$200,000	$350,000	Quality of Life Funds
			Purchase/order storm shelter for each fire station.	1 year	Purchasing	$10,000	$15,000	Departmental Budget
			Deliver and install storm shelters.	1 year	Facility Services	$10,000	$15,000	Departmental Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
		in the City of Grapevine.						
ST - 1, T - 1	Severe Thunderstorms and High Winds, Tornadoes	Install storm shelter safe rooms for City personnel and visitors at all critical facilities in the City of Grapevine.	Determine appropriate size shelter for each location.	1 year	Facility Services	$1,500,000	$3,000,000	Quality of Life Funds
			Purchase/order storm shelter for each location.	2 years	Purchasing	$10,000	$15,000	Departmental Budget
			Deliver and install storm shelters.	3 years	Facility Services	$10,000	$15,000	Departmental Budget
PF - 1	Power Failure, Winter Storms, Severe Thunderstorms and High Winds, Tornadoes, and Flooding	Have automatic emergency power for the Grapevine City Hall in the event that the main power supply is disrupted.	Identify the appropriate size and type for generator for City Hall.	6 months	Facility Services	$0	$100,000	Departmental Budget
			Purchase/order generator for City Hall.	7 months	Purchasing	$175,000	$350,000	City Budget
			Deliver and install City Hall generator.	1 year	Facility Services	$0	$100,000	Departmental Budget
PF - 1	Power Failure, Winter Storms, Severe Thunderstorms and High Winds, Tornadoes	Have automatic power generation for the Grapevine community activities center (CAC) in the event that the main power supply is disrupted.	Identify the appropriate size and type for generator for the CAC.	1 year	Facility Services	$0	$100,000	Departmental Budget
			Purchase/order generator for the CAC.	1 year	Purchasing	$175,000	$350,000	City Budget
			Deliver and install a CAC generator.	2 years	Facility Services	$0	$100,000	Departmental Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
PF - 1	Power Failure, Winter Storms, Severe Thunderstorms and High Winds, Tornadoes	Have automatic power generation for the Grapevine municipal service center in the event that the main power supply is disrupted.	Identify the appropriate size and type for generator for the Municipal Service Center.	2 years	Facility Services	$0	$100,000	Departmental Budget
			Purchase/order generator for the Municipal Service Center.	2 years	Purchasing	$175,000	$350,000	City Budget
			Deliver and install a Municipal Service Center Generator.	3 years	Facility Services	$0	$100,000	Departmental Budget
IDO - 3	Infectious Disease Outbreak	Hire consultant to work with emergency management office to develop robust COOP plan for all City of Grapevine departments.	Identify scope of work and bid/select consultant.	1 year	Emergency Management	$75,000	$150,000	City Budget
			Work with selected consultant and each department to develop robust COOP plan for provisions of City services during disease outbreak.	2 years	All Departments			
			Deliver completed plan and test plan in series of tabletop and functional exercises in offsite/remote office locations.	2 years	All Departments	$5,000	$15,000	Departmental Budget
HM - 5	Hazardous Materials Release	Incorporate hazardous materials/Tier II data layer into	Download and install CAMEO related software.	1 month	GIS	-	$2,000	City Budget
			Train GIS staff on use of CAMEO for GIS applications.	3 months	GIS	$2,000	$5,000	Department Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
		Grapevine GIS mapping.	Import Tier II database from Tarrant County into GIS layer for overlay into City of Grapevine Base Maps.	5 months	GIS	-	$5,000	City Budget
HM - 5	Hazardous Materials Release	Incorporate Tier II information into Grapevine Fire Pre-Planning/CAD Data.	Import and convert Tier II database into Excel format.	1 month	Police Dispatch		$5,000	Department Budget
			Transcribe database into CRIMES/CAD data base language.	5 months	Police Dispatch		$5,000	Department Budget
ES - 1	Expansive Soils	Mitigate expansive soils in the City of Grapevine.	Improve construction techniques through building code enhancements.	Ongoing	Building	Determined by personnel cost.	Limiting development in identified areas of expansive soils will reduce exposure to the hazardous effects of unstable soils.	General Fund
			Educate construction contractors, homeowners, and business owners about mitigation techniques.	Ongoing	Building	Determined by personnel cost.	Limiting development in identified areas of expansive soils will reduce exposure to the hazardous effects of unstable soils.	General Fund

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
T - 5	Tornado	Compile a business/entertainment database specific to emergency warning for severe weather in the City of Grapevine.	Create and compile database of restaurant/businesses/entertainment/hotels that need to warn patrons quickly of severe weather.	6 months	CVB	$5,000	$15,000	Departmental Budget
T - 1	Tornado	Install storm shelter safe rooms for fire department personnel and visitors at all five fire stations in the City of Grapevine.	Determine appropriate size shelter for each fire station.	7 months	Facility Services	$200,000	$350,000	Quality of Life Funds
F - 3	Flooding	Compile database of all neighborhood/homeowner associations.	Create and compile neighborhood association database.	3 months	Police Department	$5,000	$10,000	Departmental Budget
F - 3	Flooding	Compile database of all apartment managers/management in the City of Grapevine.	Create and compile apartment management database.	3 months	Police Department	$5,000	$10,000	Departmental Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
D - 1	Drought	Enforce water conservation measures during periods of extreme temperatures and limited rainfall in the City of Grapevine.	Lobby legislators for grant funding for water conservation enforcement during high hazard times similar to the same type of grant programs for "click it or ticket".	1 year	City Manager's Office	$10,000	$15,000	City Budgetary Funding
D - 1	Drought	Attain grants for water conservation measures during periods of extreme temperatures and limited rainfall.	Legislation changes allow for grant funding of water conservation enforcement.	2 years	Code Enforcement	$0	$10,000	Department Budget
D-1	Drought	Install low-flow fixtures at City facilities to conserve water.	Install low-flow fixtures at City facilities.	UNK	UNK	UNK	UNK	City Budgetary Funding
ST - 1	Thunderstorms & High Wind	Install storm shelter safe rooms for fire department personnel and visitors at all five fire stations in the City of Grapevine.	Determine appropriate size shelter for each fire station.	7 months	Facility Services	$200,000	$350,000	Quality of Life Funds

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ST - 1	Thunderstorms & High Wind	Install storm shelter safe rooms for City personnel and visitors at all critical facilities in the City of Grapevine.	Determine appropriate size shelter for each location. Purchase/order storm shelter for each location.	2 year	Facility Services	$1,500,000	$3,000,000	Quality of Life Funds
H - 1	Hail	Develop a program for the low cost purchase of National Oceanic and Atmospheric Administration (NOAA) all-hazard weather radios through utility bills (similar to sprinkler system rain sensor program in place) for City of Grapevine residents.	Identify vendor for bulk purchase of weather radios with SAME technology. Make bulk purchase of radios	1 year	Emergency Management	$5,000	$5,000	Departmental Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
H -2	Hail	Implement a program for the low cost purchase of National Oceanic and Atmospheric Administration (NOAA) all-hazard weather radios through utility bills (similar to sprinkler system rain sensor program in place) for City of Grapevine residents.	Distribute to citizens and allow them to purchase at reduce cost through water bill payment.	1 year	Utility Billing	$10,000	$150,000	Departmental Budget
L - 1	Lightning	Develop a program for the low cost purchase of National Oceanic and Atmospheric Administration (NOAA) all-hazard weather radios through utility bills (similar to sprinkler	Identify vendor for bulk purchase of weather radios with SAME technology. Make bulk purchase of radios	1 year	Emergency Management	$5,000	$5,000	Departmental Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
		system rain sensor program in place) for City of Grapevine residents.						
L - 2	Lightning	Implement a program for the low cost purchase of National Oceanic and Atmospheric Administration (NOAA) all-hazard weather radios through utility bills (similar to sprinkler system rain sensor program in place) for City of Grapevine residents.	Distribute to citizens and allow them to purchase at reduce cost through water bill payment.	1 year	Utility Billing	$10,000	$150,000	Departmental Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
WS – 1, ET - 1	Winter Storms, Extreme Temperatures	Develop a program for the low cost purchase of National Oceanic and Atmospheric Administration (NOAA) all-hazard weather radios through utility bills (similar to sprinkler system rain sensor program in place) for City of Grapevine residents.	Identify vendor for bulk purchase of weather radios with SAME technology. Make bulk purchase of radios	1 year	Emergency Management	$5,000	$5,000	Departmental Budget
WS - 2	Winter Storms	Implement a program for the low cost purchase of National Oceanic and Atmospheric Administration (NOAA) all-hazard weather radios through utility bills (similar to sprinkler	Distribute to citizens and allow them to purchase at reduce cost through water bill payment.	1 year	Utility Billing	$10,000	$150,000	Departmental Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
		system rain sensor program in place) for City of Grapevine residents.						
W - 2	Wildfire	Compile database of all neighborhood/homeowner associations for wildfire notifications	Create and compile neighborhood association database.	3 months	Police Department	$5,000	$10,000	Departmental Budget
W - 2	Wildfire	Compile database of all apartment managers/management in the City of Grapevine for wildfire notifications	Create and compile apartment management database.	3 months	Police Department	$5,000	$10,000	Departmental Budget
W-2	Wildfire	Implement FIREWISE community program.	Coordinate with TFS, our city and community to establish a FIREWISE community program. This program will assist us with preplanning for a fire, during and after.	3 years	Fire Department	$50,000	The primary benefit will come in the form of life and property conservation.	General Fund/Grants

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ET-1	Extreme Temperatures	Develop and extreme temperature outreach program for City of Grapevine employees that work outside.	Develop an extreme temperature outreach program that provides tips and pertinent information for ensuring the health and safety of employees working outside during extreme temperatures.	2 months	OEM	$2,000	Unknown	City Funds
ET - 1	Extreme Temperatures	Attain grants for water conservation measures during periods of extreme temperatures and limited rainfall.	Legislation changes allow for grant funding of water conservation enforcement.	2 years	Code Enforcement	$0	$10,000	Department Budget
DF - 1	Dam Failure	Identify inundation areas for dams located in the City of Grapevine	Complete inundation studies for dams located within the City of Grapevine.	1-2 years	Public Works and Transportation	TBD	TBD	TBD
DF - 1	Dam Failure	Educate citizens regarding risk for dam failure that are located in inundation areas.	Develop and implement information medium to inform citizens in inundation areas.	1-2 years	Emergency Management	TBD	TBD	TBD

5.13 Haltom City Mitigation Strategy

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
MH - 1	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires	Enhance warning systems to warn citizens about severe weather in Haltom City.	Implement OWS.	Completed	EM	$52,000	$200,000	General Fund
			Implement Code Red phone notification system.	Continual	EM	$7,700 annually	$32,000	General Fund
MH - 6	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires	Haltom City staff will keep an up-to-date list of businesses in the community.	Create and compile business database.	Haltom City	Planning	$5,000	$10,000	City Budget
			Maintain/update a business database.	Haltom City	Planning	$1,000	$2,000	City Budget
F - 2	Flooding	Enhance flood plain regulations in Haltom City.	Annual repetitive losses due to flooding will continue to be assessed and mapped. Thus make attempts to mitigate the effects within the city.	Annual along with a five year reassessment schedule	Engineering	$10,000,000	$40,000,000	General Fund, Haltom City
PF - 1	Power Failure, Winter Storms, Severe Thunderstorms	Have automatic emergency power generators for all stations in the event that the	Identify appropriate size and type of generator for fire stations #3.		Haltom City Fire/Rescue and Public Works	$0	$100,000	FEMA HMGP

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
	and High Winds, Tornadoes, Extreme Temperatures	main power supply is disrupted in Haltom City.	Purchase generators.		Haltom City Fire/Rescue	$50,000	$100,000	FEMA HMGP
			Evaluate power needs to maintain library.		Building Maintenance	$1,500	$120,000	FEMA HMGP
			Advertise for bids for City Hall auxiliary generator.		Building Maintenance	$500	$120,000	FEMA HMGP
IDO - 2	Infectious Disease Outbreak	Reduce the effects of and loss of life to various disease populations that may be at risk to infectious diseases in Haltom City.	Identify existing current city owned and operated facilities that could be utilized as distribution points for vulnerable populations to assist with appropriate delivery of preventive measures.	As funding is available	Emergency Management, Fire/Rescue	Unknown	Unknown	Grants and other outside funding sources
D - 1	Drought	Identify areas where repetitive damages occur in Haltom City during chronic hazard events.	Haltom City Water Conservation during rainy seasons through Rain Sensors on Sprinkler Systems to mitigate the effects during periods of droughts.	Within 2 years of funding	Public Works			Annual Budget, Grant Funding, Citizens
ET - 1	Extreme Temperatures	Reduce or eliminate loss of life and property damage resulting from severe weather events related to extreme heat in the City of Haltom City.	Haltom City will determine and create cooling centers to allow citizens, especially vulnerable populations, to seek refuge from extreme temperatures.	As funding is available	Parks Department	As the City currently has several facilities that could be utilized for cooling centers, the costs are minimal.	Unknown	Grants or other outside funding sources

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ES - 1	Expansive Soils	Develop and enforce Haltom City ordinances.	Limit development in areas of high hazard expansive soils through enforcement of building codes and standards.	As funding is available.	Building Inspection	Determined by personnel costs.	Limiting development in identified areas of expansive soils will reduce exposure to the hazardous effects of unstable soils.	General Fund
T - 5	Tornado	Enhance warning systems to help warn the citizens of Haltom City, concerning the potential of tornadic activity.	Implement OWS upgrades to address potential areas where growth has and will occur that may impact the ability of the system to reach its intended service area.	Project will be implemented as development occurs.	EM	52,000	The impact of warning our population of the impending Tornado is difficult to measure with the impact to life and property. This number could be in the millions of dollars.	General Fund

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
T - 5	Tornado	Update our Code Red phone notification system with a more robust system.	Install a robust Code Red phone system to notify citizens of tornado warnings.	Completed with annual updates as our community grows.	EM	7700	The impact of warning our population of the impending Tornado is difficult to measure with the impact to life and property. This number could be in the millions of dollars.	General Fund
F - 3	Flooding	Add high water warning devices on our roadways that are prone to high water.	Install high water warning systems along creek beds to notify officials of potential flooding.	3-5 years as funding is available.	Public Works	225000	400000	Certificate of obligation Bond issues
F - 1	Flooding	Enhance and enforce our flood plain regulations in Haltom City.	Utilize FIRM maps to identify at-risk properties for flooding.	5-10 years as funding becomes available	Engineering	10,000,000	40,000,000	FEMA HMGP
DF - 1	Dam Failure	Improve our ability to inform our citizens of the risks associated with living near a dam that is a barrier that impounds a body of water.	Inspect the dam's structural integrity.	3-5 year project.	Engineering	200000	800000	General Fund
D - 2	Drought	Plan for the delivery of Potable water during times of severe drought.	Install above ground storage and portable tanks to increase potable water storage capacity.	3-10 year project	Public Works	Unknown	The impact is difficult to measure concerning the overall impact of	Bond issuance

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
							doing nothing.	
ES - 1	Expansive soils	Identify areas of our city that have a history of soil related damage to structures and roadways.	Construct new roadways using soil composition data to decrease expansive soil impacts.	By building code adoption with an appendix adopted by ordinance.	Inspections	Determined by personnel costs.	Unknown	General Fund
ET - 2	Extreme Temperatures	During these times of Extreme Heat we will initiate PSAs to target the population that may be at the highest risk from the effects of extreme heat.	Open cooling centers in Haltom City to provide relief for citizens affected by the extreme heat.	As funding is available	Parks Department	The City currently has several facilities that could be utilized for cooling centers, the costs are minimal. Mainly additional utility and personnel related costs.	Unknown	General Fund

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ST - 5	Thunderstorms and High Wind	Enhance warning systems to help warn the citizens of Haltom City, concerning the potential of Severe Storms (Severe Thunderstorms, High Winds).	By updating our Code Red notification system with a more robust process for notifying our citizens by way of smart phone applications, texting and other forms of social media. This will have the potential of reaching a more active and social community. This will allow for our whole community to be warned of this potential.	Completed with annual updates as our community grows.	EM	7700	The impact of warning our population of the impending Severe Storm is difficult to measure with the impact to life and property. This number could be in the millions of dollars.	General Fund
ST - 4	Thunderstorms and High Wind	Increase awareness through PSAs such as the Knowhat2do program and continue our efforts to increase the coverage of indoor warning devices, such as weather radios.	This effort would be to better inform our population of actions they can take to better prepare and ultimately survive the effects of Severe Storms. Add weather radios for indoor warning devices to all homes and businesses.	3-5 year project	EM	200,000	The impact is difficult to measure.	General Fund, Grants and donations.

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
H - 1	Hail	Enhance warning systems to help warn the citizens of Haltom City, concerning the potential of severe storms producing large hail.	By updating our Code Red notification system with a more robust process for notifying our citizens by way of smart phone applications, texting and other forms of social media in an effort to reach a more active and social community. This will further increase our ability to warn our whole community to the potential hazard of hail, associated with severe storms.	Completed with annual updates as our community grows.	EM	7700	The impact of warning our population of the impending Severe Storm with the potential of Hail is difficult to measure with the impact to life and property. This number could be in the millions of dollars.	General Fund
H - 2	Hail	Increase awareness through PSAs such as the Knowhat2do program and continue our efforts to increase the coverage of indoor warning devices, such as weather radios.	This effort would be to better inform our population of actions they can take to better prepare and ultimately survive the effects of Hail associated with Severe Storms by adding Weather Radios for the home and or business.	3-5 year project	EM	400,000	The impact of warning our population of the impending Severe Storm with the potential of Hail is difficult to measure with the impact to life and property. This number could be in the millions of dollars.	General Fund or bond issuance.

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
L - 1	Lightning	Enhance warning systems to help warn the citizens of Haltom City, concerning the potential of severe storms producing cloud to ground and cloud-to-cloud lightning.	Install lightning detection capabilities at weather stations.	1-3 years	EM	78000	The impact of warning our population concerning Lightning associated with a Severe Storm is difficult to measure with the impact to life and property. This number could be in the millions of dollars.	General Fund and or Bond issues.
L - 2	Lightning	Increase awareness through PSAs such as the Knowhat2do program and continue our efforts to increase the coverage of indoor warning devices, such as weather radios.	Distribute lightning mitigation educational materials to the public to encourage installation of lightning rods on homes.	3--5 year project	EM	400,000	The impact of warning our population of Lightning associated with Severe Storm is difficult to measure with the impact to life and property. This number could be in the millions of dollars.	General Fund or bond issuance.

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
WS - 1	Winter Storms	Enhance warning systems to help warn the citizens of Haltom City, concerning the potential of Winter Storms. These storms can impact our city in numerous ways from slick roads to loss of power from down power lines.	By updating our Code Red notification system with a more robust process for notifying our citizens by way of smart phone applications, texting and other forms of social media. This will have the potential of reaching a more active and social community. This would also allow for our whole community to be warned of the potential hazard associated with Winter Storms. The impact of this action will reduce the amount of potential accidents and it would offer our citizen more of advanced warning to prepare for loss of power and heat.	Annual project	EM	7700	The impact of warning our population of a Winter Storm is difficult to measure with the impact to life and property. This number could be in the millions of dollars.	General fund.
WS - 2	Winter Storms	Increase awareness through PSAs such as the Knowhat2do program and continue our efforts to increase the coverage of indoor warning devices, such as weather radios.	This effort would be to better inform our population of actions they can take to better prepare and ultimately survive the effects of Winter Storms. This action can and does reduce the amount of individuals who may be impacted from the extremes associated with Winter Storms by	3--5 year project	EM	400,000	The impact of warning our population of a Winter Storm is difficult to measure with the impact to life and property. This number could be in the	General Fund or bond issuance.

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			adding Weather Radios for the home and or business.				millions of dollars.	
W - 2	Wildfire	Reduce the amount of fuel available for the spread of a wildfire.	Aggressively enforce our high weed and grass ordinance to reduce the height of grasses and other natural habitat that does offer fuel for advancing wildfires. This enforcement does offer a great deal of mitigation against the rapid growth of wildfires.	As funding is available	Code Enforcement division.	Cost associated with personnel.	Unknown	General Fund
W - 3	Wildfire	Increase awareness through PSAs such as the Knowhat2do program and other Texas Forest Service programs concerning efforts to inform our community of the dangers of wildfires.	Distribute PSAs and program information on wildfires to Haltom City community.	3-5 years as funding is available.	Fire Department	145000	The impact of protecting our population from Wildfires is difficult to measure with the impact to life and property. This number could be in the millions of dollars.	General Fund, Bond Issuance.

5.14 City of Haslet Mitigation Strategy

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
MH - 3	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Wildfires	Enhance the City of Haslet emergency operations center (EOC) by adding communications capabilities.	Add additional radio frequencies.	1 budget year	Fire	$80,000	$320,000	State and Federal Grant
			Add video conferencing ability.	1 budget year	Fire	$10,000	$40,000	State and Federal Grant
MH - 3	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Wildfires	Enhance City of Haslet audio and visual peripherals.	Increase both size and quantity of real time video monitors.	1 budget year	Fire	$10,000	$40,000	State and Federal Grant
			Enhance internet access.	1 budget year	Fire	$3,000	$12,000	City Budget
			Add additional work spaces.	1 budget year	Fire	$4,500	$18,000	City Budget
MH - 3	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Wildfires	Increase City of Haslet emergency operations center (EOC) usage opportunities.	Extend usage to neighboring jurisdictions.	Continual	Fire	$1,200	$4,800	City Budgets
			Train neighboring officials on use.	Continual	Fire	$6,000	$24,000	City Budgets
			Mock or table top multi-agency EOC operations drills.	Continual	Fire	$5,000	$20,000	City Budgets

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
MH - 5	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Wildfires	Identify significant hazards and develop specific to hazard pre-incident planning in the City of Haslet.	Pre-incident/disaster action planning.	Continual	Fire	$5,000	$20,000	Local and Regional Grants
			Identify stakeholder entities.	Continual	Fire	$1,500	$6,000	City Budget
			Involve appropriate entities in planning.	Continual	Fire	$2,000	$6,000	Local and Regional Grants
MH - 5	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Wildfires	Determine adequate resources to respond to all-hazards in the City of Haslet.	Establish resource requirements.	Continual	Fire	$5,000	$20,000	Local and Regional Grants
			Identify available resources.	Continual	Fire	$1,500	$6,000	City Budget
			Establish method of ascertaining.	Continual	Fire	$2,000	$8,000	Local and Regional Grants
MH - 5	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires	Develop contingency and after incident action in the City of Haslet.	Examine all incident possibilities.	Continual	Fire	$2,000	$8,000	Local and Regional Grants
			Make contingencies based upon possibilities.	Continual	Fire	$2,000	$8,000	Local and Regional Grants
			Establish after incident review procedures.	Continual	Fire	$2,000	$8,000	Local and Regional Grants

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
MH - 5	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Wildfires	Identify, train and equip capable citizens to form a Community Emergency Response Team (CERT) to assist in the event of a disaster in the City of Haslet.	Determine capable individuals.	30 days	Fire	$250	$1,000	City Budget
			Train selected individuals.	60-90 days	Fire	$500	$2,000	City Budget
			Equip team.	30 days	Fire	$1,000	$4,000	COG Grant
MH - 5	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Wildfires	Continue to train CERT team members in City of Haslet.	Mock drills	Continual	Fire	$1,000	$4,000	City Budget
			Frequent utilization	Continual	Fire	$1,000	$4,000	City Budget
			Repeat of initial training	Continual	Fire	$1,000	$4,000	City Budget
MH - 5	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Wildfires	Expand utilization of City of Haslet CERT team.	County and neighboring jurisdiction involvement and deployment	Continual	Fire	$1,000	$4,000	County Grant or Assistance
F-1	Flooding	Decrease flood insurance premiums in Haslet by participating in the FEMA Community Rating System program.	Work with city officials to become a member of the CRS program.	Annually	Tarrant Co, All participating	$1,000	$5,000	Tarrant County, Individual Jurisdiction Budgets

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
F-2	Flooding	Review and remove repetitive loss properties in Haslet	Review repetitive loss properties and work with homeowners to remove them using FEMA funding.	Annually	Tarrant Co, All participating	$0	$0	Tarrant County, Individual Jurisdiction Budgets
ST-1, T-1	Severe Thunderstorms and High Winds, Tornadoes	Ensure outdoors spaces in Haslet have adequate shelter for high-wind events such as severe thunderstorms or tornados.	Review current jurisdictional ordinances and building codes related to high winds.	Annually	Building Official	$0	$0	City Budget
			Develop or update ordinances and building codes to recommend new developments or facilities are built with high-wind resistant windows as needed.					
ST-2, T-2	Severe Thunderstorms and High Winds, Tornadoes	Ensure critical facilities in Haslet have adequate safe rooms to protect against high-wind events and tornadoes.	Evaluate the current conditions of critical facilities to determine which ones, if any, need safe rooms installed.	Annually	Emergency Management	$500	$$10,000	City Budget
			Determine the size and space needed to shelter the population of the critical facility.					
			Install safe rooms as needed in critical facilities.					
H-1	Hail	Develop a hail outreach program for citizens of Haslet.	Develop an outreach program that provides tips and pertinent information for ensuring the protection of property against hail.	Annually	Emergency Management	$500	$10,000	City Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Provide hail mitigation information to citizens through a social media campaign and publish the information on the City of Haslet's website.					
H-2	Hail	Ensure the City of Haslet's critical facilities have hail-resistant roofing and windows installed	Evaluate which critical facilities need hail-resistant roofing and windows installed.	24 months	Public Works	$10,000	$20,000	City Budget
			Install hail-resistant roofing and windows in identified critical facilities.					
L-1	Lightning	Protect communication infrastructure in Haslet from lightning	Evaluate the need for lightning protection on communications infrastructure in Haslet.	12 months	Emergency Management	$10,000	$20,000	Hazard Mitigation Grant, City Budget
			Install lightning rods on existing and future communication infrastructure.					
L-2	Lightning	Develop a lightning outreach program for residences and businesses in the City of Haslet.	Develop a lightning outreach program that provides tips and pertinent information for protecting property against lightning damage.	12 months	Fire Department	$1,000	$100,000	City Budget, Local Grants
			Provide lightning preparedness mitigation information to citizens of Haslet through a social media campaign and publish information on City of Haslet's website.					

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
WS-2	Winter Storm	Develop a winter weather outreach program and distribute the information for the citizens of Haslet.	Evaluate the hazards posed by severe winter weather in the City of Haslet.	12 months	Emergency Management	$500	$10,000	City Budget, local grants
			Develop a winter weather outreach program that provides tips and pertinent information for avoiding hypothermia and icy conditions.					
			Provide winter weather mitigation information to citizens of Haslet through a social media campaign and publish information on City of Haslet's website.					
D-1	Drought	Review City of Haslet's water enforcement legislation and update as necessary to mitigate the effects of drought.	Review current legislation for water conservation enforcement in the City of Haslet.	Annually	Public Works	$0	$0	City Budget
			Develop or update water conservation enforcement legislation to ensure effective practices during periods of drought.					
D-2	Drought	Develop contingency plans for City of Haslet to ensure adequate power and water supply during prolonged periods of drought.	Review current contingency plans. Develop or update potable water contingency plans.	Annually	Public Works	$5,000	$20,000	City Budget, HGMP

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Develop or update power supply contingency plans.					
D-3	Drought	Distribute drought awareness information to citizens of Haslet	Provide drought awareness information to citizens of Haslet through a social media campaign and publish the information of the City of Haslet's website.	Annually	Public Works	$500	$10,000	City Budget
W-1	Wildfire	Review city ordinances and laws to ensure mitigation practices are in effect in the City of Haslet.	Enact building permit process that encourages wildfire resistant construction.	Annually	Public Works	$0	$0	City Budget
W-2	Wildfire	Ensure the City of Haslet water systems are adequate for fighting wildfires.	Evaluate the City of Haslet's water system to ensure capacity for fighting wildfires. Install or upgrade needed equipment to ensure water systems are adequate.	Annually	Public Works	$0	$0	City Budget
W-3	Wildfire	Mitigate wildfires by instituting landscaping practices at City of Haslet's critical facilities.	Prevent wildfires from spreading to critical facilities by landscaping plants and brush away from buildings.	Annually	Public Works	$0	$0	City Budget
ET-1	Extreme Temperatures, Winter Storm	Incorporation of power generator for use at Haslet Community Center. Generator to provide the power necessary to operate HVAC in the event of wide spread power loss during extreme temperatures.	Purchase Electrical generator to power Haslet Community Center for shelter or warming/cooling center.	12 months	Emergency Management	$75,000	$100,000	City Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ET-2	Extreme Temperatures	Promote mitigation activities for residents and business in the community during extreme weather events in City of Haslet.	Develop an extreme temperature outreach program that provides tips and pertinent information for ensuring the health and safety for the citizens of Haslet.	12 months	Emergency Management	$500	$10,000	City Budget, Local grants
			Provide extreme heat mitigation information to the citizens of Haslet through a social media campaign and publish the information of the City of Haslet's website.					
ES-1	Expansive Soils	Mitigate expansive soils in the City of Haslet.	Improve construction techniques through building code enhancements.	Annually	Building Official	$1,000	$10,000	City Budget
			Educate construction contractors, homeowners, and business owners about mitigation techniques.					
ES-2	Expansive Soils	Identify critical infrastructure that may be affected by expansive soils.	Create and implement a plan to repair damage that was caused by expansive soils.	48 months	Building Official	$7,500	$30,000	City Budget, PDM grant funding

5.15 City of Hurst Mitigation Strategy

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
SV - 1, T - 1	Severe Thunderstorms and High Winds, Tornadoes	Replace eight outdoor warning systems (OWS) in the City of Hurst.	Evaluate life expectancy of 30+ year old OWS (8 locations).	6 months	Fire	$5,000	$20,000	Local
			Purchase 8 OWS and control system.	1 year	Fire	$250,000	$1,000,000	Local, Grants
			Install 8 OWS systems.	6 months	Fire	$50,000	$250,000	Local, Grants
MH - 1	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires	Purchase/maintain community notification system that would allow for more robust communications (voice and digital) that could be used for warning after events and for daily use for various departments in the City of Hurst.	Identify system requirements.	6 months	Fire	$1,000	$1,000	Local, Grants
			Purchase and install system.	6 months	Fire	$30,000 per year	$90,000 per year	Local, Grants
			Educate public on use.	1 year	Fire	$10,000	$40,000	Local, Grants
MH - 6	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires	Provide Automated License Plate Readers (ALPR) to increase detection of violators and wanted persons in the City of Hurst.	Identify companies who provide ALPR systems.	Jul-13	Police	$0	$200,000	Office of the Governor, Criminal Justice Grant
			Determine most effective system.	Jul-13	Police	$0	$200,000	Office of the Governor, Criminal Justice Grant
			Apply for and receive funding.	Sep-13	Police	$0	$200,000	Office of the Governor, Criminal Justice Grant

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Purchase ALPR system and equip selected police vehicles.	Jan-14	Police	$40,000	$200,000	Office of the Governor, Criminal Justice Grant
F - 3	Flooding	Open all passages under Hwy 10 Bridge over the Valley View Branch in the City of Hurst.	Open all waterways under bridge to allow full flow.	3 months	Texas Department Transportation	$100,000	Unknown	Unidentified
F - 3	Flooding	Replace Trinity Railway Express (TRE) (DART Line) culvert below the TxDOT bridge to stop flooding the homes on Springlake Drive in Hurst.	Improve the water flow rate through the TRE right of way.	1 year	DART/TRE	$2,000,000	Unknown	Unidentified
F - 3	Flooding	Create upstream detention areas to slow the flow downstream of the Lorean Branch intersection with Highway 121 in the City of Hurst.	Define the needed amount of detention and suitable areas to create the detention areas.	2 years	Hurst, TxDOT, NTE	$250,000	Unknown	State, Grants
			Build the detention areas.	1 year	Hurst, TxDOT, NTE	$1,500,000	Unknown	State, Grants
F - 3	Flooding	Create Walker Branch detention system above NE Mall on the Walker Branch in the City of Hurst.	Create a plan for the water detention.	2 years	Hurst, NRH, TxDOT	$500,000	Unknown	Local, State, Grants
			Build the detention areas.	1 year	Hurst, NRH, TxDOT	$1,500,000	Unknown	Local, State, Grants
IDO - 2	Infectious Disease Outbreak	Provide physical security at the Hurst, Euless, and Bedford (HEB) POD site while treating up to 200,000 people within a 48-hour timeframe.	Develop plans for security needs within the POD site.	Completed	HEB	-	-	HEB, FEMA, Center for Disease Control Public Health Preparedness Funds

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Calculate police personnel requirements and availability and then prepare a viable plan with schedules and assignments.	Completed	HEB	$49,000	$200,000	HEB, FEMA, Center for Disease Control Public Health Preparedness Funds
			Estimate fuel needs for police and ICS vehicles, and generators.	31-Dec-13	HEB	-	-	HEB, FEMA
IDO - 2	Infectious Disease Outbreak	Coordinate the effective traffic flow leading into, out of, and within the Hurst, Euless, and Bedford POD site.	Plan for law enforcement personnel needs for traffic control.	Completed	HEB	$35,000	$140,000	HEB, FEMA
			Plan for portable, physical barrier needs (cones, barricades, etc.).	Completed	HEB	-	-	HEB, FEMA
			Determine points of ingress/egress to POD site for management purposes.	Completed	HEB	-	-	HEB, FEMA
IDO - 2	Infectious Disease Outbreak	Complete and disseminate the Hurst, Euless, and Bedford POD site to local agencies, school and hospital district, and Tarrant County officials.	Prepare and disseminate POD plan.	Completed	Bedford	-	-	-
L - 1	Lightning	Mitigate the potential for lighting strikes on City Workers	Purchase and install a lighting detection system that will allow Public Works and Public Safety Dispatchers to notify personnel of potential lighting in the area.	2 years	Public Works, Fire , Police	25,000	Unknown	Local

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
H - 2	Hail	Mitigate the effects of hail	Develop educational materials for Citizens to use in making decisions on roofing materials for residences	2 years	Emergency Mgmt, Public Works, Public Information	5,000	Unknown	Local
ET - 2	Extreme Temperatures	Mitigate the effects of extreme heat on citizens	Educate citizens using the City Magazine, social media outlets and City website on the availability of shelters and other resources (financial assistance, fans, etc.) to help prevent heat related injuries and deaths.	Ongoing	Police, Fire, Public Works, Public Information, NGO	10,000	Unknown	Local, NGO, Electric Providers
ET-1	Extreme Temperatures	Incorporation of power generator for use at (physical location?). Generator to provide the power necessary to operate HVAC in the event of wide spread power loss during extreme temperatures.	Purchase Electrical generator to power (physical location?) for shelter or warming/cooling center.	12 months	Emergency Management	$75,000	$100,000	City Budget
WS-2	Winter Storm	Develop a winter weather outreach program and distribute the information for the citizens of Hurst.	Evaluate the hazards posed by severe winter weather in the City of Haslet.	12 months	Emergency Management	$500	$10,000	City Budget, local grants
			Develop a winter weather outreach program that provides tips and pertinent information for avoiding hypothermia and icy conditions.					
			Provide winter weather mitigation information to					

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			citizens of Hurst through a social media campaign and publish information on City of Hurst's website.					
ES - 1	Expansive Soils	Mitigate expansive soil problems	Educate Homeowners on mitigation techniques for foundations. Develop materials for City Website, Social Media and City Website	1 year	Public Works, Public Information	10,000	100,000	Local
ES - 1	Expansive Soils	Mitigate Expansive Soils	Review Codes/Ordinances for best practices for building techniques	Ongoing	Public Works	5,000	Unknown	Local
W - 2	Wildfire	Mitigate urban interface wildfires	Pre-Fire plan all Urban Interface Areas within the City to allow for rapid response and incident control	Ongoing	Fire, Public Works	10,000	100,000	Local
W - 3	Wildfire	Mitigate urban interface wildfires	Distribute information through the City Magazine, Social Media and City Website educating citizens concerning safe ways to conduct outdoor burning	Ongoing	Fire, Public Information	10,000	100,000	Local
D - 3	Drought	Educate Citizens on water conservation efforts	Public education through City Magazine, Social Media and City Website.	Ongoing	Public Works, Public Information	10,000	Unknown	Local
D - 2	Drought	Reduce Costs to water City Parks and City Facilities	Use native and drought resistant plants to reduce watering needs.	Ongoing	Parks	100,000	Unknown	Local

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
DF-1	Dam Failure	Participate in the Federal Emergency Management Agency's (FEMA) Community Rating System (CRS) program.	Work with city officials to become a member of the CRS program.	Mar-14	City Planner	$1,000	$2,000	City Planner Budget

5.16 City of Keller Mitigation Strategy

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
MH - 1	Severe Thunderstorms and High Winds, Tornadoes	Add an outdoor warning siren in the Big Bear Creek Park area in City of Keller.	Conduct a study to determine if an additional outdoor warning siren is warranted for Big Bear Creek Park.	2 months	Emergency Management	$ 1,000	$ 4,000	City Funds
			Purchase and install an outdoor warning siren in Big Bear Creek Park.	12 months	Emergency Management	$ 35,000	$ 140,000	Hazard Mitigation Grant, City Funds
MH - 1	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires	Purchase and implement of a mass public notification system for cell phones and texting in the City of Keller.	Purchase mass notification system for residents to sign up for cell phone/text alerts.	12 months	Emergency Management	$ 25,000	$ 100,000	Hazard Mitigation Grant, City Funds
MH - 6	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires	Implement a multijurisdictional Automatic Vehicle Location (AVL) system for both police and fire from Colleyville, Keller, Southlake, and Westlake (NETCOM).	Survey the eight departments and ascertain need and want as well as determine the number of users needed.	7 months	North East Tarrant County Communications (NETCOM)	-	-	-
			Determine vendor for purchase.	1 year	NETCOM with a representative from all cities	-	-	-
			Purchase hardware for all jurisdictions.	16 months	NETCOM	$ 90,000	$ 360,000	Individual City Budgets

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Purchase software for dispatch center and each unit.	2 years	NETCOM	$ 10,000	$ 40,000	Individual City Budgets
MH - 7	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires	Assist City of Keller citizens with funding for purchase of Weather Alert Radios.	Develop and fund rebate program for residents purchasing weather alert radios.	18 months	Emergency Management	$ 10,000	$ 40,000	Hazard Mitigation Grant, Private Foundation, City Funds
F - 3	Flooding	Improve the drainage system of the City of Keller.	Robin Court Drainage Improvements Project	12 months	Public Works	$ 600,000	$ 2,400,000	Hazard Mitigation Grant, City Funds
			Conduct study to reduce stream bank erosion impacts along Big Bear Creek, Little Bear Creek, and Marshall Branch.	3 years	Public Works	$ 100,000	$ 400,000	Hazard Mitigation Grant, City Funds
F - 5	Flooding	Develop effective flood mitigation public education in the City of Keller.	Develop informational brochure	12 months	Emergency Management	$ 2,500	$ 10,000	Hazard Mitigation Grant, City Funds
IDO - 2	Infectious Disease Outbreak	Prepare City of Keller first responders for mass prophylaxis distribution.	Train first responders in point of distribution (POD) procedures.	3 months	Emergency Management	$ 1,500	$ 6,000	City Funds

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Conduct a POD exercise to test plans and procedures.	6 months	Emergency Management	$ 3,000	$ 12,000	City Funds
IDO - 3	Infectious Disease Outbreak	Ensure continuity procedures are in place to prepare for a long-term employee shortage at City of Keller facilities.	Review continuity of operations (COOP) plans and procedures for city employees and facilities.	12 months	Emergency Management	$ 6,000	$ 24,000	City Funds
			Provide COOP training for jurisdiction employees.	3 months	Emergency Management	$ 1,500	$ 6,000	City Funds
IDO - 4	Infectious Disease Outbreak	Develop a public information campaign to educate City of Keller public about infectious diseases.	Educate the public on pandemics, including isolation, quarantine, triage, and medical care.	12 months	Emergency Management	$ 6,000	$ 24,000	City Funds
D - 1	Drought	Review City of Keller Water Conservation Plan and update as necessary to mitigate the effects of drought.	Review City of Keller Ordinance No. 1454, City of Keller Water Conservation Plan.	3 months	Environmental Services	$ 1,500	$ 6,000	City Funds
			Update water conservation enforcement to ensure effective practices during periods of drought.	3 months	Environmental Services	$ 1,500	$ 6,000	City Funds

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
D - 1	Drought	Review Drought Contingency and Emergency Water Management Plan for the City of Keller to ensure adequate power and water supply during prolonged periods of drought.	Review current contingency plans.	6 months	Environmental Services	$ 3,000	$ 12,000	City Funds
			Develop or update potable water contingency plans.	12 months	Environmental Services	$ 6,000	$ 24,000	City Funds
			Develop or update power supply contingency plans.	12 months	Environmental Services	$ 6,000	$ 24,000	City Funds
D - 2	Drought	Develop landscape and irrigation system review plans to be included in the approval process planned developments to increase conservation efforts in the City of Keller.	Develop plan to institute landscape and irrigation system reviews for new developments.	6 months	Environmental Services	$ 3,000	$ 12,000	City Funds
D - 2	Drought	Review and revise the City of Keller's drought awareness education program.	Review the drought awareness campaign to ensure it addresses current and future water conservation needs and revise as needed.	3 months	Environmental Services	$ 1,500	$ 6,000	City Funds

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
D - 3	Drought	Distribute drought awareness information to the citizen and business water customers within the City of Keller.	Provide drought awareness information to City of Keller citizens and business customers through a social media campaign.	6 months	Environmental Services	$ 3,000	$ 12,000	City Funds
			Implement the use of Public Service Announcement videos on the City of Keller cable access channel.	6 months	Environmental Services	$ 3,000	$ 12,000	City Funds
			Develop water conservation packets for landscaping vendors to provide their customers with new system installations.	12 months	Environmental Services	$ 4,000	$ 16,000	City Funds
L - 1	Lightning	Mitigate against Lightning Damage in the City of Keller.	Ensure city critical infrastructure has adequate lightning mitigation in place and upgrade protection as necessary.	12 months	Emergency Management	$ 5,000	$ 20,000	Hazard Mitigation Grant, City Funds
			Provide lightning mitigation information with	6 months	Community Development	$ 2,500	$ 10,000	Hazard Mitigation Grant, City Funds

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			building permit packets.					
HM - 4	Hazardous Materials Release	Identify potential hazard areas in the City of Keller associated with a railroad incident.	Identify materials commonly carried by the railroad that travels through the community.	3 months	Fire Department, UPRR	$ 500	$ 2,000	N/A
			Develop hazard incident overlay for the small, medium, and worse-case incidents based upon materials commonly carried on the railway.	6 months	Fire Department, GIS Staff	$ 10,000	$ 40,000	City Funds
			Identify the roadway infrastructure, residences, commercial buildings, and open land/park areas located within the hazard incident overlay.	6 months	Fire Department, GIS Staff	$ 5,000	$ 20,000	City Funds
HM - 4	Hazardous Materials Release	Identify evacuation routes for areas in the City of Keller potentially affected by railroad incidents.	Identify roadways within the hazard areas to be used as potential egress points.	6 months	Fire Department, Public Works	$ 5,000	$ 20,000	City Funds
			Develop map indicating egress	6 months	Fire Department, GIS Staff	$ 10,000	$ 40,000	City Funds

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			routes out of the hazard area.					
			Communicate egress/evacuation maps and information with residents and businesses located within the hazard overlay area through social media, online information, and brochures.	6 months	Fire Department, City Communications Specialist	$ 2,500	$ 10,000	City Funds
ET - 1	Extreme Temperatures	Ensure the City of Keller has an extreme heat plan in place.	Review current plans and procedures related to extreme heat.	6 months	Emergency Management	$ 3,000	$ 12,000	City Funds
			Develop or update extreme heat plans and ensure they provide procedures for opening cooling centers and providing public information.	12 months	Emergency Management	$ 6,000	$ 24,000	City Funds
ET - 2	Extreme Temperatures	Develop an extreme heat outreach program for City of Keller	Evaluate the hazards posed by extreme heat in the City of Keller.	6 months	Emergency Management	$ 3,000	$ 12,000	City Funds

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
		citizens and visitors.	Develop an extreme heat outreach program.	12 months	Emergency Management	$ 6,000	$ 24,000	City Funds
ET - 2	Extreme Temperatures	Distribute extreme heat mitigation information to City of Keller citizens.	Provide extreme heat mitigation information to the City of Keller citizens through a social media campaign.	6 months	Emergency Management	$ 3,000	$ 12,000	City Funds
			Provide extreme heat mitigation information through the City of Keller's website.	6 months	Emergency Management	$ 3,000	$ 12,000	City Funds
ET-1	Extreme Temperatures	Incorporation of power generator for use at a facility. Generator to provide the power necessary to operate HVAC in the event of wide spread power loss during extreme temperatures.	Purchase Electrical generator to power a facility for shelter or warming/cooling center.	12 months	Emergency Management	$75,000	$100,000	City Budget
ES - 1	Expansive Soils	Mitigate against expansive soils in the City of Keller.	Improve construction techniques through building code enhancements.	12 months	Community Development	$ 5,000	$ 20,000	City Funds, Permit Fees

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Educate construction contractors, home owners, and business owners about mitigation techniques.	12 months	Community Development	$ 1,000	$ 4,000	Hazard Mitigation Grant, City Funds, Permit Fees
F - 3	Flooding	Develop effective hazard mitigation public education in the City of Keller related to flooding	Develop informational brochure related to flooding and provide to the community	12 months	Emergency Management	$ 2,500	$ 10,000	City Funds, Grant Source
ST - 1	Thunderstorms & High Wind	Increase shelter space at the city parks for people to seek protection when a storm arrives	Build a shelter location at the baseball fields and soccer fields where people can seek shelter from severe storms.	3 Years	Parks	$ 100,000	$ 400,000	Budget, Grants
ST - 1	Thunderstorms & High Wind	Ensure that city facilities have adequate safe locations for people to take shelter	Evaluate each building owned by the City of Keller to locate shelter locations. If there is no safe location within the building install a safe room. Educate occupants of the building of the safe room locations	3 Years	Emergency Management	$ 100,000	$ 400,000	City Fund, Hazard Mitigation Grant Funding

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
H - 2	Hail	Increase awareness to the citizens on how the can protect themselves and their property from the effects of hail.	Develop and provide educational materials on what type of roofs and windows stand up to hail the best. Use other forms of media to teach people how to protect themselves from hail.	12 months	Emergency Management	$ 2,500	$ 10,000	City Funds, Hazard Mitigation Grant Funding
WS - 1	Winter Storm	Enhance the snow removal capability for the City of Keller	Purchase one (1) snow plow attachment for the public works department and outline its use within the city's winter weather protocol	12 months	Public Works	$ 7,000	$ 28,000	City Funds
			Purchase one (1) sand spreading unit for the public works department and outline its use within the city's winter weather protocol	12 months	Public Works	$ 13,000	$ 52,000	City Funds
WS - 2	Winter Storm	Provide information to the citizens of Keller about road conditions and	Utilize the city web site, emails, Code Red, and social media to keep the citizens and visitors of	6 months	PIO/Emergency Management	$ 1,000	$ 4,000	City Funds

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
		school and city office closings	Keller informed on how a winter storm is impacting city services.					
WS - 1	Winter Storm	Conduct an assessment of the winter weather protocols for city departments	Update current city-wide winter weather protocol to ensure it meets identified hazards and infrastructure priorities of the community	6 months	Public Works	$ 1,000	$ 4,000	City Funds
			Provide training to all employees that work outside on the dangers of winter weather and ways that they need to protect themselves from the effects of the cold, wet, dark, and icy conditions.	12 months	Risk Management	$ 5,000	$ 20,000	City Funds
W - 2	Wildfire	Reduce the amount of fuel available for the spread of a Wildfire.	Reduce fuel load from high weed and grass through the use and enforcement of current city ordinance.	6 months	Code Enforcement	$ 2,500	$ 10,000	City Funds

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Develop and distribute public education material to reduce wildfire impact on residential properties	12 months	Fire Department	$ 2,500	$ 10,000	City Funds
W - 3	Wildfire	Ensure the Fire Department wildfire plan and personnel capabilities are current and match identified hazards of the community	Update current policies and procedures related to wildfire response within the community.	6 months	Fire Department	$ 1,000	$ 4,000	City Funds
			Provide annual training to first responders	12 months	Fire Department	$ 3,000	$ 12,000	City Funds
ET - 1	Extreme Temperatures	Ensure the City of Keller has an extreme heat mitigation plan in place.	Open cooling centers and provide public information.	12 months	Emergency Management	$ 6,000	$ 24,000	City Funds
ST - 5	Thunderstorms & High Wind	Develop effective hazard mitigation public education in the City of Keller related to Thunderstorms and High Wind Incidents	Develop informational brochure related to thunderstorms and high wind incidents and provide to the community	12 months	Emergency Management	$ 2,500	$ 10,000	City Funds, Grant Source
T - 5	Tornado	Develop effective hazard mitigation public education in the City of	Develop informational brochure related to tornados and	12 months	Emergency Management	$ 2,500	$ 10,000	City Funds, Grant Source

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
		Keller related to tornados	provide to the community					
WS - 2	Winter Storm	Develop effective hazard mitigation public education in the City of Keller related to winter storms	Develop informational brochure related to winter storms and provide to the community	12 months	Emergency Management	$ 2,500	$ 10,000	City Funds, Grant Source
W - 3	Wildfire	Develop effective hazard mitigation public education in the City of Keller related to wildfire threats	Develop informational brochure related to the threat of wildfire and provide to the community	12 months	Emergency Management	$ 2,500	$ 10,000	City Funds, Grant Source
ET - 2	Extreme Temps	Develop effective hazard mitigation public education in the City of Keller related to extreme temperatures	Develop informational brochure related to extreme temperatures and provide to the community	12 months	Emergency Management	$ 2,500	$ 10,000	City Funds, Grant Source

5.17 City of Kennedale Mitigation Strategy

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
MH - 5	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Wildfires	Form a multijurisdictional tactical unit with Forest Hill, Kennedale, and Crowley.	Develop ILA and planning.	3 months	Forest Hill Police Department (FHPD), Kennedale Police Department, Crowley Police Department	-	-	Forest Hill, Kennedale, Crowley
			Acquire appropriate equipment.	8 months	FHPD	$25,000	$50,000	Forest Hill
			Train law enforcement officers and implement.	1 year	FHPD	$50,000	$50,000	Forest Hill
ST - 1, T - 1	Severe Thunderstorms and High Winds, Tornadoes	Ensure outdoors spaces in Kennedale have adequate shelter for high-wind events such as severe thunderstorms or tornadoes.	Evaluate current shelters in outdoor spaces in Kennedale.	Apr-14	Kennedale, Park Department	$100	$200	Kennedale Park Budget
			Determine the size and space needs for shelters in outdoor spaces in Kennedale.	Apr-14	Kennedale, Park Department	$100	$200	Kennedale Park Budget
			Install outdoor storm shelters at Sonora Park, Town Center Park, Rodgers Farm Park and Kennedale Ball Fields.	Apr-14	Kennedale, Park Department	$100,000	$200,000	FEMA
ST - 1, T - 1	Severe Thunderstorms and High Winds, Tornadoes	Ensure critical facilities in Kennedale have adequate safe rooms to protect against high-wind events and tornadoes.	Evaluate the current conditions of critical facilities to determine which ones, if any, need safe rooms installed.	Apr-14	Kennedale, Fire Department	$300	$600	Kennedale Park Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Determine the size and space needed to shelter the population of the critical facility.	Apr-14	Kennedale Building Official	$300	$600	Kennedale Departments
			Install safe rooms as needed in critical facilities.	Apr-15	Kennedale Building Official	$200,000	$400,000	Kennedale Departments
ST - 3, T - 3	Severe Thunderstorms and High Winds, Tornadoes	Ensure City of Kennedale ordinances and building codes reflect the need for high-wind resistant windows in new developments and facilities.	Review current jurisdictional ordinances and building codes related to high winds	April 2014	Kennedale Building Official	$300	$600	Building Official Budget
			Develop/update ordinances and building codes to recommend new t facilities are built with high-wind resistant windows	Jan-15	Kennedale Building Official	$2,500	$2,500	City Attorney
ST - 3, T - 3	Severe Thunderstorms and High Winds, Tornadoes	Ensure City of Kennedale critical facilities have high-wind resistant windows in place.	Evaluate the need for high-wind resistant windows in critical facilities.	Apr-14	Kennedale Building Official	$2,000	$4,000	Building Official Budget
			Install high-wind resistant windows as necessary in critical facilities.	May-15	Kennedale ISD	$100,000	$200,000	Kennedale ISD Budget
ST - 3, T - 3	Severe Thunderstorms and High Winds, Tornadoes	Ensure continuity of operations at Kennedale City Hall during a natural or man-made disaster.	Determine a suitable site and estimate cost for a tornado resistant EOC.	Jan-17	Contracted Architect	$10,000	$1,010,000	FEMA, Kennedale
			Request for proposals to prepare a site and construct a tornado resistant EOC in Kennedale.	Oct-17	Contracted Architect	Included in above estimate	$1,010,000	FEMA, Kennedale
			Construct a tornado resistant EOC.	Jan-18	General Contractor	$1,010,000	$1,010,000	FEMA, Kennedale

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ST - 4, T - 4	Severe Thunderstorms and High Winds, Tornadoes	Develop a severe thunderstorm and tornado outreach program for Kennedale citizens.	Evaluate the hazards posed by high-wind events in Kennedale.	Apr-15	Kennedale Fire Department	$500	$1,000	Fire Department Budget
			Develop a severe weather outreach program that provides tips and pertinent information for protecting property against high-wind damage.	Apr-14	Kennedale Fire Department	$300	$600	Fire Department Budget
ST - 4, T - 4	Severe Thunderstorms and High Winds, Tornadoes	Distribute severe weather mitigation information to City of Kennedale citizens.	Provide severe weather mitigation information to Kennedale citizens through a social media campaign, including severe thunderstorms and tornadoes.	Mar-14	Kennedale Fire Department	$9,000	$9,000	Kennedale City Budget
			Ensure the Kennedale website is updated during tornado season to educate citizens on severe weather mitigation activities.	Mar-14	Kennedale City Secretary	$300	$600	Kennedale City Budget
F - 1	Flooding	Decrease flood insurance premiums in Kennedale by participating in the Federal Emergency Management Agency's (FEMA) Community Rating System (CRS) program.	Work with city officials to become a member of the CRS program.	Mar-14	City Planner	$1,000	$2,000	City Planner Budget
F - 2	Flooding	Review and remove repetitive loss properties in the City of Kennedale.	Review repetitive loss properties and work with homeowners to remove them using FEMA funding.	10/1/2019	City Manager	$3,000,000	$6,000,000	FEMA

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
F - 3	Flooding	Acquire all private property located within the Village Creek 100 year Floodway in the City of Kennedale.	Submit historic flood analysis reports to support a request for flood mitigation analysis by the U.S. Army Corps Of Engineers.	Submitted July 2012	City of Kennedale	$80,000	$200,000	FEMA
			Submit engineering reports to support flood mitigation funding for the purchase of land and structures located in the Village Creek 100 Year Floodway.	Aug-16	City of Kennedale	$200,000	$5,000,000	FEMA
			Acquire all privately owned land and structures located in the Village Creek 100 year floodway.	Aug-22	City of Kennedale	$5,000,000	$10,000,000	FEMA
PF - 1	Power Failure, Winter Storms, Severe Thunderstorms and High Winds, Tornadoes	Ensure continuity of operations at Kennedale City Hall during a disruption of the main power supply.	Identify size and type of emergency generator needed to power City Hall.	Dec-13	Emergency Manager	$ -	$100,000	FEMA, Kennedale
			Purchase an emergency generator for Kennedale City Hall.	Sep-16	Emergency Manager	$95,000	$100,000	FEMA, Kennedale
			Deliver and installation of generator at Kennedale City Hall.	Dec-16	Contractor	$5,000	$100,000	FEMA, Kennedale
H - 2	Hail	Develop a hail outreach program for City of Kennedale citizens.	Evaluate the hazards posed by hail in the City.	Nov-14	Building Official	$500	$1,000	2014-15 Budget
			Develop hail outreach program that provides tips and pertinent information for ensuring	Dec-14	Fire Department	$500	$1,000	2014-15 Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			the protection of property against hail.					
H - 2	Hail	Distribute hail mitigation information to City of Kennedale citizens.	Provide hail mitigation information to citizens through a social media campaign.	Mar-14	City Secretary	$100	$1,000	City Secretary Budget
			Provide hail mitigation information through the city website.	Mar-14	City Secretary	$100	$1,000	City Secretary Budget
H - 1	Hail	Provide hail-resistant parking areas for City of Kennedale vehicles.	Evaluate the need for covered parking for city vehicles to protect them against hail.	2 weeks	Fire Department, Police Department, Building	$2,000	$50,000	City Budget
			Install awnings as needed to protect city vehicles against hail.	NA	NA	NA	NA	NA
W - 1	Wildfire	Ensure Kennedale water systems are adequate for fighting wildfires.	Evaluate the Kennedale water system to ensure capacity for fighting wildfires.	Apr-14	Kennedale Fire Department	$300	$1,000	2013-14 Budget
			Install or upgrade needed equipment to ensure water systems are adequate.	Oct-15	Kennedale Fire Department	$300,000	$300,000	2015-16 Budget
W - 1	Wildfire	Mitigate wildfires by instituting landscaping practices at Kennedale critical facilities.	Prevent wildfires from spreading to critical facilities by keeping landscaping plants and brush away from buildings.	May-14	Kennedale Public Works Department	$ 2,000	$10,000	2013-14 Enforcement Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Prevent wildfires from spreading to critical facilities by enforcing the Kennedale mowing ordinance.	May-14	Kennedale Code Enforcement Department	$ 2,000	$10,000	2013-14 Enforcement Budget
W - 2	Wildfire	Review city ordinances and laws to ensure mitigation practices are in effect in Kennedale.	Enact building permit process that encourages wildfire resistant construction.	Oct-14	Kennedale Building Official	$2,000	$ 2,000	2014-15 Budget
			Enforce Building codes to ensure compliance with conditions of Building permits.	Sep-14	Kennedale Building Official	$ 2,000	$1,999	2014-15 Budget
W - 2	Wildfire	Ensure adequate wildfire response plans and procedures are in place for Kennedale.	Review, develop, or update wildfire response plans and procedures.	Apr-14	Kennedale Fire Department	$500	$2,000	2013-14 Fire Department Budget
			Provide wildfire response training to Kennedale fire personnel.	Apr-14	Kennedale Fire Department	$2,000	$2,000	2013-14 Fire Department Budget
W - 3	Wildfire	Provide information to Kennedale citizens regarding the hazards posed by wildfires.	Develop a wildfire outreach program for Kennedale's. Newsletter insert for water bills.	May-14	Kennedale Fire Department	$ 500	$1,000	2013-14 Fire Department Budget
			Use social media to distribute tips and pertinent information for ensuring the protection of citizens and their property against wildfires.	May-14	Kennedale Fire Department	$500	$1,000	2013-14 Fire Department Budget
W - 3	Wildfire	Determine the process for becoming a Fire-wise Community in Kennedale.	Work with the Texas Department of Emergency Management to become a Fire-wise Community.	Apr-14	Kennedale Fire Department	$500	$1,000	2013-14 Fire Department Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
WS - 1	Winter Storm	Evaluate winter weather response capabilities in the City of Kennedale.	Conduct an assessment of winter weather response capabilities.	Nov-14	Kennedale Police Department, Kennedale Fire Department	$500	$2,000	2013-2014 Police and Fire Budgets
			Acquire equipment needed as determined by assessment.	Nov-14	Kennedale Police Department, Kennedale Fire Department	$5,000	$5,000	2013-2014 Police and Fire Budgets
			Provide safety training to first responders on winter weather hazards.	Nov-14	Kennedale Police Department, Kennedale Fire Department	$3,000	$6,000	2013-2014 Police and Fire Budgets
WS - 1	Winter Storm	Evaluate winter weather mitigation capabilities in the City of Kennedale.	Conduct an assessment of winter weather plans in place for jurisdiction public works.	Nov-14	Kennedale Public Works	$500	$2,000	Public Works Budget
			Develop or update winter weather mitigation plan.	Nov-14	Kennedale Public Works	$500	$2,000	Public Works Budget
WS - 2	Winter Storm	Develop a winter weather outreach program for Kennedale citizens.	Develop a winter weather outreach program that provides tips and pertinent information for avoiding hypothermia and icy conditions.	Oct-14	Kennedale Fire Department	$500	$2,000	2014-15 Fire Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
WS - 2	Winter Storm	Distribute winter weather mitigation information to the City of Kennedale residents.	Provide winter weather mitigation information to Kennedale citizens through a social media campaign.	Nov-14	Kennedale Fire Department	$500	$2,000	2014-15 Fire Budget
			Ensure the Kennedale city website is updated during winter months to educate citizens on winter weather mitigation activities.	14-Nov	Kennedale Fire Department	$500	$2,000	2014-15 Fire Budget
IDO - 2	Infectious Disease Outbreak	Prepare City of Kennedale first responders for mass prophylaxis distribution.	Train first responders in point of distribution (POD) procedures.	Dec-14	Tarrant County Health Department	$1,000	$1,000	Tarrant County Health Department
			Conduct a POD exercise to test plans and procedures.	Dec-14	Tarrant County Health Department	$1,000	$1,000	Tarrant County Health Department
IDO - 3	Infectious Disease Outbreak	Ensure continuity procedures are in place to prepare for a long-term employee shortage at City of Kennedale facilities.	Review continuity of operations (COOP) plans and procedures for city employees and facilities.	Mar-14	Kennedale Human Resource Director	$300	$600	Human Resource Budget
			Provide COOP training for jurisdiction employees.	Apr-14	Kennedale Human Resource Director	$1,000	$2,000	Human Resource Budget
IDO - 4	Infectious Disease Outbreak	Develop a public information campaign to educate City of Kennedale public about infectious diseases.	Educate the public on pandemics, including isolation, quarantine, triage, and medical care.	Feb-14	Tarrant County Health Department	$3,000	$3,000	Tarrant County Health Department
			Push information to social media.	Feb-14	Tarrant County	$3,000	$3,000	Tarrant County Health Department

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
D - 1	Drought	Review Kennedale water enforcement legislation and update as necessary to mitigate the effects of drought.	Review current legislation for water conservation enforcement in Kennedale.	Mar-14	Public Works	$100	$100	Public Works
			Develop or update water conservation enforcement legislation to ensure effective practices during periods of drought.	Mar-14	Public Works	$100	$100	Public Works
D - 1	Drought	Develop contingency plans for Kennedale to ensure adequate power and water supply during prolonged periods of drought.	Review current contingency plans.	Mar-14	Public Works	$100	$1,000	Public Works
			Develop or update potable water contingency plans.	Mar-14	Public Works	$100	$1,000	Public Works
			Develop or update power supply contingency plans.	Mar-14	Public Works	$100	$1,000	Public Works
D - 2	Drought	Upgrade water and irrigation systems to conserve water at Kennedale Police and Fire stations.	Upgrade fixtures at fire station.	Dec-14	Fire Department	$2,000	$2,000	Fire Budget
			Upgrade fixtures at police station.	Dec-14	Police Department	$2,000	$2,000	Police Budget
D - 3	Drought	Develop a drought awareness education	Evaluate the hazards posed by drought in Kennedale.	Apr-14	Public Works	$1,000	$1,000	Public Works Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
		program for Kennedale Citizens.	Develop a drought awareness education program that provides tips and pertinent information for ensuring the protection of property and the environment against drought.	Apr-14	Public Works	$1,000	$1,000	Public Works Budget
D - 3	Drought	Distribute drought awareness information to Kennedale Citizens.	Provide drought awareness information to Kennedale citizens through a social media campaign.	14-Apr	Public Works	$100	$1,000	Public Works Budget
			Provide drought awareness information through the Kennedale website.	Apr-14	Public Works	$100	$1,000	Public Works Budget
TR- 1	Terrorism	Provide the necessary equipment to combat terrorism to Kennedale law enforcement.	Evaluate the equipment currently in place at Kennedale police department.	Apr-14	Kennedale Police Department	$200	$4,000	2014 Budget
			Acquire the equipment identified in the assessment.	Apr-15	Kennedale Police Department	$100,000	$100,000	HSGP
TR - 1	Terrorism	Ensure security and surveillance equipment is in place at Kennedale critical facilities.	Assess security systems at critical facilities in Kennedale.	Apr-14	Kennedale Police Department	$200	$4,000	2014-15 Budget
			Install the systems necessary to provide security at Kennedale critical facilities.	Apr-15	Kennedale Police Department	$100,000	$100,000	HSGP
TR - 2	Terrorism	Provide an anti-terrorism training program at	Train officers in the detection of suspicious devices.	Oct-14	Kennedale Police Department	$ 2,000	$4,000	2014-15 Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
		Kennedale Police Department.	Conduct exercises to test terrorist response plans and procedures.	Apr-15	Kennedale Police Department	$4,000	$4,000	2014-15 Budget
TR - 4	Terrorism	Educate the Kennedale community about terrorism through public education.	Increase terrorism awareness fort the public through public speaking events.	Oct-14	Kennedale Police Department	$1,000	$2,000	2014-15 Budget
			Increase awareness of active shooter events by presenting in the school district.	Oct-14	Kennedale Police Department	$1,000	$2,000	2014-15 Budget
L - 1	Lightning	Protect communication infrastructure in Kennedale from lightning.	Evaluate the need for lightning protection on communications infrastructure in Kennedale.	Nov-14	Kennedale Building Official	$1,000	$2,000	2014-15 Budget
			Install lightning rods on existing and future communication infrastructure.	Nov-15	Kennedale Building Official	$10,000	$20,000	2015-16 Budget
L - 1	Lightning	Ensure Kennedale critical facilities are protected against lightning.	Evaluate the need for lightning protection for Kennedale critical facilities.	Nov-14	Kennedale Building Official	$1,000	$2,000	2014-15 Budget
			Install lightning rods and other protective equipment on critical facilities.	Nov-15	Public Works	$30,000	$60,000	2015-16 Budget
L - 2	Lightning	Develop a lightning outreach program for City of Kennedale citizens.	Evaluate the hazards posed by lightning in Kennedale.	Nov-14	Kennedale Fire Department	$500	$1,000	2014-15 Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Develop a lightning outreach program that provides tips and pertinent information for protecting property against lightning damage.	Dec-14	Kennedale Fire Department	$500	$1,000	2014-15 Budget
L - 2	Lightning	Distribute lightning mitigation information to City of Kennedale citizens.	Provide lightning mitigation information to Kennedale citizens through a social media campaign.	Nov-14	Kennedale Fire Department	$ 500	$1,000	2014-15 Budget
			Provide lightning mitigation information at outdoor spaces throughout Kennedale.	Dec-14	Kennedale Fire Department	$500	$1,000	2014-15 Budget
HM - 1	Hazardous Materials Release	Provide Kennedale fire personnel with the necessary gear to respond to hazmat releases.	Evaluate the hazmat gear currently provided by Kennedale Fire Department.	May-15	Kennedale Fire Department	$300	$300	Kennedale Fire Budget
			Acquire the gear needed as identified in the evaluation.	Dec-17	Kennedale Fire Department	$20,000	$40,000	HSGP
HM - 1	Hazardous Materials Release	Ensure Kennedale fire department has the equipment necessary to respond to hazmat releases.	Evaluate the hazmat equipment currently owned by Kennedale.	May-14	Kennedale Fire Department	$300	$300	Kennedale Fire Budget
			Acquire the equipment needed as identified in the evaluation.	Dec-17	Kennedale Fire Department	$40,000	$80,000	HSGP
HM - 2	Hazardous Materials Release	Develop a hazardous materials awareness education program for Kennedale citizens.	Evaluate hazardous materials that are used or transported in Kennedale.	Nov-14	Kennedale Fire Department	$1,000	$10,000	Kennedale Fire Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Provide hazardous materials awareness information to Kennedale citizens through a social media campaign	Nov-14	Kennedale Fire Department	$1,000	$10,000	Kennedale Fire Budget
HM - 2	Hazardous Materials Release	Distribute hazardous materials awareness information to Kennedale citizens.	Evaluate Public awareness of hazardous materials	14-May	Kennedale Fire Department	$300	$600	Kennedale Fire Budget
			Provide hazardous materials awareness information through the Kennedale website.		Kennedale Fire Department	$300	$600	Kennedale Fire Budget
HM - 3	Hazardous Materials Release	Improve the evacuation of Kennedale citizens during a hazardous event.	Partner with the Red Cross to locate shelter locations within Kennedale.	Apr-14	Kennedale Fire Department	$300	$600	Kennedale Fire Budget
			Secure agreements with the Red Cross and the school district for shelters.	Apr-14	Kennedale Fire Department	$300	$600	Kennedale Fire Budget
HM - 4	Hazardous Materials Release	Identify potential hazard areas in the City of Kennedale associated with a railroad incident.	Identify materials commonly carried by the railroad that travels through the community.	May-14	Kennedale Fire Department	$300	$600	Kennedale Fire Budget
			Develop hazard incident overlay for the small, medium, and worst-case incidents based upon materials commonly carried on the railway.	Dec-14	Kennedale Fire Department	$300	$600	Kennedale Fire Budget
ET - 1	Extreme Temperatures	Ensure the City of Kennedale has an extreme heat plan in place.	Review current plans and procedures related to extreme heat.					

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Develop or update extreme heat plans and ensure they provide procedures for opening cooling centers and providing public information.					
ET - 1	Extreme Temperatures	Identify extreme heat plans for critical infrastructure in the City of Kennedale.	Evaluate the need for extreme heat plans for critical infrastructure to ensure essential functions continue in the event of high temperatures.		Fire Department, Police Department, Public Works, Parks Department, Library Department, Administration	$500	$1,000	Fire Department, Police Department, Public Works, Parks Department, Library Department, Administration Budgets
			Develop or update plans and procedures for critical infrastructure when high temperatures are present.	1-May-14	Fire Department, Police Department, Public Works, Parks Department, Library Department, Administration	$1,000	$2,000	Fire Department, Police Department, Public Works, Parks Department, Library Department, Administration Budgets
ET - 2	Extreme Temperatures	Develop an extreme heat outreach program for Kennedale citizens.	Evaluate the hazards posed by extreme heat in Kennedale.	May-14	Fire Department	$100	$500	

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Develop an extreme heat outreach program that provides tips and pertinent information for ensuring the health and safety of citizens during extreme heat.					
ET - 2	Extreme Temperatures	Distribute extreme heat mitigation information to Kennedale citizens.	Provide extreme heat mitigation information to the Kennedale citizens through a social media campaign.	May-14	Human Resources	$100	$1,000	Human Resources Budget
			Provide extreme heat mitigation information through the Kennedale's website.	May-14	City Secretary	$100	$1,000	City Secretary Budget
ES - 1	Expansive Soils	Mitigate expansive soils in Kennedale.	Improve construction techniques through building code enhancements.	Oct-15	Building Official	$1,000	$10,000	Building Official Budget
			Educate construction contractors, homeowners, and business owners about mitigation techniques.	Oct-15	Building Official	$1,000	$10,000	Building Official Budget
ET - 1	Extreme Temperatures	Provide a cooling station in the Kennedale Community Center	Extreme Heat Emergency: Provide a cooling station in the Kennedale Community Center	Jun-15	Library staff assisted by KPD, KFD, and KPW	$5,000	$10,000	City of Kennedale Red Cross, Donations,
ET - 1	Extreme Temperatures		Extreme Cold Emergency:	Jan-15	Library staff assisted by	$5,000	$10,000	City of Kennedale

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
		Provide a warming station in the Kennedale Community Center	Provide a warming station in the Kennedale Community Center		KPD, KFD, and KPW			Red Cross, Donations,
			Use Emergency Notification System to inform public during events having the potential to cause weakening or failure of dams at Sonora Park and TRWD Balancing Reservoirs.					
H - 2	Hail	Use Emergency Notification System to inform public about approaching severe thunderstorms which have a history of producing hail	Hail Emergency: Use Emergency Notification System to inform public about approaching severe thunderstorms which have a history of producing hail	Jan-15	Fire Chief-EMC and Assistant EMC	$5,500 for annual notification contract	$100,000	City of Kennedale
WS - 2	Winter Storm	Use Emergency Notification System to inform public about approaching winter storm which may cause hazardous driving conditions, expose people and animals outdoors to extreme cold, and freeze exterior water pipes and pipes in unheated spaces within buildings	Winter Storm Emergency: Use Emergency Notification System to inform public about approaching winter storm which may cause hazardous driving conditions, expose people and animals outdoors to extreme cold, and freeze exterior water pipes and pipes in					

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			unheated spaces within buildings					

5.18 City of Lake Worth Mitigation Strategy

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ST - 1, T - 1	Severe Thunderstorms and High Winds	Ensure critical facilities in Lake Worth have adequate safe rooms to protect against high-wind events and tornadoes.	Evaluate the current conditions of critical facilities to determine which ones, if any, need safe rooms installed.	90 days	Lake Worth Emergency Management	$1,000	$3,000	General Fund
ST - 3, T - 3	Severe Thunderstorms and High Winds	Ensure Lake Worth Texas critical facilities have high-wind resistant windows in place.	Evaluate the need for high-wind resistant windows in critical facilities.	90 days	Lake Worth Emergency Management	$1,000	$3,000	General Fund
ST - 4, T - 4	Severe Thunderstorms and High Winds	Distribute severe weather mitigation information to Lake Worth citizens.	Provide severe weather mitigation information to Lake Worth citizens through a social media campaign, including severe thunderstorms and tornadoes.	30 days	Lake Worth Emergency Management	$1,000	$3,000	General Fund
			Ensure the Lake Worth website is updated during tornado season to educate citizens on severe weather mitigation activities.	45 days	Lake Worth Emergency Management	$1,000	$3,000	General Fund
PF - 1	Power Failure, Winter Storms, Severe Thunderstorms and High Winds, Tornadoes, Extreme Temperature	Ensure Lake Worth critical facilities have generator as an alternate power supply.	Identify appropriate size and type of generator for critical facilities	30 days	Lake Worth EM	$1,000	$3,000	General Fund
			Purchase/order generator for critical facilities.					
			Deliver and install critical facility generators.					
PF - 1	Power Failure, Winter Storms, Severe	Ensure Lake Worth critical facilities have emergency lighting systems in place.	Evaluate emergency lighting systems in critical facilities.	180 days	Lake Worth EM	$2,000	$5,000	General Fund

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
	Thunderstorms and High Winds, Tornadoes		Install emergency lighting systems in critical facilities.					
H - 1	Hail	Ensure Lake Worth critical facilities have hail-resistant roofing and windows installed.	Evaluate which critical facilities need hail-resistant roofing and windows installed.	90 days	Lake Worth EM	$1,000	$3,000	General Fund
H - 2	Hail	Develop a hail mitigation education program for Lake Worth citizens.	Evaluate the hazards posed by hail in the city.	90 days	Lake Worth EM	$1,000	$3,000	General Fund
W - 1	Wildfire	Ensure Lake Worth water systems are adequate for fighting wildfires.	Evaluate the Lake Worth water system to ensure capacity for fighting wildfires.	30 days	Lake Worth Emergency Management	$1,000	$3,000	General Fund
W - 2	Wildfire	Ensure adequate Lake Worth wildfire mitigation plans and procedures are in place.	Review current wildfire mitigation plans and procedures.	90 Days	Lake Worth Fire Department	$1	$3,000	General Fund
			Provide wildfire mitigation training to fire personnel.	365 Days	Lake Worth Fire Department, TEEX	$5,000	$9,000	General Fund, TEEX Grants
WS - 1	Winter Storms	Evaluate winter weather response capabilities in Lake Worth	Conduct an assessment of winter weather response capabilities.	90 days	Lake Worth Emergency Management, Lake Worth Public Works Department, Fire Department	$3,000	$6,000	General Funds
			Acquire equipment needed as determined by assessment.					

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Provide safety training to first responders on winter weather hazards.					
WS - 2	Winter Storms	Ensure winter weather mitigation capabilities exist in Lake Worth.	Conduct an assessment of winter weather mitigation plans in place for jurisdiction public works.	30 days	Lake Worth Public Works Department	$1,000	$3,000	General Funds
			Develop winter weather mitigation plan.					
IDO - 2	Infectious Disease Outbreak	Prepare Lake Worth first responders for mass prophylaxis distribution.	Train first responders in point of distribution (POD) procedures.	180 days	Lake Worth Fire Department, Tarrant County Public Health	$2,000	$4,000	General Fund
			Conduct a POD exercise to test plans and procedures.					
IDO - 3	Infectious Disease Outbreak	Ensure continuity procedures are in place to prepare for a long-term employee shortage at Lake Worth facilities.	Review continuity of operations (COOP) plans and procedures for city employees and facilities.	180 days	All Lake Worth Departments	$4,000	$9,000	General Fund
			Provide COOP training for jurisdiction employees.					
IDO - 4	Infectious Disease Outbreak	Develop a public information campaign to educate Lake Worth public about infectious diseases.	Educate the public on pandemics, including isolation, quarantine, triage, and medical care.					
D - 2	Drought	Review TCWD/Lake Worth water enforcement legislation and update as necessary to	Review current legislation for water conservation	365 Days	Joint efforts with Tarrant County Regional	$3,000	$9,000	General Fund

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
		mitigate the effects of drought.	enforcement in Lake Worth.		Walter District and members			
			Develop or update water conservation enforcement legislation to ensure effective practices during periods of drought.	365 Days	Joint efforts with Tarrant County Regional Walter District and members			
D - 2	Drought	Develop contingency plans for Lake Worth, Texas to ensure adequate power and water supply during prolonged periods of drought.	Review current contingency plans.	On Going	LW Public Works	$2,000	$6,000	General Fund
			Develop or update potable water contingency plans.					
			Develop or update power supply contingency plans.					
D - 3	Drought	Develop a drought awareness education program for Lake Worth Citizens.	Evaluate the hazards posed by drought in Lake Worth.					
			Develop a drought awareness education program that provides tips and pertinent information for ensuring the protection of property and the environment against drought.	Ongoing	Lake Worth Public Works.	$2,000	$6,000	General Fund

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
D - 3	Drought	Distribute drought awareness information to Lake Worth Citizens.	Provide drought awareness information through the Lake Worth website.	Ongoing	Public Works/IT/City Secretary	$2,000	$6,000	General Fund
TR - 1	Terrorism	Provide the necessary equipment to combat terrorism to Lake Worth law enforcement.	Evaluate the equipment currently in place at Lake Worth Police Department.	180 days	Lake Worth Police Department	$1,000	$3,000	General Fund
TR - 2	Terrorism	Provide an anti-terrorism training program at Lake Worth Police Department.	Conduct exercises to test terrorist response plans and procedures.	365 Days	Lake Worth Fire Department, Lake Worth Police Department	$8,000	$11,000	Budgeted Training funds
L - 1	Lightning	Protect communication infrastructure in Lake Worth Texas from lightning.	Evaluate the need for lightning protection on communications infrastructure in Lake Worth, TX.	90 Days	Lake Worth Fire Department, Lake Worth Police Department	$1,000	$3,000	General Fund
L - 1	Lightning	Ensure Lake Worth critical facilities are protected against lightning.	Evaluate the need for lightning protection for Lake Worth critical facilities.	90 Days	Lake Worth Emergency Management	$1,000	$3,000	General Fund
L - 2	Lightning	Distribute lightning mitigation information to the City of Lake Worth citizens.	Provide lightning mitigation information to Lake Worth citizens through a social media campaign.	Ongoing	Public Information Office	$10,000	NA	Budget
HMR - 1	Hazardous Materials Release	Provide Lake Worth fire personnel with the necessary gear to respond to hazmat releases.	Evaluate the hazmat gear currently provided by Lake Worth Fire Department.	30 days	Lake Worth Fire Department	$1,000	$3,000	General Fund
HMR - 1	Hazardous Materials Release	Ensure Lake Worth Fire Department has the	Evaluate the hazmat equipment currently owned by Lake Worth.	30 days	Lake Worth Fire Department	$1,000	$3,000	General Fund

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
		equipment necessary to respond to hazmat releases.	Acquire the equipment needed as identified in the evaluation.	365 days	Lake Worth Fire Department	$1,000	$3,000	General Fund
ET - 1	Extreme Temperatures	Ensure the Lake Worth has an extreme heat plan in place.	Review current plans and procedures related to extreme heat.	90 days	Emergency Management	$1,000	$3,000	General Fund
			Develop or update extreme heat plans and ensure they provide procedures for opening cooling centers and providing public information.	90 days	Emergency Management	$1,000	$3,000	General Fund
ET - 1	Extreme Temperatures	Identify extreme heat plans for critical infrastructure in Lake Worth.	Evaluate the need for extreme heat plans for critical infrastructure to ensure essential functions continue in the event of high temperatures.					
			Develop or update plans and procedures for critical infrastructure when high temperatures are present.					
ET - 2	Extreme Temperatures	Distribute extreme heat mitigation information to Lake Worth citizens.	Provide extreme heat mitigation information through the Lake Worth website.	60 days	IT/EM/City Secretary	$2,000	$6,000	General Fund
ES - 1	Expansive Soils	Mitigate expansive soils in Lake Worth.	Improve construction techniques through building code enhancements.	Ongoing	LW Building Official	$1,000	$3,000	General Fund

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Educate construction contractors, homeowners, and business owners about mitigation techniques.	Ongoing	LW Building Official	$1,000	$3,000	General Fund
ST - 1, T - 1, H - 1	Severe Thunderstorms and High Winds, Tornado, Hail	Install safe rooms in Lake Worth critical facilities	Install safe rooms in Lake Worth critical facilities	12-18 months	Emergency Management	TBD	TBD	Local funds, PDM, HMGP
ST - 4, T - 4	Severe Thunderstorms and High Winds, Tornado, Flooding, Hail, Winter Weather	Develop and distribute severe weather mitigation information to Lake Worth citizens to encourage private mitigation activities.	Develop and distribute severe weather mitigation information to Lake Worth citizens to encourage private mitigation activities.	6 months	Emergency Management	TBD	TBD	Local funds, PDM, HMGP
F - 3	Flooding	Improve drainage and erosion control in non-residential areas of the City of Lake Worth.	Improve drainage and erosion control in non-residential areas of the City of Lake Worth.	12 months	Emergency Management	TBD	TBD	Local funds, PDM, HMGP
L - 1	Lightning	Harden Lake Worth critical facilities are protected against lightning.	Harden Lake Worth critical facilities are protected against lightning.	12 months	Emergency Management	TBD	TBD	Local funds, PDM, HMGP
L - 1	Lightning	Harden communication infrastructure in Lake Worth Texas from lightning.	Harden communication infrastructure in Lake Worth Texas from lightning.	12 months	Emergency Management	TBD	TBD	Local funds, PDM, HMGP
WS - 1	Winter Storms	Expand winter weather planning capabilities in Lake Worth.	Expand winter weather planning capabilities in Lake Worth.	As Needed	Emergency Management	TBD	TBD	Local funds,

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
								PDM, HMGP
W-2	Wildfire	Protect the City of Lake Worth critical facilities and vulnerable populations from the effects of wildfire incidents.	Implement defensive space practices and enforce ordinances to maintain minimum distances from fuels.	Continuously	Community Development and Planning, Building Inspection and Code Compliance	$150,000	$500,000	City General Funds
W - 3	Wildfire	Develop a Community Wildfire Protection Plan to develop further targeted mitigation actions.	Develop a Community Wildfire Protection Plan to develop further targeted mitigation actions.	18 months	Emergency Management	TBD	TBD	Local funds, PDM, HMGP
W - 3	Wildfire	Develop a wildfire outreach program City of Lake Worth citizens.	Develop an outreach program City of Lake Worth citizens.	12 months	Emergency Management	TBD	TBD	Local funds, PDM, HMGP
ET - 1	Extreme Temps	Develop and adopt an extreme temperature mitigation plan.	Develop and adopt an extreme temperature mitigation plan.	12 months	Emergency Management	TBD	TBD	Local funds, PDM, HMGP
ET - 2	Extreme temps	Distribute extreme temperature public education and mitigation information to Lake Worth citizens.	Distribute extreme temperature public education and mitigation information to Lake Worth citizens.	6-8 months	Emergency Management	TBD	TBD	Local funds, PDM, HMGP

5.19 Town of Lakeside Mitigation Strategy

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
MH - 5	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Wildfires	Improve the Town of Lakeside's first responder capabilities to prepare for and respond to all-hazard events in Lakeside.	Conduct annual disaster exercises involving all response agencies and own departments.	12 months	County Emergency Management Agency (EMA), first responder agencies, Town departments	$20,000	$1,000,000	Town Budget, FEMA Homeland Security Grant Program
			Train first responders and Town department representatives annually on EOC procedures.	3 months	County EMA, first responder agencies, Town departments	$5,000	$100,000	Town Budget, Grants, FEMA Homeland Security Grant Program,
			Conduct annual continuity of operations exercise for all Town departments.	9 months	County EMA, Town departments	$10,000		Town Budget, FEMA Homeland Security Grant Program
MH - 7	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Wildfires	Increase Lakeside citizen emergency mitigation awareness.	Distribute severe weather mitigation literature at appropriate/identified events.	1 month	County EMA	$2,000	$20,000	Town Budget, FEMA
			Provide NOAA weather radios to identified special needs citizens	6 months	County EMA	$15,000	$200,000	Grants, Town Budget, FEMA

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			(for example, elderly, rural, low-income).					
ST - 4, T - 4	Severe Thunderstorms and High Winds, Tornadoes	Minimize losses of life and property due to high winds from severe thunderstorms in the Town of Lakeside.	Explore alert, warning, and notification options for visually impaired and hearing impaired citizens.	12 months	County EMA			Grants, Town Budget, FEMA
PF - 1	Power Failure, Winter Storms, Severe Thunderstorms and High Winds, Tornadoes	Improve the Town of Lakeside's information distribution and warning capabilities to citizens.	Acquire a generator for running wastewater lift station and irrigation field.	6 months	Public works			Town Budget, FEMA Homeland Security Grant Program, HUD, CDBG
H - 1	Hail	Ensure Lakeside critical facilities have hail-resistant roofing and windows installed.	Evaluate which critical facilities need hail-resistant roofing and windows installed.	8 months	City Administration	$8,000	Unknown	Line Item Budget
			Install hail-resistant roofing and windows in identified critical facilities.	24 months	City Administration	$75,000	Unknown	Line Item Budget
H - 1	Hail	Provide hail-resistant parking areas for Lakeside's city vehicles.	Evaluate the need for covered parking for city vehicles to protect them against hail.	8 months	City Administration	$3,000	Unknown	Line Item Budget
			Install covered parking areas as needed to protect city vehicles against hail.	36 months	City Administration	$25,000	Unknown	Line Item Budget
H - 2	Hail		Evaluate the hazards posed by hail in the city.	6 months	City Administration	$5,000	Unknown	Line Item Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
		Develop a hail outreach program for Lakeside citizens.	Develop hail outreach program that provides tips and pertinent information for ensuring the protection of property against hail.	12 months	City Administration	$5,000	Unknown	Line Item Budget
H - 2	Hail	Distribute hail mitigation information to Lakeside citizens.	Provide hail mitigation information to citizens through a social media campaign.	6 months	City Administration	$5,000	Unknown	Line Item Budget
			Provide hail mitigation information through the city website.	4 months	City Administration	$100	Unknown	Line Item Budget
H - 2	Hail	Improve the Town of Lakeside's hailstorm information distribution and warning to citizens.	Distribute hailstorm mitigation literature at community events.	1 month	County EMA, Town officials	$2,500	$100,000	Town Budget
W - 1	Wildfire	Ensure Lakeside water systems are adequate for fighting wildfires.	Evaluate the Lakeside water system to ensure capacity for fighting wildfires.	24 months	City Administration	$15,000	Unknown	Line Item Budget
			Install or upgrade needed equipment to ensure water systems are adequate.	24 months	City Administration	Unknown	Unknown	Line Item Budget
W - 1	Wildfire	Mitigate wildfires by instituting landscaping practices at Lakeside critical facilities.	Prevent wildfires from spreading to critical facilities by landscaping plants and brush away from buildings.	24 months	City Administration	Unknown	Unknown	Line Item Budget
W - 2	Wildfire	Protect critical facilities and vulnerable populations from	Identify critical facilities in wildfire hazard areas, develop an awareness	6 months	County EMA			Town Budget,

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
		the effects of urban grass/wildfires in Lakeside.	program, and take appropriate remedial action.					FEMA Fire Management Assistance Grant Program
W - 2	Wildfire	Review city ordinances and laws to ensure mitigation practices are in effect in Lakeside.	Enact building permit process that encourages wildfire resistant construction.	36 months	City Administration	$15,000	Unknown	Line Item Budget
W - 2	Wildfire	Ensure adequate Lakeside wildfire response plans and procedures are in place.	Review current wildfire response plans and procedures.	12 months	County Fire Marshal	Unknown	Unknown	Line Item Budget
			Develop or update wildfire response plans and procedures.	18 months	County Fire Marshal	Unknown	Unknown	Line Item Budget
			Provide wildfire response training to fire personnel.	24 months	County Fire Marshal	Unknown	Unknown	Unknown
W - 3	Wildfire	Provide information to Lakeside citizens regarding the hazards posed by wildfires.	Develop a wildfire outreach program that provides tips and pertinent information for ensuring the protection of property against wildfires.	24 months	County Fire Marshal	Unknown	Unknown	Unknown
W - 3	Wildfire	Determine the process for becoming a Firewise Community in Lakeside.	Work with the Texas Department of Emergency Management to become a Firewise Community.	24 months	County Fire Marshal	Unknown	Unknown	Line Item Budget
IDO - 3	Infectious Disease Outbreak	Improve the Town of Lakeside's first responder capabilities to prepare for and respond to pandemic/epidemic events.	Train all first responders on pandemic flu response.	6 months	Tarrant County Health and Human Services	$5,000	$50,000	Town Budget, FEMA Homeland Security

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
								Grant Program
			Participate in Strategic National Stockpile drills and exercises.	24 months	County EMA, Tarrant County Health and Human Services	$5,000	$50,000	Town Budget, FEMA Homeland Security Grant Program
			Acquire infectious disease personal protective equipment for all first responders.	8 months	County EMA, Environmental Services, Fire Department	$5,000	$50,000	Town Budget, FEMA Homeland Security Grant Program
DIDO - 4	Infectious Disease Outbreak	Improve the Town of Lakeside's pandemic/epidemic information distribution and warning to citizens.	Educate the public on pandemics, including isolation, quarantine, triage, and medical care.	6 months	County EMA, Town environmental services, Tarrant County Health and Human Services	$2,000	$20,000	Town Budget, Public Health Grants (CDC)
D - 1	Drought	Protect Lakeside critical facilities and vulnerable agriculture from effects of drought conditions.	Continue to identify and implement water conservations efforts before, during, and after times of drought.	Ongoing Program	County EMA	$2,500	$50,000	Town Budget
D - 3	Drought	Protect Lakeside critical facilities and vulnerable agriculture from effects of drought conditions.	Educate citizens in the Town about the potential negative effects that arise from	1 month	County EMA	$1,000	$50,000	Town Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			extended drought conditions.					
TR - 1	Terrorism	Increase City of Lakeside citizen domestic and international terrorism mitigation activities.	Install security-related equipment (CCTV) at Town Hall.	6 months	Public works	$5,000	$100,000	Town
TR - 2	Terrorism	Reduce the Town of Lakeside's risk of and vulnerability to domestic and international terrorism incidents.	Train all first responders on CBRNE response.	18 months	Departments	$2,000	$6,000	Town Budget, FEMA, Competitive Training Grant
L - 1	Lightning	Increase Lakeside citizen lightning awareness.	Install lightning and electric arrestors at Town sites; lift stations and pump stations.	12 months	Town Public Works			Town Budget, FEMA Hazard Mitigation Grant Program
			Provide lightning protection systems for outdoor facilities.	24 months	County EMA			
L - 2	Lightning	Increase Lakeside citizen lightning awareness.	Distribute lightning awareness literature at appropriate/identified community events.	1 month	County EMA	$2,000	$20,000	Town Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
HM - 1	Hazardous Materials Release	Improve the Town of Lakeside's capability to prepare for, respond to, and recover from hazardous material events.	Provide first responders air monitoring equipment and calibration.	9 months	County EMA			Town budget, FEMA Commercial Equipment Direct Assistance Program, SARA, Title III
ET - 1	Extreme Temperatures	Improve the Town of Lakeside's first responder capabilities mitigation against extreme heat events.	Open cooling centers for Lakeside citizens in extreme heat events.	24 months	County EMA			Town Budget
ET - 2	Extreme Temperatures	Improve the Town of Lakeside's extreme heat mitigation information distribution to citizens.	Distribute extreme temperature mitigation literature at community events.	1 month	County EMA, Town officials	$2,500	$100,000	Town Budget
ES - 1	Expansive Soils	Mitigate expansive soils in Lakeside.	Improve construction techniques through building code enhancements.	Ongoing	City Building Officials	$5,000	Unknown	Line-item Budget
			Educate construction contractors, homeowners, and business owners about mitigation techniques.	Ongoing	City Building Officials	$2,000	Unknown	Line-item Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
MH - 1	Tornado, Flooding, Thunderstorm and high winds, hail, lightning, winter storm, extreme temperatures, dam failure.	Provide NOAA weather radios to identified special needs citizens (for example, elderly, rural, low-income) and/or critical infrastructure to expand early warning capabilities.	Provide NOAA weather radios to identified special needs citizens (for example, elderly, rural, low-income) and/or critical infrastructure to expand early warning capabilities.	6 months	Town administration, police department	$15,000	$200,000	Local funds, PDM, HMGP
ST - 3, T - 3, H 1	Tornado, Flooding, Thunderstorm and high winds, hail	Install storm-resistant windows in critical infrastructures	Install storm-resistant windows in critical infrastructures	6-12 months	Public Works	$500 per building	2,000 per building	Local funds, PDM, HMGP
L - 1	Lightning	Protect and harden Lakeside critical infrastructure from lightning	Protect and harden Lakeside critical infrastructure from lightning	6 months	Public Works	15,000 per building	60,000 per building	Local funds, PDM, HMGP
F - 3	Flooding	Improve drainage and erosion control in non-residential areas of the City of Lakeside	Improve drainage and erosion control in non-residential areas of the City of Lakeside	12 months	Emergency Management	TBD	TBD	Local funds, PDM, HMGP
D - 1	Drought	Expand water conservations ordinances during times of drought.	Expand water conservations ordinances during times of drought.	As needed	Town administration	$1,000	$4,000	Local funds, PDM, HMGP
D - 2	Drought	Upgrade water/irrigation systems for the town of lakeside	Upgrade water/irrigation systems for the town of lakeside	12-18 months	Public Works	$20,000	$80,000	Local funds, PDM, HMGP

5.20 North Central Texas Council of Governments Mitigation Strategy

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ST - 7, T – 7, ET - 1	Severe Thunderstorms and High Winds, Tornadoes, Flooding, Lightning, Winter Storms, Wildfire , Extreme Temperatures	Increase the number of homes and businesses with Weather Alert Radios utilizing North Central Texas Council of Governments (NCTCOG) funding.	Purchase NOAA All-Hazard alert radios for NCTCOG.	6 months	EP	$800 (20 radios at $40 per radio)	$3,200	Hazard Mitigation Grant Program (HMGP), Local Funds
			Purchase an outdoor warning system for the NCTCOG facilities.	1 year	Administration, EP	$5,000	$20,000	HMGP, Local Funds
ST - 1, T - 1	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Extreme Heat, Winter Storms	Protect NCTCOG employees and visitors from natural hazards.	Install a community safe room in for NCTCOG facilities.	1 year	Administration, Exec Director, EP	$45,000	$180,000	HMGP, PDM, DHS, NWS Funds, Local Funds, Private Donations
ST - 4, T - 4	Severe Thunderstorms and High Winds, Tornadoes	Educate NCTCOG employees on participating in the State of Texas Tornado Shelter Rebate Program.	Conduct public education campaign to educate about tornado safety.	1 year	EP	$15,000	$60,000	NWS Funds, Local Funds, SHSP, UASI
F - 1	Flooding	Reduce flood-related costs through participation in flood insurance programs at the NCTCOG.	Purchase flood insurance for the NCTCOG facilities to provide coverage to potential damage.	One year	Administration, Exec Board, EP, E&D	$15,000	$60,000	Local Funds

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Update and improve NFIP Digital Flood Insurance Rate Maps for the North-Central Texas Region.	6 to 18 months	E&D	$150,000	$600,000	Cooperative Technical Partnership Funds (CTP), HMGP, UASI, SHSP, Local Funds
F - 5	Flooding	Develop effective flood mitigation public education materials at NCTCOG.	Plan and promote Flood Mitigation activities for NCTCOG staff and public.	6 months	EP, E&D	$15,000	$60,000	HMGP, SHSP, UASI, Local Funds
			Publish Floodplain Management Education for the North-Central Texas Region.	Annually	E&D	$25,000	$100,000	Storm Water Funds, HMGP, UASI, SHSP, Local Funds
PF - 1	Power Failure, Winter Storms, Severe Thunderstorms and High Winds, Tornadoes	Protect NCTCOG facilities against power failures.	Purchase and install additional generator capacity for NCTCOG offices and operations.	3 years	Administration	$150,000	$600,000	HMGP, SHSP, UASI, Local Funds
PF - 2			Develop and implement a power failure contingency plan.	12-18 months	Administration	$15,000	$60,000	HMGP, SHSP, UASI, Local Funds
H - 1	Hail	Educate employees to engage in storm-resistant construction practices at their homes and at NCTCOG facilities.	Upgrade current roofing and windows with Hail-Resistant roofing material and windows at NCTCOG facilities.	1 year	EP, administration			HMGP, Local Funds
H - 2	Hail	Educate employees to engage in storm-resistant construction practices at their homes and at NCTCOG facilities.	Create and promote a public education campaign to encourage hail-resistant roofing in new construction and roof replacements for employees.	1 year	EP, E&D Codes Council	$15,000	$60,000	HMGP, Local Funds

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
W - 1	Wildfire	Develop and implement landscaping practices that mitigate the risk of wildfires at NCTCOG facilities.	Implement a landscaping management policy that keeps facility vegetation especially trees adequately trimmed.	1 year	Administration, Building Management	$5,000	$20,000	Local Funds
W - 3	Wildfire	Enhance wildfire planning efforts in North-Central Texas (NCTCOG).	Develop Community Wildfire Protection Plans for each of the rural counties in the North-Central Texas Region.	12-18 months	EP - NCTCOG	$200,000	$800,000	HMGP, PDM, Texas Forest Service Grants, Other Federal/State Grants
W - 3	Wildfire	Work with North-Central Texas communities to enhance their Firewise ratings (NCTCOG).	Develop Firewise communities in cities across the North-Central Texas Region	18-24 months	NCTCOG	$400,000	$1,600,000	HMGP, PDM, Texas Forest Service Grants, Other Federal/State Grants
WS - 1	Winter Storms	Provide warming centers to Tarrant County citizens, particularly those with special needs (NCTCOG).	Develop NCTCOG facilities as warming centers to the public with a focus on special populations.	1 year	NCTCOG Agency on Aging, Administration, Exec Director, EP	$5,000	$20,000	Local Funds
WS - 2	Winter Storms	Ensure that employees and NCTCOG citizens are prepared for a winter weather emergency.	Conduct public education campaign warning of risks associated with winter storms.	1 year	EP	$15,000	$60,000	HMGP, Local

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Purchase of additional laptops and licenses to give greater number of employees the ability to work from home or other alternate work sites in severe winter weather conditions.	3 years	EP	$135,000	$540,000	HMGP, Local Funds, Grant Streams
D - 2	Drought	Implement environmental conservation practices at NCTCOG facilities.	Install low water fixtures in all NCTCOG facilities.	1 year	Administration, EP, E&D	$150,000	$600,000	Water Resource Council, Local funds
			Publish and distribute information on the Texas SmartScape program.	1 year	E&D	$15,000	$60,000	HMGP, Local funds
L - 1	Lightning	Mitigate lightning risk at NCTCOG facilities.	Installation of lightning down conductors to NCTCOG facilities.	1 year	EP: Severe Weather Team	$85,000	$340,000	HMGP, Local funds
			Purchase and install lightning rods to prevent structural/hardware damage.	1 year	EP	$60,000	$240,000	HMGP, Local funds
ET - 1	Extreme Heat	Identify and implement mitigation-feasible projects related to extreme heat (NCTCOG).	Maintain interior building temperatures below 77 degrees Fahrenheit.	1 year	Administration	$10,000	40,000	Local Funds

5.21 City of North Richland Hills Mitigation Strategy

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
MH - 5	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires	Improve the City of North Richland Hills's first responder capabilities to prepare for and respond to all-hazard events.	Conduct annual disaster exercises involving all response agencies and City departments.	12 months	City EMA, first responder agencies, City departments	$50,000	$1,000,000	City Budget, FEMA Homeland Security Grant Program
			Train first responders and City department representatives annually on EOC procedures.	12 months	City EMA, first responder agencies, City departments	$10,000	$100,000	City Budget, Grants, FEMA Homeland Security Grant Program
			Conduct annual continuity of operations exercise for all City departments.	12 months	City EMA, City departments	$40,000	$160,000	City budget, FEMA Homeland Security Grant Program
ST - 7, T - 7	Severe Thunderstorms and High Winds, Tornadoes	Increase citizen severe thunderstorm/windstorm mitigation in the City of North Richland Hills.	Distribute severe weather mitigation literature at appropriate/identified events.	36 months	City EMA	$2,000	$20,000	City Budget, FEMA
			Provide NOAA weather radios to identified special needs citizens (for example, elderly, rural, low-income).	12 months	City EMA	$15,000	$200,000	Grants, City Budget, FEMA
			Create covered areas for City equipment/vehicles at	12 months	City EMA, Public Works	$80,000	$320,000	Grants, City Budget, FEMA

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			the City Service Center.					
F - 1	Flooding	Improve the City of North Richland Hills's flooding information distribution and warning to citizens.	Continue efforts to lower the City's CRS rating.	12 months	City EMA, City Floodplain Admin/Engineering Department			City budget
F - 2	Flooding	Eliminate repetitive loss properties in the City of North Richland Hills.	Continue to identify repetitive loss areas and structures.	24 months	City EMA, City Floodplain Admin/Engineering Department			City budget, FEMA Severe Repetitive Loss Program, HUD Sustainable Housing and Communities Program
			Continue to relocate/acquire structures that could be affected by flooding.	36 months	City EMA, City Floodplain Admin/Engineering Department	$15,000	$250,000	City Budget, Grants, HMGP, HUD, CDBG
F - 3	Flooding	Improve the City of North Richland Hills's drainage system.	Design, construct, and maintain drainage improvement projects, including areas of the City to minimize the risk of loss of life and future flood damages.	12 months	City EMA, City Floodplain Admin/Engineering Department			City Budget, Federal Funding, FEMA HMGP
DF - 4	Dam Failure	Improve the City of North Richland Hills's dam failure information distribution and warning to citizens.	Distribute dam failure mitigation literature at community events.	12 months	City EMA, City Officials	$2,500	$10,000	Unknown

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
DF - 4	Dam Failure	Improve the City of North Richland Hills's first responder capabilities to prepare for and respond to dam failure events.	Train all first responders on dam failure awareness and response.	12 months	City EMA, City fire department	$10,500	$40,000	Unidentified
			Conduct a dam breech analysis study and take appropriate remedial actions.	24 months	City EMA, Public Works	$12,000	$50,000	Unidentified
PF - 1	Power Failure, Winter Storms, Severe Thunderstorms and High Winds, Tornadoes	Improve the City of North Richland Hills's information distribution and warning capabilities to citizens.	Acquire 10 generators for running signal lights at major thoroughfares.	6 months	City public works			City Budget, FEMA Homeland Security Grant Program, HUD, CDBG
H - 1	Hail	Improve the City of North Richland Hills's mitigation activities for hailstorms.	Replace metal roofing with hail-resistant roofing for all City buildings.	24 months	City Facilities Department			City Budget, FEMA, HMGP
			Create covered areas for City equipment/vehicles various locations that City vehicles are parked.	12 months	City Facilities Department	$80,000	$320,000	City Budget, FEMA, HMGP
H - 2	Hail	Improve the City of North Richland Hills's hailstorm information distribution and warning to citizens.	Distribute hailstorm mitigation literature at community events.	36 months	City EMA, City officials	$2,500	$100,000	City Budget
W - 2	Wildfire	Protect critical facilities and vulnerable populations from the effects of urban grass/wildfires in the City of North Richland Hills.	Identify critical facilities in wildfire hazard areas and develop an awareness program and take appropriate remedial action.	6 months	City EMA, Fire Department			City Budget, FEMA Fire Management Assistance Grant Program

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
W - 3	Wildfire	Encourage the protection of residential and commercial structures in the City of North Richland Hills.	Educate homeowners during Fire Prevention month on mitigation (October).	6 months	City EMA, Fire Department	$2,000	$8,000	City Budget
WS - 1	Winter Storms	Improve first responder capabilities to prepare for, respond to, and recover from severe winter storms in the City of North Richland Hills.	Provide more ice control capability for public works equipment.	12 months	City Public Works			City Budget, HMGP
WS - 1	Winter Storms	Improve the City of North Richland Hills's capability to prepare for, respond to, and recover from severe winter storms.	Establish programs to protect the poor, ill, and elderly during extreme winter temperatures.	24 months	City EMA			City Budget, HUD Community Development Block Grant, FEMA
WS - 2	Winter Storms	Increase citizen severe winter storm awareness, preparedness, and response in the City of North Richland Hills.	Distribute severe winter weather mitigation literature at appropriate/identified community events.	12 months	City EMA, City officials	$2,000	$20,000	City Budget
			Acquire larger generator for EOC operations.	12 months	City EMA, NWS	$200,000	$800,000	City Budget, Grants
IDO - 3	Infectious Disease Outbreak	Improve the City of North Richland Hills's first responder capabilities to prepare for and respond to pandemic/epidemic events.	Train all first responders on pandemic flu response.	12 months	City Environmental Services, Tarrant County Health and Human Services	$5,000	$50,000	City Budget, FEMA Homeland Security Grant Program
			Participate in Strategic National Stockpile drills and exercises.	12 months	City EMA, City Environmental Services, Tarrant County Health and Human Services	$5,000	$50,000	City Budget, FEMA Homeland Security Grant Program

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Acquire infectious disease personal protective equipment for all first responders.	12 months	City EMA, City Environmental Services, City Fire Department	$5,000	$50,000	City Budget, FEMA Homeland Security Grant Program
			Augment equipment for establishing point of distribution sites for first responders.	12 months	City Environmental Services	$20,000	$80,000	City Budget, FEMA Public Assistance Grant Program
IDO - 4	Infectious Disease Outbreak	Improve the City of North Richland Hills's pandemic/epidemic information distribution and warning to citizens.	Educate the public on pandemics, including isolation, quarantine, triage, and medical care.	36 months	City EMA, City Environmental Services, Tarrant County Health and Human Services	$2,000	$20,000	City Budget, Public Health Grants (CDC)
D - 1	Drought	Protect critical facilities and vulnerable agriculture in the City of North Richland Hills from the effects of drought conditions.	Continue to identify and implement water conservations efforts before, during, and after times of drought.	6 months	City EMA	$2,500	$50,000	City Budget
D - 1	Drought	Review North Richland Hills water enforcement legislation and update as necessary to mitigate the effects of drought.	Review current legislation for water conservation enforcement in North Richland Hills.	Oct-16	NRH Public Works & Emergency Management	$0	$150,000	Local & Federal
			Develop or update water conservation enforcement legislation to ensure effective practices during periods of drought.	Oct-16	NRH Public Works & Emergency Management	$0	$500,000	Local & Federal

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
D - 1	Drought	Develop contingency plans for North Richland Hills to ensure adequate power and water supply during prolonged periods of drought.	Review current contingency plans.		NRH Public Works & Emergency Management	$0	$100,000	Local & Federal
			Develop or update potable water contingency plans.		NRH Public Works & Emergency Management	$0	$100,000	Local & Federal
			Develop or update power supply contingency plans.		NRH Public Works & Emergency Management	$0	$100,000	Local & Federal
D - 2	Drought	Upgrade water and irrigation systems to conserve water in North Richland Hills.	Installing efficient irrigation systems in new city facilities.	Oct-20	NRH Public Works & Emergency Management	$50,000	$100,000	Local & Federal
D - 3	Drought	Protect critical facilities and vulnerable agriculture in the City of North Richland Hills from the effects of drought conditions.	Educate citizens in the City about the potential negative effects that arise from extended drought conditions.	12 months	City EMA	$1,000	$50,000	City Budget
D - 3	Drought	Develop a drought awareness education program for North Richland Hills citizens.	Evaluate the hazards posed by drought in North Richland Hills.	10/1/2014	NRH Emergency Management	$0	$100,000	Local & Federal
			Develop a drought awareness education program that provides tips and pertinent information for ensuring the protection of property and the environment against drought.	10/1/2014	NRH Emergency Management	$0	$100,000	Local & Federal

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
D - 3	Drought	Distribute drought awareness information to North Richland Hills citizens.	Provide drought awareness information to North Richland Hills citizens through a social media campaign.	Oct-14	NRH Emergency Management	$0	$100,000	Local & Federal
			Provide drought awareness information through the North Richland Hills website.	Oct-14	NRH Emergency Management	$0	$100,000	Local & Federal
TR - 1	Terrorism	Increase citizen domestic and international terrorism mitigation activities in the City of North Richland Hills.	Provide satellite and microwave capability for mobile command post.	24 months	City EMA	$100,000	$400,000	City Budget, FEMA Homeland Security Grant Program
			Provide more close captioned TV (CCTV) at identified public sites.	12 months	City public works	$1,200,000	$4,800,000	City Budget, FEMA Homeland Security Grant Program
			Install security-related equipment (CCTV) at City Hall.	12 months	City public works	$250,000	$100,000	City Budget, FEMA Homeland Security Grant Program
TR - 2	Terrorism	Increase citizen domestic and international terrorism mitigation activities in the City of North Richland Hills.	Train all first responders on CBRNE.	12 months	City environmental services department	$5,000	$100,000	City Budget, FEMA Competitive Training Grant Program

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
TR - 4	Terrorism	Increase citizen domestic and international terrorism mitigation activities in the City of North Richland Hills.	Increase public terrorism mitigation awareness through public speaking engagements.	36 months	City police	$1,000	$5,000	City Budget
			Present information about active shooter events at public schools.	36 months	City police, school officials	$2,000	$6,000	City Budget, School Budget, Department of Education Readiness and Emergency Management for Schools Program
L - 1	Lightning	Increase citizen lightning awareness in the City of North Richland Hills.	Institute a public education campaign and associated signage for walking trails and City parks.	24 months	City Parks and Recreation Department			City Budget, FEMA
			Install lightning and electric arrestors at City sites; lift stations and pump stations.	12 months	City Public Works, Facilities Department			City Budget, FEMA Hazard Mitigation Grant Program
			Provide lightning protection systems for outdoor facilities.	12 months	City EMA, Parks and Recreation Dept, Facilities Department			
L - 2	Lightning	Increase citizen lightning awareness in the City of North Richland Hills.	Distribute lightning awareness literature at appropriate/ identified community events.	36 months	City EMA	$2,000	$20,000	City Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
HM - 1	Hazardous Materials Release	Improve the City of North Richland Hills's capability to prepare for, respond to, and recover from hazardous material events.	Provide hazardous material response equipment.	12 months	City Environmental Services, City Fire Department			City budget, FEMA Commercial Equipment Direct Assistance Program, SARA, Title III
			Provide first responders air monitoring equipment and calibration.	6 months	City Environmental Services			City budget, FEMA Commercial Equipment Direct Assistance Program, SARA, Title III
			Provide training for first responders on air monitoring equipment and calibration.	6 months	City Environmental Services			FEMA Commercial Equipment Direct Assistance Program, SARA, Title III
ET - 1	Extreme Temperatures	Improve the City of North Richland Hills's first responder capabilities to mitigate extreme heat events.	Open cooling centers and take appropriate action to make available.	12 months	City EMA			City Budget
ET - 2	Extreme Temperatures	Improve the City of North Richland Hills's extreme heat mitigation information distribution to citizens.	Distribute extreme temperature mitigation literature at community events.	12 months	City EMA, City Officials	$2,500	$100,000	City Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ES - 1	Expansive Soils	Mitigate expansive soils in North Richland Hills.	Improve construction techniques through building code enhancements.	Oct-20	NRH Public Works & Emergency Management	$0	$50,000	Local and Federal
			Educate construction contractors, homeowners, and business owners about mitigation techniques.	Oct-20	NRH Public Works & Emergency Management	$0	$50,000	Local and Federal
H - 1	Hail	Provide hail resistant parking for city owned vehicles.	Evaluate the need and locations to build protection from hail for city vehicles. Install covered parking at the locations where needed.	2020	Facility Maintenance	$100,000	NA	General Fund
H - 2	Hail	Increase awareness to the citizens on how the can protect themselves and their property from the effects of hail.	Provide educational materials on what type of roofs and windows stand up to hail the best. Use other forms of media to teach people how to protect themselves from hail.	2019	Emergency Management	$1,500	NA	General Fund
L - 2	Lightning	Develop a lightning mitigation education program for the City of North Richland Hills.	Reach out to community groups and provide them a one hour education program on the dangers of lightning and how to protect themselves from lightning through mitigation activities.	2015	Emergency Management	Staff Time	NA	General Fund

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
W - 2	Wildfire	Reduce the amount of fuel available for the spread of a Wildfire.	Aggressively enforce our high weed and grass ordinance to reduce the height of grasses and other natural habitat that does offer fuel for advancing wildfires. This enforcement does offer a great deal of mitigation against the rapid growth of Wildfires.	As funding is available	Code Enforcement division.	Cost associated with personnel.	Unknown	General Fund
ET - 1	Extreme Temperatures	During these times of Extreme Heat we will initiate PSAs to target the population that may be at the highest risk from the effects of Extreme Heat.	The City of North Richland Hills will actively determine parameters for the opening of cooling centers to allow citizens, especially vulnerable populations, to seek refuge from extreme temperatures.	As funding is available	Parks Department	The City currently has several facilities that could be utilized for cooling centers, the costs are minimal. Mainly additional utility and personnel related costs.	Unknown	General Fund

5.22 City of Richland Hills Mitigation Strategy

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ST - 1, T - 1	Severe Thunderstorms and High Winds, Tornadoes	Obtain funding from City of Richland Hills revenues during budget process to replace OWS.	Replace OWSs.	1 year	City of RH	$50,000	$200,000	Operating Budget
ST - 5, T - 1	Severe Thunderstorms and High Winds, Tornadoes	Initiate use of Emergency Communications Network – Code Red.	Active promotion and assistance for signup of residents and business community on Code Red.	Annual	Police Dept	$3,000	$100,000	City Operating Budget
ST - 1, T - 1	Severe Thunderstorms and High Winds, Tornadoes	Active promotion of safe room construction in new and remodeled structures.	Promote and encourage the addition of safe rooms in all new construction and major renovations.	Annual Program	Emerg. Mngt. and Community Development	$2,500	$100,000	City Operating Budget
			Assist residents in application of Safe Room grants when available.	Annual Program	EM	1,000	$100,000	City Operating Budget
ST - 4, T - 4	Severe Thunderstorms and High Winds, Tornadoes	Public education activities directed towards residents and businesses regarding mitigation measures and precautions for severe weather events.	Use City Website as a source for residents to obtain information on mitigation for severe storms.	Annually	Fire / EM	$1,000	$100,000	City Operating Budget
			Prepare Written Articles for City Newsletter	Annually	Fire / EM	$1,000	$100,000	City Operating Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Inform residents and business community of severe storm mitigation activities during civic and social events in the city through talks and distribution of written material.	Annually	Fire/EM	$,500	$100,000	City Operating Budget
ST - 1, T - 1	Severe Thunderstorms and High Winds, Tornadoes	Ensure City of Richland Hills city owned facilities have a safe room or place of shelter.	Evaluate current facilities for safe room.	2 weeks	EM / PW	$500		City Operating Budget
			Evaluate the current facilities' place of refuge during severe weather incidents.	2 weeks	EM / PW	$500		City Operating Budget
ST - 1, T - 1	Severe Thunderstorms and High Winds, Tornadoes	Addition of safe rooms in city owned facilities if one does not exist at this time.	Ensure city facilities in Richland Hills have adequate safe room protection against severe weather events.	4 years	EM / PW	$400,000	$1,000,000	City Operating Budget
F - 1	Flooding	Reduce flood insurance premiums to citizens by ensuring Richland Hills's participation in the CRS program.	Join FEMA's CRS Program.	3 months	City of RH	$8,000	$100,000/yr.	Drain Bonds
F - 3	Flooding	Construct drainage Improvements along Stream BFC-5 and 5A in the City of Richland Hills.	Baker Blvd. Detention Pond.	Completed	City of RH	$480,000	$1,920,000	Drain Bonds
			BISD Detention Pond.	Completed	City of RH	$1,145,000	$4,580,000	Drain Bonds
			Upper Hardest Drain Improve.	Completed	City of RH	$363,000	$1,452,000	Drain Bonds
F - 3	Flooding	Construct larger drainage system in the City of Richland Hills.	Matthews Interceptor	6 months	City of RH	$1,500,000	$6,000,000	Drain Bonds
			Kingsbury Interceptor	2 years	City of RH	$1,200,000	$4,800,000	Drain Bonds

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Lower Hardisty Drain Improv	3 years	City of RH	$2,500,000	$100,000	Drain Bonds
F - 4	Flooding	Maintain existing levees along the Big Fossil Creek on the east side of Richland Hills.	Perform semi-annual inspection of the levee to look for any maintenance problems or levee failure issues.	Twice per year	Public Works			PW Operating Budget
			Report inspection of levees to Army Corps of Engineers.	Twice per year	Public Works			PW Operating Budget
PF - 1	Power Failure, Winter Storms, Severe Thunderstorms and High Winds, Tornadoes	Ensure city buildings in Richland Hills, used for safety and sheltering, are equipped with power generators.	Develop an inventory of generators available in public safety buildings, designated, shelters, and city facilities.	3rd Qtr 2014	Emergency Management/Fire			
			Seek out funding for purchase of needed power generators for needed buildings.	1st Qtr 2015	Emergency Management			
			Install power generators in identified city properties and buildings identified as shelters.	1st Qtr 2016	Emergency Management	$40,000	$160,000	City Issued Bonds
PF - 1	Power Failure, Winter Storms, Severe Thunderstorms and High Winds, Tornadoes	Ensure City of Richland Hills critical facilities have adequate power generators and capabilities exist to provide power to those critical facilities (pumping station, sewer lifting stations, etc.).	Evaluate the current facilities (levee pumps, sewage lift station pumps) power sources and need for generators.	1st Qtr 2015	Public Works	$500	$2,000	Public Works Operating or Enterprise Fund
			If needed install permanent pumps or capability to bring in temporary generators	2nd Qtr 2016	Public Works	$75,000	$1,600,000	City Issued Bonds

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			in the event of long term power outage.					
PF - 2	Power Failure, Winter Storms, Severe Thunderstorms and High Winds, Tornadoes	Provide education materials to residents of Richland Hills in securing property and relocating to family or friends residences in the event of long term power outage.	Identify appropriate size and type of generator for critical facilities.	3rd Qtr 2015	Emergency Management	$2,000	$8,000	Emergency Management Budget
			Purchase/order generator for critical facilities.	3rd Qtr 2015	Emergency Management	$2,000	$8,000	Emergency Management Budget
PF - 2	Power Failure, Winter Storms, Severe Thunderstorms and High Winds, Tornadoes	Distribution of materials and training of citizens and businesses of Richland Hills in mitigation activities that they can take during long-term power outages.	Through social media, website, city newsletter; inform residents on mitigation activities.	4th Qtr 2015	Emergency Management/Fire	$2,000	$8,000	Fire Public Education Budget
PF - 2			Through presentations at schools, civic organizations, etc., distribute material and provide residents and business community informational material.	4th Qtr 2015 through 2016	Emergency Management/Fire	$2,000	$8,000	Fire Public Education Budget
H - 2	Hail	During new construction meetings in Richland Hills promote hail resistant construction practices.	During pre-construction meetings with developers provide hail-resistant construction benefits.	1st Qtr 2015	Commercial Developers			
			During pre-construction meetings provide hail-resistant construction benefits.	1st Qtr 2015	Commercial Developers			

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
H - 2	Hail	Seek established public education programs describing dangers of hail, in Richland Hills.	Search for existing public education programs regarding hail danger and develop program for Richland Hills to present to the public.	3rd Qtr 2014	Emergency Management			
			Provide public with hail damage mitigation information through website and newsletter.	3rd Qtr 2014	Emergency Management			
H - 2	Hail	Distribute through public education activities hail mitigation programs and practices property owners can take to protect property from hail damage.	During building inspections meet with property owners to distribute and explain hail damage mitigation programs and actions.	2 years	Emergency Management / Fire Department	$2,000	$100,000	City Operating Budget
			During civic events and community programs in the City distribute information to public on hail mitigation programs and actions.	2 years	Emergency Management / Fire Department	$2,000	$100,000	City Operating Budget
H - 1	Hail	Protect City owned vehicles and machinery parked outside protection from hail damage.	Evaluate the current fleet of city vehicles and equipment parked unprotected from weather and hail.	3 months	Public Works, Police and Fire	$250		City Operating Budget
			Install covered parking areas as needed to protect city vehicles and equipment from hail.	4 years	Public Works	$50,000	$250,000	City Operating Budget or Bonds

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
W - 1	Wildfire	Provide residents through the Richland Hill website, social media, newsletter and signs of County burn bans when in effect.	Alert residents to county burn bans through multiple media messages.	ongoing action/project	Fire, Police			
			Develop handouts to distribute to residents informing of the city ordinance on open fires and the county burn ban	3nd Qtr 2014	Fire	$300	$1,200	Fire Dept Budget, Printing
W - 1	Wildfire	Public education program developed to provide residents with knowledge of wildfire mitigation actions both in Richland Hill city boundaries and while in rural areas.	Seek out established public education material on wildfire prevention in both urban and rural areas.	2nd Qtr 2014	Fire			
			Develop public education program designed to inform citizens of wildfire prevention in both urban and rural areas.	3rd Qtr 2014	Fire			
			Train fire personnel in wildfire safety, urban and rural, so public education can be spread to the public.	3rd Qtr 2014	Fire			
IDO - 2	Infectious Disease Outbreak	Review current Tarrant County/Richland Hills mass prophylaxis distribution policies/procedures.	Review current policies for both the county and city.	2nd Qtr 2014	Emergency Management			
			Revise/update current city policy/practices to meet current county recommendations.	4th Qtr 2014	Emergency Management			

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
IDO - 2	Infectious Disease Outbreak	Prepare City of Richland Hills's first responders and volunteers to work with Tarrant County in the event of a mass prophylaxis distribution.	Train first responders in POD procedures.	3rd Qtr 2014	Fire/Emergency Management			
			Training non-first responders city employees in POD procedures.	4th Qtr 2014	Emergency Management			
			Develop volunteer pool to assist city/county in POD activities.	2nd Qtr 2015	Emergency Management			
IDO - 4	Infectious Disease Outbreak	Using existing materials collect and put together information packets on dangers of infectious disease outbreaks and effective measures the Richland Hills public can take in protecting themselves.	Search and collect information/brochures that can be distributed to the public.	3rd Qtr 2014	Emergency Management	$1,000	$5,000	Operations Budget, Grant
			Distribute messages via social media, city newsletter, and website.	4th Qtr 2014	Emergency Management	$1,000	$4,000	Operations Budget, Grant
D - 1	Drought	Review and update if needed current City of Richland Hills ordinances regarding water conservation during periods of drought.	Review current ordinances to determine if they meet recommended practices from state and/or City of Fort Worth (water supplier).	3rd Qtr 2014	Public Works / City Manager			
			If necessary present new or revised ordinances to City Council for water conservation.	4th Qtr 2014	Public Works / City Manager			

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Review state, county and Fort Worth Water District (city's source of potable water) restrictions and recommendations from water conservation.	3rd Qtr 2014	Public Works			
D - 3	Drought	Public education increasing awareness of water restrictions.	Through social media blitz city often with water restrictions and conservation methods.	1st Qtr 2015	Public Works			
			Repeated messages in city newsletter regarding drought, water conservation and restrictions.	1st Qtr 2015	Public Works			
			Increase signs and visibility of outdoor signs providing message(s) on water restrictions, conservation and restrictions.	1st Qtr 2015	Public Works	$5,000	$20,000	Water Enterprise Fund
TR - 2	Terrorism	Conduct multiagency jurisdictional mock training exercises to active shooter scenarios, coordinated by Richland Hills.	Participate in BISD mock lockdown training exercises.	Completed	Police Department, BISD	-	$7,900	City Revenue
			Conduct multiagency response to active shooter training in multiple schools.	Completed	Richland Hills, N. Richland Hills, Watauga, Haltom City Police Departments	-	$7,900	City Revenue
			Develop after action report to evaluate training.	Completed	Police Department	-	$7,900	City Revenue

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
TR - 2	Terrorism	Provide active shooter response training to all Richland Hills uniformed officers in the department.	Develop a lesson plan on response to active shooter.	Completed	Police Department		$7,900	City Revenue
			Conduct basic on-site training in rapid response to active shooter incidents.	Completed	Police Department		$7,900	City Revenue
			Assemble go-kits for responding to active shooter incidents.	Completed	Police Department	$7,608	$7,900	City Revenue
TR - 3	Terrorism	Have a standard operating procedure (SOP) in effect in the event of an active shooter call-out in Richland Hills.	Conduct research into incidents that have occurred in the past.	Completed	Police Department	-	-	City Revenue
			Hold Safety and Security Forum with BISD representatives.	Completed	Police Department, BISD	-	-	City Revenue
			Develop SOP for officers responding to active shooter incidents.	Completed	Police Department	-	-	City Revenue
L - 2	Lightning	Develop and institute lightning mitigation information for residents and business owners in Richland Hills.	Research current public education materials on lighting hazards and protective measures.	Apr-14	Fire			
			Obtain established public education material on lighting mitigation and safety.	May-14	Fire	$500	$2,000	City Budget
			Develop public education presentation for lightning mitigation awareness and safety for audience presentations.	May-14	Fire	$500	$2,000	City Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
L - 2	Lightning	Reduce lightning risks to residential, commercial and institutional structures in the City of Richland Hills through promoting the use of lightning arrestors, surge protectors and whole house surge protectors.	Obtain and distribute information on protecting property against lightning damage.	4th Qtr 2014	Fire	$500	$2,000	Public Education Budget
			Promote lightning protection on new or remodeled structures in the city during permit application period.	3rd Qtr 2014	Community Development	$300	$1,200	Community Development Budget - Printing
L - 1	Lightning	Ensure city communication infrastructure is protected from lightning strikes.	Evaluate the current lightning protection on city communication infrastructure.	Apr-15	Police	$1,000	$100,000	City Operating Budget
			Replace or update existing lightning protection on city communication infrastructure.	Dec-15	Police	$10,000	$100,000	City Operating Budget
L - 1	Lightning	Ensure critical city structures are protected from lightning strikes.	Evaluate the current lightning protection on critical city facilities.	Jun-15	PW	$2,000	$100,000	City Operating Budget
			Update, replace or install lightning protection on critical city facilities.	2 years	PW	$30,000	$250,000	City Operating Budget
HM - 1	Hazardous Materials Release	Perpetuate the knowledge, safe practices and mitigation activities in the business community on handling and storing	Train Fire Inspectors in hazardous materials operations level.	1st Qtr 2014	Fire Depart.	$1,500	$6,000	FD Training Budget and TFS grants

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
		hazardous materials, in Richland Hills.	Fire Inspectors to be accompanied by HazMat Techs during inspections of sites with HazMat materials.	1st Qtr 2015	Fire Depart.			
HM - 1	Hazardous Materials Release	Fire Department's Hazardous Materials Team Members to work with business owners employees in review company's operations and actions during spill events, in Richland Hills.	Identify business properties with hazardous materials on site.	3rd Qtr 2014	Fire Department			
			Promote joint training exercise between department's hazmat team and companies, in the city, that have hazardous materials.	4th Qtr 2014	Fire Department			
			Department and regional HazMat Team to train on specific products in business community.	4th Qtr 2014 and beyond	Fire Department			
			Obtain equipment and supplies needed to respond to specific potential incidents inside business community.	4th Qtr 2014 and beyond	Fire Department			
ET - 1	Extreme Temperatures	Promote incorporation of power generators for the use of a new Richland Hills city facility in the planning stages now. Generator(s) to provide the power necessary to operate HVAC	Electrical generator(s) to power new public facility for shelter or warming/cooling center.	1st Qtr 2016	Emergency Management	$50,000	$200,000	Bonds

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
		in the event of wide spread power loss during extreme temperatures.	Build warming/cooling shelter facility into new public building.	1st Qtr 2016	Emergency Management	$10,000	$40,000	Bonds
ET - 1	Extreme Temperatures	Develop extreme temperature plans to operate Richland Hills warming/cooling shelter.	Develop plans to operate, staff, and run a warming/cooling shelter.	3rd Qtr 2014	Emergency Management			
			Hold drills to test plan with existing city structures.	4th Qtr 2014	Emergency Management			
ET - 2	Extreme Temperatures	Promote mitigation activities for residents and business community during extreme weather events in Richland Hills.	Develop public education program for residents on mitigation for extreme weather.	4th Qtr 2014	Emergency Management			
			Develop public education campaign program for business and building owners for mitigating effects of extreme temperature.	4th Qtr 2014	Emergency Management			
ES - 1	Expansive Soils	Develop public education programs directed towards informing the Richland Hills public about the possibility of earthquakes and the mitigation actions that can be taken to protect themselves.	Collect existing public education material on building structures resistant to expansive soils.	1st Qtr 2016	Emergency Management / Community Development	$2,000	$8,000	Operating Budget
			Distribute materials promoting building methods that reduce the damage from earthquakes to builders / remodelers, citizens.	2nd Qtr 2016	Community Development			

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Present materials and steps to mitigate expansive soils during presentations to residents and business owners.	2nd Qtr 2016 and forward	Emergency Management / Community Development			
ES - 1	Expansive Soils	Review current City of Richland Hills's building codes to determine if they are adequate in promoting the materials and building practices that would diminish the damage to the new structures from expansive soils.	Review current, adopted, building code to determine whether the code addresses construction methods needed in areas where earthquakes are a possibility.	1st Qtr 2015	Community Development			
			Propose and adopt, by ordinance, safe building methods used to mitigate the possible damage to a structure from expansive soil	2nd Qtr 2015	Community Development			
DF - 1	Dam Failure	Pre-plan actions that would need to be taken in areas where potential flooding could take place with a failure of the levee.	Identify property and residents that would be affected by a failure of the levee along the Big Fossil Creek.	3rd Qtr 2014	Public Works / Emergency Management			
			Develop plans to notify residents and evacuate those residents in the event of a potential levee failure	4th Qtr 2014	Emergency Management / Police Dept			
DF - 1	Dam Failure	Maintain existing levees along the Big Fossil Creek on the east side of Richland Hills.	Perform semi-annual inspection of the levee to look for any maintenance problems or levee failure issues.	Twice per year	Public Works			PW Operating Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Report inspection of levees to Army Corps of Engineers.	Twice per year	Public Works			PW Operating Budget
DF - 1	Dam Failure	Improve the City of Richland Hills first responder and employee capabilities to prepare for and respond to dam failure events.	Prepare an employee training program specifically addressing response to dam failure incidents.	6 months	Police, Fire, Public Works	$3,000	$100,000	City Operating Budget
			Conduct annual training on response to dam failure events with all city employees.	Annually	All Departments	$2,500	$100,000	City Operating Budget
WS - 1	Winter Storms	Take actions to improve the capabilities of city first responders to prepare for and respond to residents request for assistance.	Purchase tire chains for emergency vehicles and Public Works vehicles.	3 months	Fire, Police and Public Works	$3,000		City Operating Budget
			Prepare City employees to be self-reliant in city facilities by stock piling supplies and equipment for 7 days of operations	6 months	Fire, Police and Public Works	$3,000		City Operating Budget
			Installation of large emergency generator in proposed City Community Center.	2 years	City Manager's Office / EM	$30,000	$100,000	Capital Budget
WS - 2	Winter Storms	Provide public education activities promoting awareness and mitigation activities for winter storms.	Distribute severe winter weather mitigation information through public education functions, civic events and social media.	3 months annually	Police, Fire and Emergency Management	$2,500	$100,000	City Operating Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Establish a method to identify at-risk residents (elderly, poor, physically challenged) who would need assistance during severe winter weather.	6 months	Police, Fire and Emergency Management	$2,500	$100,000	City Operating Budget
W - 3	Wildfire	Provide residents through the city's website, social media, newsletter and signs of County burn bans when in effect.	Alert residents to county burn bans through multiple media messages.	Ongoing action/project	Fire / Police	$250	$100,000	City Operating Budget
			Develop handouts to distribute to residents informing of the city ordinance on open fires and the county burn ban.	6 months	Fire	$500	$100,000	City Operating Budget
W - 3	Wildfire	Public education program developed to provide residents with knowledge of wildfire mitigation actions both in the city boundaries and while in rural areas.	Develop Wildfire Mitigation public education program that evaluates the city geographic and demographics to target hazard audience.	2nd Qtr 2014	Fire and Emergency Management	$1,000	$100,000	City Operating Budget
			Promote public wildfire mitigation through public education programs.	6 months	Fire and Emergency Management	$2,500	$100,000	City Operating Budget
			Train fire personnel in wildfire safety, urban and rural, so public education can be spread to the public.	3 months	Fire and Emergency Management	$5,000	$100,000	City Operating Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
W - 2	Wildfire	Review City ordinances, laws and current fire codes to ensure wildfire mitigation practices are in effect in Richland Hills.	Review, alter if necessary and adopt city ordinances that prevent wildfires	6 months	Fire / Police/ Emergency Management	$500	$100,000	City Operating Budget
			Review and alter, if necessary, current wildfire responses plans and procedures for an adequate.	6 months	Fire	$500	$100,000	City Operating Budget
D - 1	Drought	Review and update if needed current City of Richland Hills ordinances regarding water conservation during periods of drought.	Review current ordinances to determine if they meet recommended practices from state and/or City of Fort Worth (water supplier).	3rd Qtr 2014	Public Works / City Manager	$1,000	$25,000	City Operating Budget
			If necessary present new or revised ordinances to City Council for water conservation.	4th Qtr 2014	Public Works / City Manager	$1,000	$25,000	City Operating Budget
			Review state, county and Fort Worth Water District (city's source of potable water) restrictions and recommendations from water conservation.	Annually	Public Works	$1,000	$25,000	City Operating Budget
D - 3	Drought	Public education increasing awareness of water restrictions.	Through social media blitz city often with water restrictions and conservation methods.	1st Qtr 2015	Public Works			

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Repeated messages in city newsletter regarding drought, water conservation and restrictions.	1st Qtr 2015	Public Works			
			Increase signs and visibility of outdoor signs providing message(s) on water restrictions, conservation and restrictions.	1st Qtr 2015	Public Works	$5,000	$20,000	Water Enterprise Fund
D - 2	Drought	Update, Alter or Eliminate lawn irrigation systems at city facilities to conserve water.	Alter irrigation systems to operate at specific times watering only enough to sustain plants.	6 months	Public Works	$5,000	$25,000	City Operating Budget
			Over seed current city facility lawns and parks with drought resistant grasses.	6 months	Public Works	$3,000	$50,000	City Operating Budget
			New plantings at city facilities will be of drought resistant native plantings for water conservation.	4 years	Public Works	$25,000	$100,000	City Operating Budget
ES - 1	Expansive Soils	Develop public education programs directed towards informing the public about the possibility of earthquakes and the mitigation actions that can be taken to protect themselves.	Collect existing pub ed material on building structures resistant to expansive soils.	1st Qtr 2016	Emerg Mngt / Community Development	$2,000	$8,000	Operating Budget
			Distribute materials promoting building methods that reduce the damage from	2nd Qtr 2016	Community Development			

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			earthquakes to builders / remodelers, citizens.					
			Present materials and steps to mitigate expansive soils during presentations to residents and business owners.	2nd Qtr 2016 and forward	Emerg Mngt / Community Development			
ES - 1	Expansive Soils	Review city's current building codes to determine if they are adequate in promoting the materials and building practices that would diminish the damage to the new structures from expansive soils.	Review current, adopted, building code to determine whether the code addresses construction methods needed in areas where earthquakes are a possibility.	1st Qtr 2015	Community Development			
			Propose and adopt, by ordinance, safe building methods used to mitigate the possible damage to a structure from expansive soil	2nd Qtr 2015	Community Development			

5.23 City of Saginaw Mitigation Strategy

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ST - 2, T - 2	Severe Thunderstorms, High Winds and Tornadoes	Get as many Saginaw citizens as possible successful in receiving a storm shelter.	Aggressively participate in the State of Texas Tornado Shelter Rebate Program.	Annually	Fire Department/ Emergency Management	$0	$100,000	HMGP

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ST - 1, T - 1	Severe Thunderstorms, High Winds and Tornadoes	Ensure critical facilities in Saginaw have adequate safe rooms to protect against high-wind events and tornadoes.	Evaluate the current conditions of critical facilities to determine which ones, if any, need safe rooms installed.	Annually	Fire Department/ Emergency Management	$0	$100,000	City Budget / Grant Opportunities
			Establish the size and space needed to shelter the population of the critical facility.	Annually		$0	$100,000	City Budget / Grant Opportunities
			Install safe rooms as needed in critical facilities.	Annually		$100,000	$100,000	City Budget / Grant Opportunities
ST - 5, L-1, T – 5	Severe Thunderstorms and High Winds, Lightning, Tornadoes and Extreme Temperatures	Distribute extreme weather mitigation information to Saginaw citizens.	Provide extreme weather mitigation information to citizens through all available social media outlets and city notification methods, including info regarding extreme heat, severe thunderstorms and tornadoes. Ensure the city website is kept up to date regarding extreme weather education and extreme weather mitigation activities.	Annually	Fire Department/ Emergency Management	$1,000	$1 Million	City Budget
F – 1	Flooding	Decrease flood insurance premiums in Saginaw by participating in the Federal Emergency Management Agency's (FEMA) Community Rating System (CRS) program.	Work with City Leadership and become a member of the CRS program	1 Year	Fire Department, Public Works, Building Department	$5,000	$25,000	FEMA

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
F – 2	Flooding	Review and remove repetitive loss properties in Saginaw.	Review repetitive loss properties and work with property owners to remove them using FEMA funding.	Annually	Fire Department, Public Works, Building Department			FEMA
H – 2	Hail	Develop a hail outreach program for the Saginaw citizens.	Develop hail outreach program that provides tips and pertinent information for ensuring the protection of property against hail.	Annually	Fire Department/ Emergency Management	$500	$1 Million	City Budget
			Provide hail mitigation information to citizens through a social media campaign.			$500	$1 Million	City Budget
			Provide hail mitigation information through the city website.			$0	$1 Million	City Budget
H – 1	Hail	Provide hail-resistant parking areas for Saginaw's city vehicles.	Evaluate the need for covered parking for city vehicles to protect them against hail.	Annually	Public Works	$500	$500	City Budget / Grant Opportunities
			Install awnings over parking areas as needed to protect city vehicles against hail.			$50,000	$200,000	
L – 1	Lightning	Protect communication infrastructure in Saginaw from lightning damage	Install lightning rods on existing and future communication infrastructure.	Annually	Fire and Police Departments	$10,000	$250,000	City Budget / Grant Opportunities
L-1	Lightning	Ensure Saginaw critical facilities are protected against lightning damage	Evaluate the hazards and risks posed by lightning in Saginaw.	Annually	Fire Department /	$500	$500	City Budget / Grant Opportunities

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Install lightning rods and other protective equipment on critical facilities.	Annually	Emergency Management	$50,000	$500,000	
WS – 1	Winter Storms	Improve Saginaw first responder capabilities to mitigate effects of severe winter storms	Provide/purchase more ice control capability for public works equipment.	Annually	Public Works	Unk	Unk	City Budget / Grant Opportunities
WS – 2	Winter Storms	Improve the City of Saginaw's capability to mitigate against severe winter storms.	Establish programs/shelters to protect the poor, ill, and elderly during extreme winter temperatures.	Annually	Fire Department / Emergency Management	Unk	Unk	City Budget / Grant Opportunities
			Distribute severe winter weather mitigation literature at appropriate/identified community events and through the city website.					
D – 1	Drought	Review and aggressively enforce Saginaw's water use codes and ordinances and update as necessary to mitigate the effects of drought.	Review current code and ordinances for water conservation in Saginaw	Annually	Public Works, Code Enforcement and Emergency Management	Unk	Unk	City Budget / Grant Opportunities
			Develop and/or update water conservation enforcement ordinances to ensure effective practices during periods of drought.					
D – 2	Drought	Upgrade water and irrigation systems to conserve water in Saginaw City facilities.	Install efficient irrigation systems in new and existing City facilities.	Annually	Public Works	$50,000	$250,000	City Budget / Grant Opportunities
			Update water appliances to newer water conservation design models.			$50,000	$250,000	

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
W – 3	Wildfire	Mitigate wildfires by encouraging wildfire resistant construction and practices in the Saginaw.	Enact building permit process that encourages wildfire resistant construction.	Annually	Building Department	Unk	Unk	City Budget / Grant Opportunities
			Increase public education on how to reduce the risks from wildfires (construction, landscaping, etc.). Notifications, city website, social media.		Building Department and Fire Department	Unk	Unk	
W – 2	Wildfire	Ensure adequate Saginaw wildfire response plans and procedures are in place.	Review current wildfire response plans and procedures. Coordinate with surrounding partner agencies for automatic aid ensuring appropriate type and number of resources respond quickly.	Annually	Fire Department	Unk	Unk	City Budget / Grant Opportunities
ET – 1	Extreme Temperatures	Establish a plan for mitigating the negative effects of extreme temperatures within Saginaw.	Open cooling shelters and provide public information.	Annually	Fire Department / Emergency Management	$1,000	$10,000	City Budget / Grant Opportunities
ET – 1	Extreme Temperatures	Establish extreme temperature mitigation plans for critical infrastructure in Saginaw.	Develop mitigation procedures for critical infrastructure when temperature extremes are experienced and shut			Unk	Unk	City Budget / Grant Opportunities

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			down of non-critical infrastructure for ease on utilities.					
ES – 1	Expansive Soils	Mitigate expansive soils in Saginaw.	Improve construction techniques through building code enhancements.	Annually	Building Department	Unk	Unk	City Budget / Grant Opportunities
			Educate construction contractors, homeowners, and business owners about mitigation techniques. Seminars, notifications, training classes, city website, published ordinances.			Unk	Unk	

5.24 City of Southlake Mitigation Strategy

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
MH – 1	Severe Thunderstorms and High Winds, Tornadoes, Flooding, Hail, Lightning, Winter Storms, Hazardous Materials Incident	Maintain Southlake public alert systems.	Ensure annual OWS maintenance is performed.	Continual	Fire Department	$5,000	$100,000	General Fund
			Ensure maintenance of Blackboard Connect calling system.	Continual	Fire Department	$23,500	$500,000	General Fund
			Maintain 790AM Radio Station for emergency usage.	Continual	Fire Department	$500	$100,000	General Fund
			Utilize City's cable channel to promote mitigation and provide alerts.	Continual	Information Technology	$1,500	$50,000	General Fund
MH – 6	Severe Thunderstorms and High Winds, Tornadoes, Flooding, Hail, Lightning, Winter Storms, Hazardous Materials Incident, Wildfire	Implement a multijurisdictional Automatic Vehicle Location (AVL) system for both police and fire from Colleyville, Keller, Southlake, and Westlake (NETCOM).	Survey the eight departments and ascertain need and want as well as determine the number of users needed.	7 months	North East Tarrant County Communications (NETCOM)	-	-	-
			Determine vendor for purchase.	1 year	NETCOM with a representative from all cities	-	-	-
			Purchase hardware for all jurisdictions.	16 months	NETCOM	$90,000	$360,000	Individual City Budgets
			Purchase software for dispatch center and each unit.	2 years	NETCOM	$10,000	$40,000	Individual City Budgets

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
MH – 6	Severe Thunderstorms and High Winds, Tornadoes, Flooding, Hail, Lightning, Winter Storms, Hazardous Materials Incident, Wildfire, Extreme Temperatures, Expansive Soils	Utilize GIS to stay up-to-date on hazard mitigation information for the City of Southlake.	Obtain GIS data on types and numbers of future buildings, infrastructure, and critical facilities.	1 year	Planning and Development Services	$2,500	$50,000	General Fund
			Update hazard vulnerability analysis based on land use and development trends in the City.	1 year	Fire Department, Planning and Development Services	$5,000	$25,000	General Fund
MH – 7	Severe Thunderstorms and High Winds, Tornadoes, Flooding, Hail, Lightning, Winter Storms, Hazardous Materials Incident, Wildfire, Extreme Temperatures, Expansive Soils	Increase training opportunities and participating in the City of Southlake CERT program.	Conduct annual CERT class.	Continual	Fire Department	$250	$10,000	General Fund
			Conduct ongoing CERT drills and refresher training.	Continual	Fire Department	$150	$5,000	General Fund
			Organize CERT Team by SPIN Neighborhood.	2 years	Fire Department	$750	$5,000	General Fund

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
MH – 7	Severe Thunderstorms and High Winds, Tornadoes, Flooding, Hail, Lightning, Winter Storms, Hazardous Materials Incident, Wildfire, Extreme Temperatures, Expansive Soils, Drought	Ensure City of Southlake citizens and businesses know how to mitigate disasters.	Hold an annual Southlake Safety Fair.	Continual	Fire Department, Police Department	$200	$20,000	General Fund
			Hold an annual SPIN meeting on hazard mitigation.	Continual	Fire Department	$50	$20,000	General Fund
			Hold annual Safe Building Week to educate citizens and businesses about building codes and safe practices.	Continual	Planning and Development Services	$500	$15,000	General Fund
ST – 3, T – 3	Severe Thunderstorms and High Winds, Tornadoes	Require the enforcement of building codes in the City of Southlake.	Require the enforcement of building codes to protect against winds of 90 miles per hour sustained for up to 30 seconds.	Continual	Planning and Development Services	$5,000	$1,000,000	Builders, Residents
F – 3	Flooding	Improve drainage in City of Southlake residential areas.	Lodestar Drainage Improvements – improve drainage to eliminate standing water issues on Lodestar Dr.	1 year	Public Works	$110,000	$500,000	Stormwater Utility Fund
			Construct drainage box culvert on Zena Rucker Road to facilitate future development.	1 month	Public Works	$200,000	$10,000,000	Stormwater Utility Fund
F – 3	Flooding	Improve drainage and erosion control in non-residential areas of the City of Southlake.	South White Chapel Bridge Scour Improvements – Project will address scour	1 month	Public Works	$150,000	$2,000,000	Stormwater Utility Fund

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			erosion occurring around bridge columns.					
			Drainage basin improvements at Bicentennial Park – improve drainage at Bicentennial Park by expanding stage discharge and possible volume increase.	1 year	Public Works	$450,000	$1,000,000	Stormwater Utility Fund
D-1	Drought	Improve Southlake's water supply to ensure adequate firefighting ability during summer drought.	Construct TW King 30 inch water supply line to increase capability of water able to be pumped in.	3 months	Public Works	$11,000,000	$20,000,000	General Fund
D-1	Drought	Review and aggressively enforce Southlake's water use codes and ordinances and update as necessary to mitigate the effects of drought.	Review current code and ordinances for water conservation in Southlake. Develop and/or update water conservation enforcement ordinances to ensure effective practices during periods of drought.	Annually	Public Works, Code Enforcement and Emergency Management	Unk	Unk	City Budget / Grant Opportunities
D-2	Drought	Upgrade water and irrigation systems to conserve water in Southlake City facilities.	Install efficient irrigation systems in new and existing City facilities.	Annually	Public Works	$50,000	$250,000	City Budget / Grant Opportunities

5.25 Tarrant County Mitigation Strategy

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
MH – 1	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires	Improve Tarrant County warning time for citizens outside of City limits by Tarrant County.	Identify areas not covered by existing systems.	Jan-14	Tarrant County OEM, Transportation	$4,000	$16,000	FEMA, Tarrant County
			Obtain quote and secure funding.	Feb-14	Tarrant County OEM	$1,000	$ 4,000	FEMA, Tarrant County
			Perform installation of system.	Apr-14	Contractor/Vendor	$175,000	$700,000	FEMA, Tarrant County
MH – 7	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires	Tarrant County will purchase weather radios for distribution to common workspaces and break rooms to keep employees aware of potential weather hazards while at work.	Obtain quote for various equipment (ex. NOAA weather radios).	Dec-13	Tarrant County OEM	$2,500	$10,000	FEMA, State, Tarrant County
			Place order and distribute materials to the county buildings.	Dec-13	Tarrant County Purchasing and Facilities	$10,000	$40,000	FEMA, State, Tarrant County
ST – 2, T – 2	Severe Thunderstorms and High Winds, Tornadoes	Each jurisdiction in Tarrant County will ensure participation in the State of Texas Shelter Rebate Program.	Participate in the State of Texas Tornado Shelter Rebate Program.	Annually	Individual Jurisdictions	$5 million	$20 million	HMGP

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ST – 4, T – 4	Severe Thunderstorms and High Winds, Tornadoes	Use Tarrant County public education and public information officers to spread positive information regarding opportunities for installation of storm shelters.	Create pamphlets for distribution.	Apr-14	Tarrant County OEM	$1,500	$120,000	FEMA, State Tarrant County
			Advertise local program to help subsidize installation cost of shelters.	Dec-14	Tarrant County PIO	$30,000	$120,000	FEMA, State Tarrant County
F – 1	Flooding	Tarrant County will participate and improve Community Rating System through the National Flood Insurance Program (NFIP)	Tarrant County to plan with stakeholders on developing strategies to reduce vulnerability to reduce the risk to flooding.	Continual	Tarrant County, All Participating Jurisdictions	$100,000	$400,000	Tarrant County and potential grant funding
F – 3	Flooding	Prevent the eventual washing out of road by the encroaching creek at Winscott Plover, by Tarrant County.	Survey the intersection.	2 months	Tarrant County Transportation	$32,000	$128,000	100% Tarrant County
			Design the new layout of the intersection.	4 months	Tarrant County Transportation	$125,000	$500,000	25% Tarrant County, 75% FEMA
			If needed, purchase the right of way.	3.5 months	Tarrant County Transportation	$54,450	$217,800	100% Tarrant County
			If needed, move utility lines.	6 months	Tarrant County Transportation	$100,000	$400,000	100% Tarrant County
			Complete construction.	6 months	Tarrant County Transportation	$451,684	$878,293	25% Tarrant County, 75% FEMA

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
F – 3	Flooding	Create additional flow of storm water to pass under Geraldine Road and prevent flooding or washing out of the road by increasing the conveyance of water under the street, by Tarrant County.	Survey the intersection.	1 months	Tarrant County Transportation	$28,000	$112,000	Tarrant County
			Design the new layout.	1 months	Tarrant County Transportation	$30,000	$120,000	Tarrant County
			If needed, purchase the right of way.	3.5 months	Tarrant County Transportation	$54,450	$217,800	Tarrant County
			If needed, move utility lines.	6 months	Tarrant County Transportation	$100,000	$400,000	Tarrant County
			Complete construction.	1 week	Tarrant County Transportation	$20,000	$ 150,000	Tarrant County
F – 3	Flooding	Create additional flow of storm water to pass under the roadway and prevent flooding or washing out of the road by larger pipes that pass under.	Survey the intersection.	1 month	Tarrant County Transportation	$19,200	$76,800	Tarrant County
			Design the new layout.	3 months	Tarrant County Transportation	$45,000	$180,000	Tarrant County
			If needed, purchase the right of way.	3.5 months	Tarrant County Transportation	$54,450	$217,800	Tarrant County
			If needed, move utility lines.	6 months	Tarrant County Transportation	$100,000	$400,000	Tarrant County
			Complete construction.	1 week	Tarrant County Transportation	$30,000	$300,000	Tarrant County

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
W – 2	Wildfire	Tarrant County to encourage the protection of Tarrant County residential and commercial structures.	Develop a Wildland Urban Interface Plan to identify areas of Tarrant County to mitigate against the threat of wildfire in rural areas that backup to urban residential areas. Develop WUI plan with the Texas Forest Service and fire service stakeholders in the unincorporated areas of Tarrant County.	2016	Tarrant County Emergency Management and Fire Marshal's Office	$100,000	$500,000	Grants, County Budget
W – 3	Wildfire		Educate homeowners during Fire Prevention month on mitigation (October).	1 month	Tarrant County EMA, Lake Worth FD	$2,000	$8,000	Town Budget
WS – 1	Winter Storms	Purchase additional equipment (de-ice or sand) for Tarrant County maintenance crews to use in the event of hazardous road conditions.	Identify potential shortfalls in supplies needed in winter responses.	Mar-14	Tarrant County Precinct Garages, OEM	$5,000	$20,000	FEMA, State, Tarrant County
			Procure materials needed in advance of winter weather.	Oct-14	Tarrant County OEM, Purchasing	$20,000	$80,000	FEMA, State, Tarrant County
IDO – 1	Infectious Disease Outbreak	Enhance epidemiology response program at Tarrant County Public Health.	Develop Community Assessment Public Health Emergency Response Teams (CASPER).	FY14	Tarrant County Public Health	$10,000	$30,000	DSHS
			Purchase field deployment equipment (laptops, radios, etc.).	FY15	Tarrant County Public Health	$50,000	$75,000	FEMA

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Provide additional contract staff for data collection.	FY15	Tarrant County Public Health	$100,000	$250,000	DSHS
IDO – 1	Infectious Disease Outbreak	Enhance surveillance and detection programs at Tarrant County Public Health.	Maintain and upgrade (as needed) current surveillance systems: RODS, ESSENCE, Bio Sense, and Bio Watch.	FY14	Tarrant County Public Health	$25,000	$40,000	DSHS
			Implement Bio Watch training programs for local HAZMAT.	FY15	Fort Worth OEM	$50,000	$75,000	DHS
			Provide exercise and training for Public Health Informatics, EPI, and PHP.	FY15	Tarrant County Public Health	$25,000	$50,000	FEMA
IDO – 1	Infectious Disease Outbreak	Enhance environmental health field response and laboratory testing at Tarrant County Public Health.	Increase lab surge readiness levels with new testing and processing equipment.	FY14	Tarrant County Public Health	$75,000	$150,000	FEMA
			Increase Environmental Health field response levels with additional vector control equipment.	FY14	Tarrant County Public Health	$50,000	$75,000	FEMA
			Add additional Lab and Environmental Health response team staff.	FY15	Tarrant County Public Health	$100,000	$250,000	DSHS
IDO – 2	Infectious Disease Outbreak	Tarrant County to establish emergency medical cache for first responders in Tarrant County.	Purchase medical cache for Tarrant County First Responders.	FY14	Tarrant County Public Health and NCTTRAC	$80,000	$120,000	FEMA
			Contract local hospitals to assist with medical cache inventory and rotation.	FY14	NCTTRAC	$50,000	$100,000	FEMA

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Conduct Training and Exercises for Alpha point of dispensing (POD) operations for delivery of 1st Responder medical cache.	FY15	Tarrant County Public Health and NCTTRAC	$25,000	$50,000	DSHS
IDO – 2	Infectious Disease Outbreak	Tarrant County to enhance POD site security program through local law enforcement in Tarrant County.	Conduct POD security training exercise for local law enforcement.	FY15	Tarrant County Public Health and Tarrant County OEM	$25,000	$50,000	DSHS
			Purchase tactical gear for county constables.	FY15	Tarrant County OEM	$75,000	$100,000	FEMA
IDO – 2	Infectious Disease Outbreak	Tarrant County to improve coordination with local partners and stakeholders in Tarrant County for medical countermeasure planning.	Hire contract closed POD recruiter for private/corporate sector.	FY15	Tarrant County Public Health	$75,000	$150,000	DSHS
			Sponsor continuity of operations (COOP) training for local businesses and private sector partners.	FY15	Tarrant County Public Health	$25,000	$50,000	FEMA
IDO – 3	Infectious Disease Outbreak	Enhance and improve isolation and quarantine protocols for Tarrant County stakeholders and local agencies (NCTTRAC).	Provide specialized training on I&Q protocols for hospital infection control nurses.	FY15	NCTTRAC	$50,000	$75,000	DSHS
IDO – 3	Infectious Disease Outbreak	Tarrant County to improve COOP readiness to incorporate pandemic preparedness measures among partners and stakeholders in Tarrant County.	Provide COOP training for private sector business partners.	FY15	Tarrant County Public Health	$25,000	$50,000	DSHS

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
IDO – 3	Infectious Disease Outbreak	Tarrant County to enhance and improve situational awareness during a biological disease outbreak/pandemic for local emergency management in Tarrant County.	Develop smart phone apps for situational awareness reporting and public service announcements (PSAs).	FY15	Tarrant County IT	$50,000	$75,000	FEMA
D – 1	Drought	Review TCWD/Lake Worth water enforcement legislation and update as necessary to mitigate the effects of drought.	Review current legislation for water conservation enforcement in Lake Worth.	365 Days	Joint efforts with Tarrant County Regional Walter District and members	$3,000	$9,000	General Fund
			Develop or update water conservation enforcement legislation to ensure effective practices during periods of drought.	365 Days	Joint efforts with Tarrant County Regional Walter District and members			
D – 2	Drought	Upgrade water and irrigation to conserve water for Tarrant County Facilities and for Tarrant County residents. Upgrade irrigation systems, installing better water fixtures at critical infrastructure/county facilities.	Upgrade water and irrigation to conserve water for Tarrant County Facilities and for Tarrant County residents. Upgrade irrigation systems, installing better water fixtures at critical infrastructure/county facilities.	2016	Tarrant County Facilities	$10,000	$50,000	Tarrant County Budget, Grants

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
H – 1	Hail	Provide hail resistant parking areas for county owned vehicles and equipment. Determine the need for covered parking and storage area for county owned vehicles and equipment at County Precinct Maintenance Facilities	Provide hail resistant parking areas for county owned vehicles and equipment. Determine the need for covered parking and storage area for county owned vehicles and equipment at County Precinct Maintenance Facilities	2016	County Transportation/ County Precincts	$100,000	$500,000	County funds, HMGP, PDM
H – 2	Hail	Distribute hail preparedness information to County personnel and residents of Tarrant County. Provide hail preparedness public education to citizens by publication, county website, and social media.	Distribute hail preparedness information to County personnel and residents of Tarrant County. Provide hail preparedness public education to citizens by publication, county website, and social media.	2016	Tarrant County Emergency Management	$2,500	$10,000	Tarrant County budget and HMGP Grants
L – 1	Lightning	Protect Communication infrastructure for Tarrant County from lightning. Determine the need for lightning protection on communications infrastructure in Tarrant County.	Protect Communication infrastructure for Tarrant County from lightning. Determine the need for lightning protection on communications infrastructure in Tarrant County.	2018	Tarrant County IT Department/ Facilities Department	$10,000	$50,000	None identified
		Install Lighting Rods on existing and future communications infrastructure.	Install Lighting Rods on existing and future communications infrastructure.	2020	Tarrant County IT Department/ Facilities Department	$30,000	$1,000,000	None identified

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
L – 2	Lightning	Protect Tarrant County critical infrastructure and facilities to protect from lightning. Install lightning rods and other protective equipment on critical facilities such as downtown high rises.	Protect Tarrant County critical infrastructure and facilities to protect from lightning. Install lightning rods and other protective equipment on critical facilities such as downtown high rises.			$300,000	$1,000,000	None identified
WS – 1	Winter Storms	Equip county vehicles and equipment with digital thermometers to identify pavement and asphalt temperatures to determine freeze levels. Purchase digital thermometers to equipment county public works/precinct equipment to determine freeze levels on bridges, overpasses, and roadways.	Equip county vehicles and equipment with digital thermometers to identify pavement and asphalt temperatures to determine freeze levels. Purchase digital thermometers to equipment county public works/precinct equipment to determine freeze levels on bridges, overpasses, and roadways.	2016	Tarrant County Transportation/ County Precincts	$50,000	$200,000	County Budget, HMGP
WS – 2	Winter Storms	Protect critical infrastructure such as Central Garage to provide critical services to county vehicles and the ability to use fuel pumps to fuel county vehicles during power outages from a winter storm.	Protect critical infrastructure such as Central Garage to provide critical services to county vehicles and the ability to use fuel pumps to fuel county vehicles during power outages from a winter storm.	2016	Tarrant County Transportation	$200,000	$1,000,000	County Budget, HMGP, PDM

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ET – 1	Extreme Temperatures	Identify Tarrant County critical infrastructure that does not currently have emergency power generation capability to provide HVAC during extreme temperatures (hot and cold).	Identify Tarrant County critical infrastructure that does not currently have emergency power generation capability to provide HVAC during extreme temperatures (hot and cold).	2017	Tarrant County Facilities Department	$300,000	$1,200,000	
ES – 1	Expansive Soils	Provide public education to residents of Tarrant County on expansive soils.	Provide public education to residents of Tarrant County on expansive soils.	2016	Tarrant County Emergency Management	$ 2,500	$10,000	
ES – 2	Expansive Soils	Identify critical infrastructure that may be affected by expansive soils to create a plan to repair damage that may have been caused by expansive soils.	Identify critical infrastructure that may be affected by expansive soils to create a plan to repair damage that may have been caused by expansive soils.	2018	Tarrant County Facilities Department	$10,000	$50,000	County Budget and Grants
DF – 1	Dam Failure	Identify critical infrastructure located adjacent to Echo Lake Dam and develop a vulnerability analysis and inundation study to determine threats and vulnerability for a potential dam failure.	Identify critical infrastructure located adjacent to Echo Lake Dam and develop a vulnerability analysis and inundation study to determine threats and vulnerability for a potential dam failure.	2018	Tarrant County Transportation Department	$100,000	$500,000	Tarrant County Budget, HMGP, PDM
DF – 2	Dam Failure	Provide public education to citizens about the risk of dam failure in Tarrant County.	Provide public education to citizens about the risk of dam failure in Tarrant County.	2016	Tarrant County Office of Emergency Management and Transportation	$2,500	$10,000	Tarrant County Budget, HMGP

5.26 City of Watauga Mitigation Strategy

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ST – 1, T – 1	Severe Thunderstorms and High Winds, Tornadoes	Notify all citizens within Watauga City Parks of impending inclement weather.	Design and install warning sirens in all City parks.	5 years	Emergency management	$ 250,000	$ 7,500,000	City Funds, Grants
ST – 1, T – 1	Severe Thunderstorms and High Winds, Tornadoes	Replace outdated outdoor sirens within the City of Watauga.	Design and replace 3 OWSs.	5 years	Emergency Management	$ 250,000	$ 7,500,000	City Funds,
MH – 4	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires	Purchase a mobile command center for the City of Watauga.	Purchase a Mobile Command Center.	1 year	Emergency Management	$ 500,000	$ 2,000,000	City Funds, Grant Funds
MH – 5	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires	Train City of Watauga personnel in damage assessment.	Train personnel to conduct damage assessments.	18 months	Emergency Management	$ 3,000	$ 12,000	City Funds,

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
MH – 5	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires	Establish a Rapid Response Team (RRT) in the City of Watauga.	Establish policy regarding RRT.	Dec-13	Police Department (PD)	$ 500	$ 2,000	Department Budget
			Establish goals and objectives.	Oct-14	PD	$ 4,000	$ 16,000	Department Budget
			Develop team organizational chart.	May-14	PD	$ 250	$ 1,000	Department Budget
			Determine team selection and equipment.	Oct-14	PD	$ 8,000	$ 24,000	Department Budget
			Provide training for team.	Ongoing	PD	$ 7,500	$ 22,000	Department Budget
MH – 6	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires	Maintain a current business database for Watauga.	Create business database.	Oct-13	Police Department	$ 2,500	$ 10,000	City Budget
			Maintain the current business list.	Ongoing	Police Department, Fire Department	$ 500	$ 2,000	City Budget
F – 3	Flooding	Improve drainage of rainwater runoff in the streets of the Watauga Heights subdivision.	Design and install new storm water drains along the streets in subdivision.	5 years	Public Works	$ 1,500,000	$ 7,000,000	City Funds, Debt, Grants
PF – 1	Power Failure, Winter Storms, Severe Thunderstorms and High Winds, Tornadoes	Ensure City of Watauga critical facilities have alternate power supply.	Identify appropriate size and type of generator for critical facilities.	12 months	Building Maintenance	$ 1,000	$ 4,000	City Funds
			Purchase/order generator for critical facilities.	6 months	Building Maintenance	$ 60,000	$ 240,000	City Funds, Grants

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Deliver and install critical facility generators.	12 Months	Building Maintenance	$ 15,000	$ 60,000	City Funds, Grants
PF – 1	Power Failure, Winter Storms, Severe Thunderstorms and High Winds, Tornadoes	Ensure City of Watauga critical facilities have emergency lighting systems in place.	Evaluate emergency lighting systems in critical facilities.	3 months	Building Maintenance	$ 1,000	$ 4,000	City Funds
			Install emergency lighting systems in critical facilities.	12 months	Building Maintenance	$ 60,000	$ 240,000	City Funds, Grants
D – 1	Drought	Review City of Watauga water enforcement legislation and update as necessary to mitigate the effects of drought.	Review current legislation for water conservation enforcement in City of Watauga.	Completed	Public Works, Water Department	$ 2,500	$ 10,000	City Funds
			Develop or update water conservation enforcement legislation to ensure effective practices during periods of drought.	12 Months	Public Works, Water Department	$ 10,000	$ 40,000	City Funds
D – 1	Drought	Develop contingency plans for City of Watauga to ensure adequate power and water supply during prolonged periods of drought.	Review current contingency plans.	Completed	Public Works	$ 10,000	$ 40,000	City Funds
			Develop or update potable water contingency plans.	3-months	Public Works, Water Department	$ 10,000	$ 40,000	City Funds
			Develop or update power supply contingency plans.	12-months	Public Works	$ 10,000	$ 40,000	City Funds
D – 2	Drought	Upgrade water and irrigation systems to	Renewed approximately 20 water mains.	Completed	Public Works, Water Department	$2M	$8M	City Funds

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
		conserve water in Watauga.	Renew the Remaining Water Mains to stop breakage and leakage	24 Months	Public Works, Water Department	$50M	$200M	City Funds, Grants
D – 3	Drought	Develop a drought awareness education program for City of Watauga citizens.	Evaluate the hazards posed by drought in City of Watauga.	Completed	Public Works, Water Department	$ 5,000	$ 20,000	City Funds
			Develop a drought awareness education program that provides tips and pertinent information for ensuring the protection of property and the environment against drought.	Completed	Public Works, Water Department	$ 10,000	$ 40,000	City Funds
D – 3	Drought	Distribute drought awareness information to City of Watauga citizens.	Provide drought awareness information to City of Watauga citizens through a social media campaign.	12 months	IT/PIO	$ 5,000	$ 20,000	City Funds
			Provide drought awareness information through the City of Watauga website.	Completed	IT/PIO	$ 5,000	$ 20,000	City Funds
ET – 1	Extreme Temperatures	Ensure City of Watauga has an extreme heat plan in place.	Review current plans and procedures related to extreme heat.	18 months	Emergency Management	$ 1,500	$ 6,000	City Funds

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Develop or update extreme heat plans and ensure they provide procedures for opening cooling centers and providing public information.	12 months	Emergency Management	$ 3,000	$ 12,000	City Funds
ET – 1	Extreme Temperatures	Identify extreme heat plans for critical infrastructure in City of Watauga.	Evaluate the need for extreme heat plans for critical infrastructure to ensure essential functions continue in the event of high temperatures.	3 months	Emergency Management	$ 1,500	$ 6,000	City Funds
			Develop or update plans and procedures for critical infrastructure when high temperatures are present.	12 months	Emergency Management	$ 3,000	$ 12,000	City Funds
ET – 2	Extreme Temperatures	Develop an extreme heat outreach program for Watauga citizens.	Evaluate the hazards posed by extreme heat in the City of Watauga.	12 months	Emergency Management	$ 1,500	$ 6,000	City Funds
			Develop an extreme heat outreach program that provides tips and pertinent information for ensuring the health and safety of citizens during extreme heat.	18 months	Emergency Management	$ 1,500	$ 6,000	City Funds

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ET – 2	Extreme Temperatures	Distribute extreme heath mitigation information to City of Watauga citizens.	Provide extreme heat mitigation information to the City of Watauga citizens through a social media campaign.	18 months	IT/Emergency Management	$ 5,000	$ 20,000	City Funds
			Provide extreme heat mitigation information through the City of Watauga's website.	18 months	IT/Emergency Management	$ 5,000	$ 20,000	City Funds
ES – 1	Expansive Soils	Mitigate expansive soils in Watauga.	Improve construction techniques through building code enhancements.	12 months	Building Official	$ 25,000	$ 100,000	City Funds
			Educate construction contractors, homeowners, and business owners about mitigation techniques.	24 months	Building Official	$ 10,000	$ 40,000	City Funds
T – 5	Tornado	Enhance warning systems to help warn the citizens of Watauga, concerning the potential of tornadic activity.	Implement OWS upgrades to address potential areas where growth has and will occur that may impact the ability of the system to reach its intended service area.	Project will be implemented as funds become available.	EM	$ 85,000	The impact of warning our population of the impending Tornado is difficult to measure with the impact to life and property. This number could be in the millions of dollars.	General Fund

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
T – 5	Tornado	Update our Blackboard Connect phone notification system with a more robust system.	By updating our Blackboard Connect notification system with a more robust process for notifying our citizens by way of smart phone applications, texting and other forms of social media. This will have the potential of reaching a more active and social community. This will also allow for our whole community to be more informed of the approaching severe weather that may be producing a Tornado.	Completed with annual updates as our community grows.	EM	$ 15,000	The impact of warning our population of the impending Tornado is difficult to measure with the impact to life and property. This number could be in the millions of dollars.	General Fund
F – 3	Flooding	Add high water warning devices on our roadways that are prone to high water.	Add measures such as an enhanced warning system that will offer a measuring system for high water that will notify our Public Works department to barricade the area to reduce the potential for loss of life	3-5 years as funding is available.	Public Works	$ 225,000	$ 400,000	Certificate of obligation Bond issues

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
F – 2	Flooding	Enhance and enforce our flood plain regulations in Watauga.	Annual repetitive losses due to flooding will continue to be assessed and mapped. Insuring our FIRM mapping is adequate and above all correct as it relates to properties that may be raised above the flood elevations.	5-10 years as funding becomes available	Engineering	$ 10,000,000	$ 40,000,000	FEMA HMGP
ST – 5	Thunderstorms and High Wind	Enhance warning systems to help warn the citizens of Watauga, concerning the potential of Severe Storms(Severe Thunderstorms, High Winds).	By updating our Blackboard Connect notification system with a more robust process for notifying our citizens by way of smart phone applications, texting and other forms of social media. This will have the potential of reaching a more active and social community. This will allow for our whole community to be warned of this potential.	Completed with annual updates as our community grows.	EM	$ 15,000	The impact of warning our population of the impending Severe Storm is difficult to measure with the impact to life and property. This number could be in the millions of dollars.	General Fund

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ST – 4	Thunderstorms and High Wind	Increase awareness through PSAs such as the Knowhat2do program and continue our efforts to increase the coverage of indoor warning devices, such as weather radios.	This effort would be to better inform our population of actions they can take to better prepare and ultimately survive the effects of Severe Storms. Add weather radios for indoor warning devices to all homes and businesses.	3-5 year project	EM	$ 200,000	The impact is difficult to measure.	General Fund, Grants and donations.
H – 2	Hail	Enhance warning systems to help warn the citizens of Watauga, concerning the potential of severe storms producing large hail.	By updating our Blackboard Connect notification system with a more robust process for notifying our citizens by way of smart phone applications, texting and other forms of social media in an effort to reach a more active and social community. This will further increase our ability to warn our whole community to the potential hazard of hail, associated with severe storms.	Completed with annual updates as our community grows.	EM	$ 7,700	The impact of warning our population of the impending Severe Storm with the potential of Hail is difficult to measure with the impact to life and property. This number could be in the millions of dollars.	General Fund

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
H – 2	Hail	Increase awareness through PSAs such as the Knowhat2do program and continue our efforts to increase the coverage of indoor warning devices, such as weather radios.	This effort would be to better inform our population of actions they can take to better prepare and ultimately survive the effects of hail associated with severe storms by adding weather radios for the home and or business.	3-5 year project.	EM	$ 400,000	The impact of warning our population of the impending Severe Storm with the potential of Hail is difficult to measure with the impact to life and property. This number could be in the millions of dollars.	General Fund or bond issuance.
L – 1	Lightning	Enhance warning systems to help warn the citizens of Watauga, concerning the potential of severe storms producing cloud to ground and cloud to cloud lightning.	Adding additional weather stations with lightning detection capability. The ability to detect the potential for lightning offers life saving measures. Additional mitigation actions concern adding hand held lightning detection devices for our public works and parks personnel.	1-3 Years	EM	$ 78,000	The impact of warning our population concerning Lightning associated with a Severe Storm is difficult to measure with the impact to life and property. This number could be in the millions of dollars.	General Fund and or Bond issues.

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
L- 2	Lightning	Increase awareness through PSAs such as the Knowhat2do program and continue our efforts to increase the coverage of indoor warning devices, such as weather radios.	This effort would be to better inform our population of actions they can take to better prepare and ultimately survive the effects of lightning associated with severe storms by adding weather radios for the home and or business.	3–5 Year Project.	EM	$ 400,000	The impact of warning our population of Lightning associated with Severe Storm is difficult to measure with the impact to life and property. This number could be in the millions of dollars.	General Fund or bond issuance.
WS – 1	Winter Storms	Enhance warning systems to help warn the citizens of Watauga, concerning the potential of winter storms. These storms can impact our city in numerous ways from slick roads to loss of power from down power lines.	By updating our Blackboard Connect notification system with a more robust process for notifying our citizens by way of smart phone applications, texting and other forms of social media. This will have the potential of reaching a more active and social community. This would also allow for our whole community to be warned of the potential hazard associated with Winter Storms. The impact of this action will reduce the amount of potential	Annual project	EM	$ 7,700	The impact of warning our population of a Winter Storm is difficult to measure with the impact to life and property. This number could be in the millions of dollars.	General fund.

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			accidents and it would offer our citizen more of advanced warning to prepare for loss of power and heat.					
WS – 2	Winter Storms	Increase awareness through PSAs such as the Knowhat2do program and continue our efforts to increase the coverage of indoor warning devices, such as weather radios.	This effort would be to better inform our population of actions they can take to better prepare and ultimately survive the effects of winter storms. This action can and does reduce the amount of individuals who may be impacted from the extremes associated with winter storms by adding weather	3–5 Year Project.	EM	$ 400,000	The impact of warning our population of a Winter Storm is difficult to measure with the impact to life and property. This number could be in the millions of dollars.	General Fund or bond issuance.

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			radios for the home and or business.					
W – 2	Wildfire	Reduce the amount of fuel available for the spread of a wildfire.	Aggressively enforce our high weed and grass ordinance to reduce the height of grasses and other natural habitat that does offer fuel for advancing wildfires. This enforcement does offer a great deal of mitigation against the rapid growth of wildfires.	As funding is available	Code Enforcement division.	Cost associated with personnel.	Unknown	General Fund
W – 1	Wildfire	Increase training of our fire personnel.	Increase training for wild land firefighting operations. Add additional firefighting equipment to better respond and mitigate the effects of a wildfire.	3-5 years as funding is available.	Fire Department	$ 145,000	The impact of protecting our population from Wildfires is difficult to measure with the impact to life and property. This number could be in the millions of dollars.	General Fund, Bond Issuance.

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ET – 1	Extreme Temperatures	During these times of extreme heat we will initiate PSAs to target the population that may be at the highest risk from the effects of extreme heat.	Watauga will actively determine parameters for the opening of cooling centers to allow citizens, especially vulnerable populations, to seek refuge from extreme temperatures.	As funding is available	Parks Department	The City currently has several facilities that could be utilized for cooling centers, the costs are minimal. Mainly additional utility and personnel related costs.	Unknown	General Fund
ES – 1	Expansive soils	Identify areas of our city that have a history of soil related damage to structures and roadways.	Add inspections and geological data to identify potential soil composition that is favorable to the effects of soil expansion. This inspection will assist with identifying the correct soil preparation and construction methods to limit the effects of expansive soils on both structures and roadways.	By building code adoption with an appendix adopted by ordinance.	Inspections	Determined by personnel costs.	Unknown	General Fund
ES – 1	Expansive soils	Improve construction techniques through building code enhancements	Educate construction contractors, home owners, and business owners about mitigation techniques	5 Years	Building Official	$ 1,000	$ 7,000	General Funds

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
DF – 1	Dam Failure	Improve our ability to inform our citizens of the risks associated with living near a dam that is a barrier that impounds a body of water.	Maintain awareness of the condition of the structural integrity of the dam. Increase inspections of the dam. Add those living near the dam to an early alerting system in the event of a dam failure.	3-5 year project.	Engineering	$ 200,000	$ 800,000	General Fund
DF-1	Dam Failure	Participate in the Federal Emergency Management Agency's (FEMA) Community Rating System (CRS) program.	Work with city officials to become a member of the CRS program.	Mar-14	City Planner	$1,000	$2,000	City Planner Budget

5.27 City of Westlake Mitigation Strategy

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ST – 1, T – 1	Severe Thunderstorms and High Winds, Tornadoes	Ensure effective communications are in place for emergency situations in the City of Westlake.	Purchase and install Citywide OWS for severe weather events.	24 months	Westlake Fire Department, Emergency Operations	$90,000	$5,000,000	City Funds, State and Federal Grant Programs, Donor Funding
			Purchase and install Citywide Voice/Email/Smart Device "All-Hazard" Warning System.	6 months	Westlake Fire Department	$3,000/year	$5,000,000	City Funds, State and Federal Grant Programs, Donor Funding
MH – 3	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires	Construct and equip permanent structure to serve as Fire Department/Training Facility/EOC in the City of Westlake	Perform design and financial study to determine facility requirements.	6 months	Westlake Fire Department, Westlake Emergency Operations, Westlake Planning and Development	$2,500 in staff time	$10,000	Town Funds
			Contract for engineering and design of facility.	3 months	Outside Contractor	$20,000	$80,000	Town Funds, Donor Finds
			Construct and equip permanent fire station/training/EOC facility.	2 years	Various Contractors	$6,000,000	$24,000,000	Town Funds, Bonds, Hazard Mitigation Grants, State Funds

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
MH – 6	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires	Implement a multijurisdictional Automatic Vehicle Location (AVL) system for both police and fire from Colleyville, Keller, Southlake, and Westlake (NETCOM).	Survey the eight departments and ascertain need and want as well as determine the number of users needed.	7 months	North East Tarrant County Communications (NETCOM)	-	-	-
			Determine vendor for purchase.	1 year	NETCOM with a representative from all cities	-	-	-
			Purchase hardware for all jurisdictions.	16 months	NETCOM	$90,000	$360,000	Individual City Budgets
			Purchase software for dispatch center and each unit.	2 years	NETCOM	$10,000	$40,000	Individual City Budgets
MH – 7	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires, Extreme Temperatures	Ensure effective communications are in place for emergency situations in the City of Westlake.	Provide Westlake Homeowners with Weather Alert Radios.	12 months	Town Leadership, Westlake Fire Department, Emergency Management.	$8,000	$5,000,000	Hazard Mitigation Matching Grants, Donor Funds
ST – 3, T – 3	Severe Thunderstorms and High Winds, Tornadoes	Reduce property loss/damage due to high winds in the City of Westlake.	Mandate “Storm Hardened” construction guidelines in Westlake.	2 years	Planning /Zoning, Town Planning/Permitting Office	$5,000	$1,000,000/year	Internal

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Install wind resistant windows/hurricane shutters at Westlake Academy.	3 years	Westlake Fire Department, Management	$50,000	$100,000	Hazard Mitigation Grants,
DF – 4	Dam Failure	Mitigate flooding from dam failure in the City of Westlake.	Conduct Inundation Studies and develop EAPs for all High Hazard Dams in Westlake.	18 months	Westlake Fire Department, Fort Worth /Tarrant County OEM (Support)	$200,000	$500,000	HMGP, Private Foundations, Dam owner
			Conduct a search for previously unidentified High Hazard Dams in Westlake.	9 months	Westlake Fire Department, Fort Worth – Tarrant County OEM (Support)	$20,000	$80,000	The cost of this project is low compared to the potential benefits of locating previously unknown high hazard dams.
H – 1	Hail	Ensure City of Westlake citizens have information regarding hail resilience.	Evaluate City buildings to determine feasibility of installing hail-resistant roofing and window coverings with a focus on critical infrastructure.	1 year	Westlake Town Engineer	$25,000	$100,000	Hazard Mitigation Grant Sources, Insurance Industry Partnerships, Town Funds
H – 2	Hail	Ensure Westlake citizens have information regarding hail resilience.	Develop and implement a public education campaign to encourage “hail-resistant” roofing in	9 months	Westlake Planning and development, Westlake Fire Department	$1,000	$250,000	HMGP, Insurance Industry Partnerships

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			new construction and roof replacements.					
D – 1	Drought	Mitigate drought in the City of Westlake.	Develop a contingency plan to identify potential impacts of drought on the community to include utilities such as power generation and drinking water; health and safety including pre-existing health conditions and special needs; and emergency response such as fire suppression operations.	1 year	Westlake Fire Department /Emergency Management, Fort Worth – Tarrant County OEM (Support)	$10,000	$40,000	HMGP, Private Foundations, Water Suppliers
D – 3	Drought	Mitigate drought in the City of Westlake.	Participate in the design and implementation of the Tarrant County specific water conservation public education efforts to complement existing programs.	1 year	Westlake Fire Department, Emergency Management, Fort Worth – Tarrant County OEM (Support)	$1,000	$4,000	HMGP, Private Foundations, Water Suppliers

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
D – 3	Drought	Upgrade water and irrigation systems to conserve water in Westlake City facilities.	Install efficient irrigation systems in new and existing City facilities.	Annually	Public Works	$50,000	$250,000	City Budget / Grant Opportunities
ET - 1	Extreme Temperatures	Reduce the loss of life and property damage resulting from extreme heat in Westlake.	Conduct a study to determine the feasibility of expanding monitoring of populations at risk from extreme heat.	1 year	Tarrant County Public Health, Westlake Fire Department, Emergency Management	$5,000	$20,000	HMGP, Other State or Federal Public Health Grants
ET - 2	Extreme Temperatures	Reduce the loss of life and property damage resulting from extreme heat in Westlake.	Enhance public education concerning extreme heat/severe weather mitigation activities.	6 months	Westlake Fire Department, Emergency Management	$2,000	$8,000	HMGP, City Funds
ES - 1	Expansive Soils	Mitigate expansive soils in Westlake.	Continue to improve construction techniques through building code enhancements.	Previously implemented/ongoing	Planning and Development	$1,000/year	$50,000/year	Internal Funding Sources
			Continue to educate construction contractors, homeowners, and business owners about mitigation techniques.	Previously implemented/ongoing	Planning and Development/ Emergency Management	$1,000/year	$50,000/year	Internal Funding Sources

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
T - 1	Tornado	Reduce Loss of Life/Injury resulting from Tornadic Weather events.	Develop and adopt an outreach program promoting the construction and use of safe rooms by: ▪ Encouraging the construction and use of safe rooms in homes, critical infrastructure, and other vulnerable public structures. ▪ Encouraging builders and homeowners to locate tornado safe rooms inside or directly adjacent to houses to prevent injuries due to flying debris or hail	2 years / Continuous	Westlake Fire / EMC /Engineering	$5,000.00	$2,000,000	Staff Time, Grants, Donors
			Update Westlake building and construction codes and ensure that they require or encourage wind engineering measures and construction techniques.	2 years / Continuous	Westlake Facilities and engineering	$5,000	$5,000,000	Staff Time
			Purchase and activate Town-wide OWS and emergency warning	6 Months	Westlake Fire, Westlake EMC	$130,000	$5,000,000	City Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			/ Hazard notification system with the ability to contact each resident phone / email / smart device.					
F - 2	Flooding	Reduce potential for property loss due to flooding	Perform relocation and protection for all critical facilities and infrastructure that may lie within known or designated floodplain areas.	12 months / Continuous	Westlake Facilities and Engineering	$20,000	$1,500,000	Staff Time, Town Budget, Grants
			Replace existing Ottinger road bridge located between Westlake Cemetery and SH 170. This bridge lies below historic flood levels and is regularly inundated.	48 Months	Westlake Facilities and Engineering	$350,000	$1,000,000	Town Budget
ST - 3	Severe Thunderstorms and High Winds	Mitigate loss of life and damage from severe thunderstorm or high wind events.	Retrofit (where necessary)Town-Owned buildings and critical facilities to reduce future wind damage.	4 years	EMC, Facilities and Engineering	$10,000	$100,000	Grants, Donor Funding, Insurance Industry Partnerships

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Update (where necessary) Westlake construction guidelines requiring that Storm Hardened and Wind resistant materials and techniques are utilized	5 years	Planning and Permitting, Facilities and Maintenance	$20,000	$1,000,000	Grants, , Insurance Industry Partnerships
H - 1	Hail	Protect against property loss and loss of life or injury form hail events	1) Install hail resistant roofing and siding, structural bracing, shutters, laminated glass window panes, and hail-resistant roof coverings where needed on Town-Owned buildings and critical infrastructure to minimize damage.	4 Years	Facilities and Engineering, OEM, Fire Department, Planning	$30,000	$1,000,000	HMGP, Donor Sources
H - 2			Develop and adopt an outreach program to increase public awareness of hail dangers, including: 1) Mailing safety brochures with monthly water bills. 2) Post warning signage at local	24 Months / Continuous	OEM, Facilities and Engineering, Utilities	$5,000	$20,000	Donor Sources, HMGP

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			parks and other outdoor venues. 3) Teaching school children about the dangers of hail and how to take safety precautions.					
L - 1	Lightning	Protect against property loss and injury or death form lightning strikes.	Protect critical facilities and infrastructure from lighting damage with the following measures: 1) Installing lightning protection devices such as lightning rods and grounding, on communications infrastructure and other critical facilities. 2) Installing and maintaining surge protection on critical electronic equipment. 3 “Adopt new standards for hardening existing lightning protection materials and systems.”	36 Months / Continuous	Maintenance / Facilities / Engineering/ Fire Dept / IT	$5,000	$1,000,000	HMGP , Insurance Partnerships

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
L - 2			Conduct outreach programs to promote awareness of lightning dangers. ▪▪ Develop a lightning "What2Know" brochure for distribution through the classroom.. ▪▪ Mailing safety brochures with monthly water bills. ▪▪ Posting warning signage at local parks. ▪▪ Teaching school children about the dangers of lightning and how to take safety precautions.	24 Months	OEMC, Fire Department, Utility Department	$5,000	$20,000	Town Budget, Staff Time
WS - 1	Winter Storms	Reduce potential for property loss, damage, injury, or loss of life due to winter storms.	Reduce Impacts to Roadways by : 1) Plan for and maintain adequate road and debris clearing capabilities.	12 Months	OEMC, Facilities and Engineering, Fire Department	$5,000	$250,000	HMGP, Local Business Donation, Foundation Grants

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			2) Partner with County and State agencies for co-utilization of snow and Ice hazard removal assets.					
			Assist Vulnerable Populations by identifying specific residents who may be exceptionally vulnerable in the event of protracted winter storm events or power outages.	12 Months	OEMC	Staff Time	Unknown	Staff Time
WS – 2	Winter Storms	Develop a winter weather awareness mitigation program for City of Westlake residents.	Develop a winter weather outreach program that provides tips and pertinent information for mitigate against hypothermia and icy conditions.	Annually	OEMC	$10,000	NA	Budget
W - 3	Wildfire	Reduce potential for property loss, damage, injury, or loss of life due to wildfire	Increase public education on how to reduce the risks from wildfires (construction, landscaping, etc.)	6 Months / Continuous	Westlake OEMC, Westlake Fire	$1,000	$200,000	HMGP, Town Budget
W - 1			Enact building permit process that includes wildfire resistant construction.	1 year	Westlake Fire Marshal, Planning/ Permitting	$1,000	$200,000	HMGP, Town Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
W - 2			Identify wildfire hazard. areas and assess overall community vulnerability. Regulate development in wildfire hazard areas.	3 years	Planning / Zoning	$1,000	$200,000	HMGP, Town Budget
ET - 2	Extreme Temperatures	Reduce potential for property loss, damage, injury, or loss of life due to Temperature Extremes.	Increase Awareness of Extreme Temperature Risk and Safety by educating citizens regarding the dangers of extreme heat and cold and the steps they can take to protect themselves when extreme temperatures occur.	3 years / Continuous	OEMC, Westlake Fire	$2,000	$50,000	HMGP, Donor Funds
			Educate and inform property owners about the potential property loss resulting from freezing and bursting pipes, and how to avoid such hazards.	1 Year / Continuous	OEMC, Westlake Fire	$2,000	$100,000	HMGP, Insurance Partnerships, Donor Funds
DF-1	Dam Failure	Participate in the Federal Emergency Management	Work with city officials to become	Mar-14	City Planner	$1,000	$2,000	City Planner Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
		Agency's (FEMA) Community Rating System (CRS) program.	a member of the CRS program.					
DF-1	Dam Failure	Develop a buyout program for properties in the floodplain.	Develop a buyout program for properties in the floodplain.	As funding is available	Public Works	TBD	TBD	Local funds, HMGP, PDM, FMA
DF - 1	Dam Failure	Reduce potential for property loss, damage, injury, or loss of life due to Dam Failure	Conduct Inundation Studies and develop Emergency Action Plans for all High Hazard Dams in Westlake.	5 years	Engineering	$40,000	1,000,000	HMGP, Dam Owners
			Conduct a search for previously unidentified High Hazard Dams in Westlake.	5 Years	Engineering	$20,000	$1,000,000	HMGP, Dam Owners

5.28 City of Westworth Village Mitigation Strategy

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
MH - 5	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires	Improve multiagency response to all emergencies and disasters in Westworth Village.	Schedule and conduct Incident Command training annually for all law enforcement, fire, and emergency medical services (EMS) as a pre-requisite for NIMS training.	2 years	Emergency Management	$3,000	$50,000	Grant Funds, Multiagency Funds
			Schedule and conduct NIMS training annually.	2 years	Emergency Management	$3,000	$50,000	Grant Funds, Multiagency Funds
			Conduct annual tabletop disaster training exercises involving all emergency response agencies.	3 years	Emergency Management	$3,000	$50,000	Grant Funds, Multiagency Funds
MH - 7	Severe Thunderstorms and High Winds, Tornadoes, Hail, Lightning, Winter Storms, Flooding, Dam Failure, Wildfires	Provide hazard mitigation information to citizens of Westworth Village.	Develop/maintain a web site for citizen information: shelter in-place, safe room information, citizen training FEMA course listing, and links to websites.	1 year	Emergency Management	$500	$20,000	City Budget
			Partner with COP, volunteers, and emergency response agencies to post monthly notices of training available to citizens.	1 year	Emergency Management	$500	$20,000	City Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
PF - 1	Power Failure, Winter Storms, Severe Thunderstorms and High Winds, Tornadoes	To have automatic emergency power generators for the Westworth Village Fire and Public Works Building in the event that the main power supply is disrupted.	Identify appropriate size and type of generator for the building.	1 year	Public Works and Fire Department	-	-	-
			Purchase/order generator.	2 years	Public Works, Fire Department	$30,000	$60,000	City Funds
			Delivery and installation of fire station generators.	3 years	Public Works	-	-	-
D - 1	Drought	Review water enforcement legislation and update as necessary to mitigate the effects of drought in Westworth Village.	Review current legislation for water conservation enforcement.	Mar-15	City Administration	$100		City Funds
			Develop or update water conservation enforcement legislation to ensure effective practices during periods of drought.	Mar-15	City Administration	$250		City Funds
D - 1	Drought	Develop contingency plans to ensure adequate power and water supply to Westworth Village during prolonged periods of drought.	Review current contingency plans and supplier contracts.	Oct-15	All City Departments	0	$0	City Budget
			Develop or update potable water contingency plans and supplier contracts.	Dec-15	Public Works & Emergency Management	$100	$1,000	City Budget
			Develop or update power supply contingency plans and supplier contracts.	Dec-15	Emergency Management	$100	$1,000	City Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
D - 2	Drought	Upgrade water and irrigation systems to conserve water in Westworth Village.	Upgrade irrigation systems at city parks and recreation facilities.	Dec-17	Public Works	$25,000	$100,000	City Funds, Grants
			Complete the installation of Storm water drainage with street improvements	Ongoing	Public Works			City Funds, Grants
D - 3	Drought	Develop a drought mitigation outreach program for Westworth Village citizens.	Evaluate the hazards posed by drought.	December 2014 and ongoing	City Administration	$250	$10,000	City Funds
			Develop a drought mitigation outreach program that provides tips and pertinent information for ensuring the protection of property and the environment against drought.	December 2014 and ongoing annually	City Administration & Emergency Management	$1,500	$5,000	City Funds, Grants
D - 3	Drought	Distribute drought awareness information to Westworth Village citizens.	Provide drought awareness information to citizens through website and monthly meetings.	Oct-14	City Administration, Emergency Management	$100	$2,500	City Funds
			Provide drought awareness information through the public school, educating children on doing their part to protect and conserve water.	May-15	Emergency Management, Code Enforcement	$500	$5,000	City Funds, Grants
ET - 1	Extreme Temperatures	Ensure Westworth Village has an extreme heat plan in	Review current plans and procedures related to extreme heat.	Aug-15	City Administration	$0	$0	NA

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
		place to mitigate the effects of extreme heat events.	Open cooling centers and provide public information.	Dec-15	City Administration	$250	$5,000	City Funds, grants
ET - 1	Extreme Temperatures	Identify extreme heat plans for critical infrastructure in Westworth Village.	Ensure essential functions continue in the event of high temperatures, by conducting mitigation activities.	Aug-15	City Administration	$250	$5,000	City Funds, grants
ET - 2	Extreme Temperatures	Develop an extreme heat outreach program for Westworth Village citizens.	Evaluate the hazards posed by extreme heat in Westworth Village.	Aug-15	City Administration	$500	$3,000	City Funds
			Develop an extreme heat outreach program that provides tips and pertinent information for ensuring the health and safety of citizens during extreme heat.	Dec-15	City Administration	$1,000	$10,000	City Funds, Grants
ET - 2	Extreme Temperatures	Distribute extreme heath mitigation information to Westworth Village citizens.	Provide extreme heat pmitigation information to the Westworth Village citizens through a social media campaign.	Jan-16	City Administration	$500	$5,000	City Funds, Grants
			Provide extreme heat mitigation information through the city police department's website.	Jan-16	City Administration	$100	$5,000	City Funds, Grants

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
ES - 1	Expansive Soils	Mitigate expansive soils in Westworth Village.	Improve construction techniques through building code enhancements.	Aug-18	Zoning and Code Enforcement	$250	$5,000	City Budget
			Educate construction contractors, homeowners, and business owners about mitigation techniques.	Dec-18	Zoning and Code Enforcement	$500	$5,000	City Budget, Grants
T - 1	Tornadoes	Ensure outdoor spaces/parks/trails projects in the future in Westworth Village have adequate shelter for high-wind events such as thunderstorms or tornadoes.	Evaluate current shelters in proximity to outdoor spaces within Westworth Village.	Dec-16	City Administration	$500		City Funds
			Determine the size and space needed for shelters, based on the anticipated attendance at each location, and include those requirements in future developments.	Dec-16	City Administration	$2,000		City Funds
			Install outdoor storm shelters at outdoor locations that are deemed inadequate after review in 1.1.1 and 1.1.2	Jan-18	City Administration	$10,000		City Funds
T - 1	Tornadoes	Ensure critical facilities' in Westworth Village have adequate safe rooms to protect against high-wind events and tornadoes	Evaluate the current conditions of critical facilities to determine which ones, if any, need safe rooms installed.	Annually	Code Compliance	0	$0	City Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			Install safe rooms as needed in critical facilities	Dec-16	Public Works	$2,000	$2,000	City Budget
F - 1	Flooding	Improve Westworth Village's flooding information distribution and warning to citizens.	Continue efforts to lower the City's CRS rating.	Annually	City Administration Code Compliance			City Funds
F - 3	Flooding	Improve drainage and erosion in new and re-developing areas of Westworth Village	Identify the proper mitigation measures for developments that eliminate flooding, by insuring participation in storm drains & safe ponds.	With each permit review	Code Compliance; Public Works	0	$0	City Budget
			Review Building and Development Ordinances to insure current mitigation strategies are included and penalties are assessed for failing to comply with Ordinance.	Annually	City Administration and Code Compliance	0	0	City Budget
ST - 4	Severe Thunderstorms and High Winds	Provide Educational Materials to citizens of Westworth Village in securing property, and how to plan to shelter in place or when to temporarily relocate in the event of a long term power outage.	Obtain Tarrant County materials and modify them if needed for Westworth Village specific needs.	Annually	City Administration Code Compliance	0		City Funds
			Speak at City Council and Community wide luncheon on the benefits of having an emergency plan for residents as well as businesses.	Annually	City Administration Emergency Management	0		City Funds

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
H - 1	Hail	Provide hail-resistant parking areas for Westworth Village city vehicles	Evaluate the need for covered parking for city vehicles to protect them against hail.	Dec-15	City Administration	0		City Funds
			Install covered parking areas as determined needed	Dec-16	City Administration	$20,000		City Funds
H - 2	Hail	Provide citizens and business owners in Westworth Village information regarding the effects of hail and how to mitigate them.	Provide hail mitigation information to citizens through water bills, social media and at one monthly Community Luncheon annually.	Annually	Emergency Management and City Administration	0	$0	City Budget
			Provide high risk targets additional education on how to mitigate hail related damage.	Annually	City Administration and Code Compliance	0	0	City Budget
W - 1	Wildfire	Mitigate wildfires by instituting landscaping practices that reduce overgrown vegetation on all city property	Prevent wildfires from spreading to critical facilities by maintaining landscaping, reducing overgrowth and increasing no/low growth barriers	Annually	Code Enforcement and Public Works	0		City Funds
			Maintain needed equipment to ensure water systems are adequate	Annually	Code Enforcement and Public Works	0		City Funds
W - 2	Wildfire	Review city ordinances to ensure mitigation practices are in effect in the Westworth Village.	Enact building permit process that encourages wildfire resistant construction.	Ongoing	Code Compliance	0	$0	City Budget
			Work with Contracted Fire Marshall to ensure that annual inspections	Annually	Code Compliance	0	0	City Budget

Goal Addressed	Hazard Addressed	Objective	Action/Project Description	Projected Time to Completion	Department or Agency Responsible	Estimated Cost	Estimated Benefit	Funding Sources
			review wildfire assessments					
ET - 1	Extreme Temperatures	Improve Westworth Village's capability to mitigate against severe winter storms	Establish programs to protect the poor, ill and elderly during extreme winter temperatures	Dec-16	Emergency Management	0		City Funds
WS - 1	Winter Storms	Improve Westworth Village citizens mitigation activities related to winter storms.	Distribute severe winter weather mitigation information via Water Bills, city website and community luncheons.	Ongoing	Emergency Management	0	$0	City Budget
			Purchase and install an emergency generator at Public Works facility	Dec-17	City Administration and Public Works	$150,000	0	City Budget
L - 1	Lightning	Protect Westworth Village communication infrastructure from lightning	Evaluate the need for lightning protection on communications infrastructure	Dec-16	Police Department and Emergency Management	$800		City Funds
			Install lightning rods on all existing and future communication infrastructure	Dec-16	Police Department and Emergency Management	$15,000		FEMA
L - 2	Lightning	Develop a lightning mitigation education program for citizens of Westworth Village.	Evaluate the hazards posed by lighting	Ongoing	Emergency Management	$1,500	$0	City Budget

Section 6
EXECUTING THE PLAN

44 CFR 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.

6.1 Plan Implementation

The Tarrant County Local Mitigation Action Planning process was overseen by the North Central Texas Council of Governments (NCTCOG). The plan was submitted to the Texas Division of Emergency Management (TDEM) and the Federal Emergency Management Agency (FEMA) for approval. All participating jurisdictions formally adopted the plan by resolution in accordance with the Disaster Mitigation Act of 2000.

Each jurisdiction participating in this plan is responsible for implementing specific mitigation actions as prescribed in the mitigation strategies. In each mitigation strategy, every proposed action is assigned to a specific local department or agency in order to assign responsibility and accountability and increase the likelihood of subsequent implementation. This approach enables individual jurisdictions to update their unique mitigation strategy as needed without altering the broader focus of the countywide plan. The separate adoption of locally specific actions also ensures that each jurisdiction is not held responsible for monitoring and implementing the actions of other jurisdictions involved in the planning process.

The Tarrant County Emergency Management Coordinator or their designee is the lead position for plan implementation and will work with the Tarrant County Local Mitigation Action Planning Committee to ensure mitigation actions are implemented into jurisdiction planning procedures. Each participating jurisdiction will implement the plan and their individuals mitigation actions in the timeframe appropriate for their planning processes. As necessary, Tarrant County and its participating jurisdictions will seek outside funding sources to implement mitigation projects in both the pre-disaster and post-disaster environments. When applicable, potential funding sources have been identified for proposed actions listed in the mitigation strategies.

6.2 Evaluation

All members of the Tarrant County Local Mitigation Action Planning Committee (LMAPC) and Tarrant County will be responsible for ensuring that the Tarrant County Local Mitigation Action Plan (LMAP) is evaluated as required. Specifically, the Tarrant County Emergency Management Coordinator or their designee will convene the Tarrant County LMAPC and ensure the evaluation process is conducted in a thorough manner. The evaluation will include analyzing current mitigation projects, evaluating success, and reevaluating future mitigation needs and prioritization based upon changes in needs and/or capabilities of Tarrant County.

The LMAPC will reconvene annually to ensure that projects are on track and to reevaluate the mitigation goals, objectives, and action steps. The mitigation plan shall be viewed as an evolving, dynamic document.

6.3 Multijurisdictional Strategy and Considerations

Tarrant County will lead activities for mitigation planning countywide. Although Tarrant County will be responsible for maintaining this plan, including the documentation of in progress and completed mitigation strategies, each participating jurisdiction is responsible for reporting hazards, their costs, and a status report on mitigation actions to the NCTCOG for recording in the plan.

Each jurisdiction is responsible for completing mitigation activities by providing the capabilities and authorities needed to carry out activities. Participating jurisdictions completed an analysis of their current legal, staffing, and fiscal capabilities as they relate to hazard mitigation planning. Jurisdictional capabilities and authorities identified to ensure successful mitigation planning are located in Appendix C.

6.4 Plan Update

The Disaster Mitigation Act of 2000 requires that the Tarrant County LMAP be updated at least once every five years. Tarrant County's Emergency Management Coordinator or their designee will be responsible for ensuring that this requirement is met. Tarrant County and the LMAPC will annually review the LMAP for needed updates. The LMAPC will be involved in this process to ensure all jurisdictions provide input into the planning process. The public will be invited to participate in this process through public hearings.

6.5 Plan Maintenance

44 CFR Requirement 201.6 (c) (5)
The 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 Council, County commissioner, Tribal Council). For multijurisdictional plans, each jurisdiction requesting approval of the plan must document that it has been formally adopted.

It is the intention of all documented plan participants to formally adopt the LMAP after each maintenance revision. Once all participants adopt the changes, the revised LMAP will be submitted to the Texas Division of Emergency Management (TDEM) and the Federal Emergency Management Agency (FEMA). The plan will be revised and maintained as required under the guidance of the LMAPC and formally adopted by Tarrant County and jurisdiction elected officials after each revision.

Table 6-1 lists representatives from each jurisdiction who are responsible for the implantation, evaluation and maintenance, including updates and monitoring, of the Tarrant County LMAP. The primary coordinator for these activities will be the Tarrant County Emergency Management Coordinator.

Table 6-1
Jurisdiction Representatives for Plan Implementation, Evaluation and Maintenance.

Name	Agency	Title
Kwa heri Harris	Arlington, City of	Emergency Management Coordinator
Irish Hancock	Arlington, City of	Emergency Management Administrator
Chief Scott	Azle Fire Department	Fire Chief
Russell Hines	Bedford Building Department	Building Official
James Tindell	Bedford Fire Department	Fire Chief
Bobby Sewell	Bedford Fire Department	Deputy Chief
James Richardson	Bedford Fire Department	Deputy Chief
Kenneth Overstreet	Bedford Public Works	Operations Director
Shawn Fannan	Blue Mound Fire Department	Fire Chief
Kenny Phillips	Colleyville Fire Department	Emergency Management Coordinator
Luke Thompson	Crowley Fire Department	Fire Marshal/Emergency Management Coordinator
Matthew Miller	Dallas Fort Worth International Airport Office of Emergency Management	Emergency Management Specialist
David McCurdy	Dallas Fort Worth International Airport Office of Emergency Management	Emergency Management Program Manager
Joe Kraft	Euless OEM	Assistant Coordinator
Ed Henderson	Forest Hill Fire Department	Fire Chief/EM Coordinator
Sheyi Ipaye	Forest Hill, City of	City Manager
Keith Wells	Fort Worth Office of Emergency Management	Senior Emergency Management Officer
Carrie Little, CEM	Grapevine Fire Department	Emergency Management Coordinator
Fred Napp	Haltom City Fire Rescue	Fire Marshal
Perry Bynum	Haltom City Fire Rescue	Emergency Management Coordinator
Justin W. French	Haltom City Planning & Development	Director of Planning
Tom Ice	Haltom City Public Works	Engineer
Kirt Mays	Haslet Fire Department	Fire Chief / Emergency Management Coordinator
David Palla	Hurst Fire Department	Assistant Chief/Emergency Management Coordinator
David Jones	Keller Fire Department	Fire Chief/Emergency Management Coordinator
Mike McMurray	Kennedale Fire Department	Fire Chief

Name	Agency	Title
Mike Voorhies	Lake Worth Fire Department	Fire Marshal / EMC
Mike Christenson	Lake Worth Fire Department	Fire Chief
Sean Densmore	Lake Worth Public Works	PW Director
Daniel Hackbush	Lake Worth Risk Mangt.	Human Resources
Sean Hughes	Lakeside, Town of	Emergency Management Coordinator
Nicholas F. LaGrassa	NCTCOG	Emergency Preparedness Program Assistant
Billy Owens	North Richland Hills Fire Department	Emergency Management Coordinator
William Bell	Richland Hills, City of	Fire Chief/Emergency Coordinator
Doug Spears	Saginaw Fire Department	Fire Chief
Ben Williamson	Southlake Fire Department	Emergency Management Coordinator/Assistant to the Fire Chief
Tonya Hunter	Tarrant County Emergency Management	Emergency Management Coordinator
Justin Cox	Tarrant County Emergency Management	Assistant Emergency Management Coordinator
William Wessel	Tarrant County Emergency Management	Emergency Management Specialist
Randy Barkley	Watauga Fire Department	Fire Marshal/Emergency Management Coordinator
Richard Whitten	Westlake Fire Department	Chief
Troy Crow	Westlake Marshals Office	Marshal / Emergency Management Coordinator
Roger Unger	Westworth Village, City of	City Administrator
Brandy Barrett	Westworth Village, City of	Project Manager

44 CFR 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.

Public participation will be sought throughout the implementation, evaluation, and maintenance of the LMAP. This participation will be sought in a multitude of ways, including but not limited to periodic presentations on the plan's progress to elected officials, schools, or other community groups; annual questionnaires or surveys; public meetings; and postings on social media and interactive websites.

6.6 Incorporation into Existing Planning Mechanisms

It will be the responsibility of each participating jurisdiction to determine additional implementation procedures when appropriate. This includes integrating the requirements of the Tarrant County LMAP into other local planning documents, processes, or mechanisms such as the following:

- Comprehensive plans
- Strategic plans
- Capital improvement plans
- Growth management plans
- Ordinances, resolutions, and regulations
- Continuity of operations plans

Opportunities to integrate the requirements of this plan into other local planning mechanisms will continue to be identified through future meetings of the LMAPC and through the five-year review process as required by FEMA.

The primary means for integrating mitigation strategies into other local planning mechanisms will be through the revision, update, and implementation of each jurisdiction's individual plans that require specific planning and administrative tasks (for example, plan amendments, ordinance revisions, capital improvement projects, etc.).

The members of the LMAPC will remain charged with ensuring that the goals and strategies of new and updated local planning documents for their jurisdictions or agencies are consistent with the goals and actions of the Tarrant County LMAP and will not contribute to increased hazard vulnerability in Tarrant County or its participating jurisdictions.

During the planning process for new and updated local planning documents, such as a comprehensive plan, capital improvements plan, or emergency management plan, Tarrant County will provide a copy of the Tarrant County LMAP to the appropriate parties and recommend that all goals and strategies of new and updated local planning documents are consistent with and support the goals of the Tarrant County LMAP and will not contribute to increased hazards in the affected jurisdiction(s).

Although it is recognized that there are many possible benefits to integrating components of this plan into other local planning mechanisms, the development and maintenance of this stand-alone LMAP is deemed by the LMAPC to be the most effective and appropriate method to ensure implementation of local hazard mitigation actions at this time.

All organizations will incorporate the Tarrant County LMAP into existing plans in an effort to mitigate the impact of future disasters. A list of the existing plans and procedures in which mitigation activities will be integrated is listed in the table below.

Table 6-2
Jurisdiction Incorporation into Planning Mechanisms

Jurisdiction	Type of Plan	Department Responsible	Review Timeline	New or Existing?	Actions to be Integrated	Process for Integrating Mitigation Actions into Planning Mechanisms
Arlington	2015 Comprehensive Plan	Storm Water (PW&T)	Every year	Existing	Public Education	City Council Adoption
Arlington	Conduct feasibility study of automatic barricades in flood-prone areas.	Storm Water (PW&T)	Every 3 years	Existing	Look at areas with major erosions which lead to flooding	Incorporated into the City's Watershed Planning efforts. Plans are presented to the public and approved by City Council
Azle	Planning and Zoning	Building Official	Quarterly	Existing		During meetings to create, adopt, update, or otherwise change any documents that have an effect on vulnerability to natural hazards, Azle will consult the most recent version of the Hazard Mitigation Action Plan. Provided there is sufficient political, fiscal, and administrative capability, actions detailed in the HazMAP will be brought before the City Council to be approved, via vote, for integration into the document wherever applicable.
Azle	Drainage plan	Stormwater manager	Annually	Existing		
Azle	Strategic plan	City Administration	5 years	Existing		
Azle	Master Thoroughfare	Street Superintendent	5 years	Existing		
Bedford	2010 Comprehensive Plan	City Administration	Every 10 years	Existing	Review all actions for impact to historic structures or properties	Incorporating risk assessment and hazard mitigation principles into comprehensive planning efforts. Incorporating a hazard risk assessment into the local development and subdivision review process. Involving citizens in comprehensive planning activities that identify and mitigate hazards.
Bedford	2010 Bedford Comprehensive Land Use Plan	Planning & Zoning Department	Every 10 years	Existing	Continue to implement mitigation projects	Incorporating a stand-alone element for hazard mitigation into the local comprehensive (land use) plan. Determining and enforcing acceptable land uses to alleviate the risk of damage by limiting exposure in such hazard areas. Ensuring natural hazards are considered in all land suitability analyses. Adding hazard mitigation measures to existing adequate public facilities tests and programs.

Jurisdiction	Type of Plan	Department Responsible	Review Timeline	New or Existing?	Actions to be Integrated	Process for Integrating Mitigation Actions into Planning Mechanisms
Blue Mound	Comprehensive Plan	City Administration	Every year	Existing	Any necessary	During meetings to create, adopt, update, or otherwise change any documents that have an effect on vulnerability to natural hazards, Blue Mound will consult the most recent version of the Hazard Mitigation Action Plan. Provided there is sufficient political, fiscal, and administrative capability, actions detailed in the HazMAP will be brought before the City Council to be approved, via vote, for integration into the document wherever applicable.
Colleyville	Capital Improvement Plan	City Administration	Every 10 years	New	Improve low water crossings	When reviewing the Capital Improvement Plan the Leadership Team will review the Mitigation Action Plan to see which action items can be addressed with the fiscal and administrative capabilities of the city.
Colleyville	Emergency Management Plan	Emergency Management	Every 5 years	Existing	Improve Warning System	The Emergency Manager will review the Mitigation Plan and advise the people responsible for each annex in the Emergency Management Plan of ways to include areas of the Mitigation Plan into the revised version of the EMP.
Colleyville	Emergency Management Plan	Emergency Management	Every 5 years	Existing	Improve EOC	The Emergency Manager will review the Mitigation Plan and advise the people responsible for each annex in the Emergency Management Plan of ways to include areas of the Mitigation Plan into the revised version of the EMP.
Crowley	Capital Improvement Plans	DPW	3 years	New	Adding backup generator to Recreation Center	Acquiring quotes for a generator and installation materials. Plans will be reviewed and approved as any other electrical installation by the Building Official and Fire Department. The City Council will have to approve funding as with any other projects.
Crowley	Land Use Plans	Building Department	3 years	Existing	Flood Plane Management	Continue to enforce current Flood Plain Ordinances and review as necessary. This is a continuing function of the Flood Plain Manager.
Crowley	Capital Improvement Plans	OEM	5 years	New	Building a Community Tornado Shelter	Acquiring quotes for building construction. Plans will be reviewed and approved as any other building project by the Building Official and Fire Department. The City Council will have to approve funding as with any other projects.
DFW	Land Use Plan	Commercial Development	As needed	Existing	Continue evaluation for risk reduction	Coordinate risk reduction activities into the long-term land use plan, anticipating floodplain and stormwater issues.

Jurisdiction	Type of Plan	Department Responsible	Review Timeline	New or Existing?	Actions to be Integrated	Process for Integrating Mitigation Actions into Planning Mechanisms
DFW	DFW Hazard Assessment	Office of Emergency Management	Every year	Existing	Utilize for identification of hazards for risk reduction	As updates are made, review document for updates to the Hazard Mitigation Plan
DFW	DFW Enterprise Risk Management Plan	Risk Management	Every year	Existing	Utilize for identification of hazards for risk reduction	As updates are made, review document for updates to the Hazard Mitigation Plan
Euless	2030 Comprehensive Plan	Planning & Development Department	As Needed	Existing	Update from FEMA Flood Plain MAP.	The Planning process for the City of Euless involves plan creation by the Planning and Economic Development Department. It is then reviewed by the Development Services Group which has representation from all applicable City departments and public input/participation. It is then reviewed by the City Manager's Office, followed by presentation to the Planning and Zoning Commission for recommendation. The final step is presentation to the City Council for approval.
Euless	Comprehensive Zoning Ordinance	Planning & Development Department	As Needed	Existing	Update to reflect City owned property.	The Planning process for the City of Euless involves plan creation by the Planning and Economic Development Department. It is then reviewed by the Development Services Group which has representation from all applicable City departments and public input/participation. It is then reviewed by the City Manager's Office, followed by presentation to the Planning and Zoning Commission for recommendation. The final step is presentation to the City Council for approval.
Forest Hill	2010 Comprehensive Plan	City Administration	Every 10 years	New	Section 11; Page 72	City leadership will review the mitigation action items to determine need for new capital improvement projects within each proposed fiscal year's budget
Fort Worth	Citywide Historic Preservation Plan	Planning & Development	As required	Existing	Review all actions for impact to historic structures or properties	The mitigation actions are presented to Planning and Development Department for inclusion the development of the Citywide Historic Preservation Plan. The final plan with mitigation actions are presented to the Historic and Cultural Landmark Commission and the Mayor and Council for review and approval.

Jurisdiction	Type of Plan	Department Responsible	Review Timeline	New or Existing?	Actions to be Integrated	Process for Integrating Mitigation Actions into Planning Mechanisms
Fort Worth	Comprehensive Plan/Capital Improvement Plan	Planning & Development	Annually	Existing	Continue to implement mitigation actions such as Lebow Channel Project	The mitigation actions are presented to Planning and Development Department for inclusion the development of the Comprehensive Plan/Capital Improvement Plan. The final document with mitigation actions are presented to the Mayor and Council for review and approval.
Fort Worth	COOP Plan (under development)	Fire/OEM	TBD	Under Development	Development mitigation action items to support COOP	The mitigation actions are presented to City Departments during the COOP development process. The EMC and Department Directors review the final COOP document before it is presented to the Mayor and Council.
Fort Worth	Emergency Management Plan	Fire/OEM	Reviewed annually	Existing	Improve emergency response and incorporate mitigation into recovery	The mitigation actions are presented to City Departments during the Plan development process. The EMC and Department Directors review the final document before it is presented to the Mayor and Council.
Fort Worth	Flood Plain Management Plan (under development)	Floodplain Administrator	TBD	Under Development	Overall Floodplain Management Priorities City-wide	The mitigation actions are presented to Stormwater Division during the Plan development process. The EMC, Floodplain Administrator, Tarrant Regional Water District and Department Director review the final document before it is presented to the Mayor and Council for review and approved.
Fort Worth	International 2009 Building Code	Planning & Development	As required	Existing	Improve hardening of structures	The mitigation actions are presented to Planning and Development Department for inclusion the review and development of the city ordinance. The final document with mitigation actions are presented to the Mayor and Council for review and approval.
Fort Worth	Repetitive Loss Mitigation Plan (under development)	Floodplain Administrator	TBD	Under Development	Overall Repetitive Loss Mitigation Priorities City-wide	The mitigation actions are presented to Stormwater Division during the Plan development process. The EMC, Floodplain Administrator, Tarrant Regional Water District and Department Director review the final document before it is presented to the Mayor and Council for review and approved.
Fort Worth	Subdivision Ordinance	Planning & Development	As required	Existing	Continue preventing development in hazard areas	The mitigation actions are presented to Planning and Development Department for inclusion the review and development of the city ordinance. The final document with mitigation actions are presented to the Mayor and Council for review and approval.

Jurisdiction	Type of Plan	Department Responsible	Review Timeline	New or Existing?	Actions to be Integrated	Process for Integrating Mitigation Actions into Planning Mechanisms
Fort Worth	Threat and Hazard Identification and Risk Assessment	Fire/OEM	Annually	Existing	All actions that affect CIKR	The mitigation actions are presented to City Departments during the Plan development process. The EMC and Department Directors review the final document before it is presented to the Mayor and Council.
Fort Worth	Zoning Ordinances	Planning & Development	As required	Existing	Continue enforcement of zoning in hazard areas	The mitigation actions are presented to Planning and Development Department for inclusion the development of the Plan. The final document with mitigation actions are presented to the City Planning Commission. The plats are presented to the corresponding independent school districts, the Fort Worth Transportation Authority and the appropriate utility companies. The final document is presented to the Mayor and Council for review and approval.
Grapevine	Geographical Information Systems	Information Technology	Annually	New	Incorporate Tier II sites into public information page	Emergency Manager to coordinate with IT staff to develop approach and view
Grapevine	Capital Improvement Plan	Emergency Management	Every 5 years	New	Hire consultant to develop COOP plan citywide for each department	Emergency Manager will develop a plan for improvements to incorporate staff time to justify a consultant for a COOP for City approval
Grapevine	Capital Improvement Plan	Facilities	Every 5 years	New	Purchase of generators for city facilities that currently do not have backup generators installed	Emergency Manager to coordinate with CMO to ask for approval to Incorporate into the Capital Improvement Plan
Grapevine	Capital Improvement Plan	Facilities	Every 5 years	New	Installation of storm shelters/safe rooms at critical facilities	Emergency Manager to coordinate with CMO to ask for approval to Incorporate into the Capital Improvement Plan

Jurisdiction	Type of Plan	Department Responsible	Review Timeline	New or Existing?	Actions to be Integrated	Process for Integrating Mitigation Actions into Planning Mechanisms
Grapevine	Capital Improvement Plan	Emergency Management	Every 5 years	New	Develop program for low cost purchase of NOAA weather radios for citizens through installments on the city water bill	Emergency Manager to coordinate with CMO to ask for approval to Incorporate into the Capital Improvement Plan
Grapevine	Capital Improvement Plan	Information Technology	Every 5 years	New	Close fiber loop to allow for uninterrupted fiber connectivity between critical facilities	Emergency Manger will monitor status of the project in coordination with IT department for scope of work, costs, funding and approval for implementation.
Haltom City	2020 Comprehensive Plan	City Administration	5 years	Existing	Continue to identify and fund opportunities to reduce the effects of flooding on our community.	When reviewing and updating the Comprehensive Plan the Leadership Team will review the Mitigation Action Plan to see which action items can be addressed with the fiscal and administrative capabilities of the city.
Haltom City	Land Use Plan	City Administration	Short range planning(3-5 yrs.)	Existing	Acquire property in or near floodplain.	When reviewing and updating our Land use plan the Leadership Team with the direction of the City Council will review our Mitigation Action Plan to address areas where the plan can be administered adhering to the overall Master plan of our city.
Haslet	Capital Improvement Plan	City Administration	Annual review of 5 year plan	New	Traffic control in flood areas	During meetings to create, adopt, update, or otherwise change any documents that have an effect on vulnerability to natural hazards, Haslet will consult the most recent version of the Hazard Mitigation Action Plan. Provided there is sufficient political, fiscal, and administrative capability, actions detailed in the HazMAP will be integrated into the document wherever applicable.
Hurst	Capital Improvement Plan	City Administration	Annual review of a multiyear plan	Existing	Drainage improvements	Annual process based upon available resources and long-term plans.

Jurisdiction	Type of Plan	Department Responsible	Review Timeline	New or Existing?	Actions to be Integrated	Process for Integrating Mitigation Actions into Planning Mechanisms
Hurst	Storm Drainage Master Plan Phase I	Public Works	01/10/2017 - 09/30/2020	Existing 2011	Optional Buyout Program 11 homes in 100yr Flood Plain	Annual process based - Part of the CIP Process
Keller	Future Land Use Plan (1998)	Community Development	As requested by Council	Existing	N/A	The contactor and city leadership will review the mitigation action plan for its impact on plan revisions and implementation
Keller	Capital Improvement Plan	City Administration	Annually during budget process	Existing	Potential drainage improvement projects - unfunded requests	City leadership will review the mitigation action items to determine need for new capital improvement projects within each proposed fiscal year's budget
Keller	- CIP Project	Public Works		2014 New	Robin Drive and Robin Court Drainage Improvements	This project is based upon mitigation action items identified within the previous plan and has been approved by city leadership for implementation
Keller	- CIP Project	Public Works		2014 New	Indian Meadows Addition Drainage Improvements	This project is based upon mitigation action items identified within the previous plan and has been approved by city leadership for implementation
Keller	- CIP Project	Public Works		2014 New	Keller Sports Park-Arena Rd Culvert Improvements	This project is based upon mitigation action items identified within the previous plan and has been approved by city leadership for implementation
Keller	- CIP Project	Public Works		2013 Completed	Daryll Ln, Garden Ln & Melissa Dr Drainage Project	This project has been completed and was implemented due to mitigation action items identified in the previous plan
Keller	- CIP Project	Public Works		2013 Completed	Tributary BB-11 Concrete Channel Repair	This project has been completed and was implemented due to mitigation action items identified in the previous plan
Keller	- CIP Project	Public Works		2013 Completed	Highland Oaks Crossing Channel Improvements Ph 2	This project has been completed and was implemented due to mitigation action items identified in the previous plan
Keller	Drainage Master Plan (1991)	Public Works	As needed	Existing	Notations of potential drainage	City leadership and public works staff will review identified mitigation action items and consider plan revision as necessary to address them

Jurisdiction	Type of Plan	Department Responsible	Review Timeline	New or Existing?	Actions to be Integrated	Process for Integrating Mitigation Actions into Planning Mechanisms
					issues within the city	
Keller	Flood Hazard Prevention Ordinance (2009)	Public Works	As needed	Existing	Flood hazard prevention activities and processes	City leadership and public works staff will review identified mitigation action items and consider plan revision as necessary to address them
Kennedale	Comprehensive Plan, Zoning Ordinances, Subdivision Plan, Drainage-Runoff Plan	Community Development	Every 5 years	Existing	Ensure development in or near floodplain is compatible with and sensitive to floodplain	Development Review Committee reviews proposed and on-going development projects with technical assistance from city engineer
Kennedale	Capital Improvement Plan Funding the Village Creek Master Plan (2012)	Community Development	As needed	Existing	Acquire structures in floodplain as needed and as funding permits; restore Village Creek ecosystem; install trail system.	Obtain engineering reports, perform water quality studies, secure project approval by US Army Corps of Engineers, Submit grant request to FEMA
Lake Worth	2030 Comprehensive Plan	City Administration	Every 10 years	New	Remove road from floodplain	During meetings to create, adopt, update, or otherwise change any documents that have an effect on vulnerability to natural hazards, Blue Mound will consult the most recent version of the Hazard Mitigation Action Plan. Provided there is sufficient political, fiscal, and administrative capability, actions detailed in the HazMAP will be brought before the City Council to be approved, via vote, for integration into the document wherever applicable.
Lake Worth	Land Use Plan	Land Use	Every 3 years	Existing	Acquire homes in floodplain	

Jurisdiction	Type of Plan	Department Responsible	Review Timeline	New or Existing?	Actions to be Integrated	Process for Integrating Mitigation Actions into Planning Mechanisms
Lakeside	Comprehensive Plan	City Administration	Every year	Existing	Any necessary	During meetings to create, adopt, update, or otherwise change any documents that have an effect on vulnerability to natural hazards, Lakeside will consult the most recent version of the Hazard Mitigation Action Plan. Provided there is sufficient political, fiscal, and administrative capability, actions detailed in the HazMAP will be brought before the City Council to be approved, via vote, for integration into the document wherever applicable.
North Richland Hills	THIRA	Emergency Management	3	Existing	Repetitive loss buyouts	When reviewing and updating our Land use plan the Leadership Team with the direction of the City Council will review our Mitigation Action Plan to address areas where the plan can be administered adhering to the overall Master plan of our city.
Richland Hills	Richland Hills Capital Improvement Plan	Public Works	Current Project	Existing	Flood Control / Underground Interceptor	Plans, budgets and grant applications were developed between City Engineer and outside consultants, presented to City Council during City Council Meetings as well as Capital Improvement budget meetings and ultimately approved by City Council. First stage completed in November 2014 second stage out for bid December 2014.
Saginaw	Capital Improvement Plans	City Administration	5 Year Cycle with Annual Review	Existing	Flooding/Retention /Drainage Projects Funded	City Leadership and Public Works staff will review mitigation action items considering plan revision as necessary, and implement action based on priority given to project over other projects that are also already funded. Projects approved by Public Works, the City Engineer and City Management are presented to City Council for final approval to begin project.
Saginaw	Capital Improvement Plans	City Administration	5 Year Cycle with Annual Review	Existing	Flooding/Retention /Drainage Projects Un-Funded	City Leadership will review mitigation action items to determine need for new capital improvement projects and prioritize them. Funding will be based on priority and addressed within each fiscal year's budget.
Southlake	Capital Improvement Plan	City Administration/Multiple	Yearly	Existing	drainage improvements, bridge scour improvements	Streets/Drainage improvements and mitigation efforts are captured in the City Budget which acts as year-1 of the CIP. Multiple drainage projects are listed in the CIP for possible future implementation.

Jurisdiction	Type of Plan	Department Responsible	Review Timeline	New or Existing?	Actions to be Integrated	Process for Integrating Mitigation Actions into Planning Mechanisms
Southlake	Southlake 2030 Comprehensive Plan	City Administration/Multiple	Minor updates as needed	New	stormwater drainage planning	The first element of Southlake's strategic management system is Southlake 2030, which is the comprehensive master plan that includes all elements of the City's planning efforts, such as land use, parks, trails, thoroughfares, community facilities, etc. The second level of implementation plans includes our departmental business plans. Departments prepare their business plans following an analysis of their department's strengths, weaknesses, opportunities and threats and with the goal of implementing best practices associated with the services they provide. These plans are prepared bi-annually each spring and are the basis for budget submittal. Additionally, departments prepare annual work plans which articulate both the connection to the business plan as well as clearly outlining what the department is planning to do, how they are planning to do it and when they project the work will be complete
Southlake	Consolidated Future Land Use Plan	Planning & Development Services Department		New	zoning , flood plain change integration	Southlake approaches land use planning through sector planning, a method which divides the City into sectors to identify development issues and to develop recommendations for each individual area. Land use recommendations from the sector and small area plans were combined into one cohesive document for the City as a whole to form the Consolidated Future Land Use Plan. Additional recommendations developed in the sector and small area plans will be incorporated into other plan elements, such as the Mobility Plan, as appropriate. This plan accounts for the floodplains and changes in floodplains as depicted by FEMA.
Southlake	Comprehensive Emergency Management Plan	Office of Emergency Management	Every 5 years	Existing	Updates to the Basic Plan and Annex P	The Comprehensive Emergency Management Plan (CEMP), in particular Annex-P Hazard Mitigation, represents a reflection of the HazMAP. Once the HazMAP is complete, we will work update Annex-P to ensure cohesion and synergy between the plans according to the review schedule for Annex-P
Tarrant County	Strategic Plan	County Administration	Annually	New	Finalize the plan and progress towards the goals	Once Strategic Plan has been completed, integrate Hazard Mitigation as an Emergency Management Goal to be completed within next five (5) years. Review annually, and update Strategic Plan with updates on Hazard Mitigation Actions.

Jurisdiction	Type of Plan	Department Responsible	Review Timeline	New or Existing?	Actions to be Integrated	Process for Integrating Mitigation Actions into Planning Mechanisms
Tarrant County	Emergency Operations Plan	Emergency Management	Every 5 years	New	Finalize the plan and progress towards the goals	Once the Tarrant County Emergency Management Plan has been developed with 31 communities and Tarrant County, we will integrate Hazard Mitigation language into Annex P: Hazard Mitigation to be completed within the next twelve (12) months (within 2015). Review annually, and update TCEMP with updates on Hazard Mitigation Actions.
Tarrant County	Continuity of Operations Plan	Emergency Management	Every 3 to 5 years	New	Finalize the plan and progress towards the goals	Once the Tarrant County Continuity of Operations Plan / Continuity of Government Plan has been developed, identify Hazard Mitigation Strategies as an Emergency Management Goal to be completed within next five (5) years. Review annually, and update COOP with updates on Hazard Mitigation Actions.
Tarrant County	Mass Fatality Plan	Medical Examiner/Emergency Management/Public Health	Every 3 to 5 years	New	Finalize the plan and progress towards the goals	Once the Tarrant County Mass Fatality Plan has been developed, identify Hazard Mitigation Strategies as an Emergency Management Goal to be completed within next five (5) years. Review annually, and update Mass Fatality Plan with updates on Hazard Mitigation Actions related to man-made and technological hazards.
Tarrant County	Debris Management	Emergency Management	Every 3 to 5 years	New	Finalize the plan and progress towards the goals	Once the Tarrant County Debris Management Plan has been developed, identify Hazard Mitigation Strategies as an Emergency Management Goal to be completed within next five (5) years. Review annually, and update Debris Management Plan with updates on Hazard Mitigation Actions related to natural hazards or debris generating events/incidents.
Watauga	Capital Improvement Plan	City Administration	Annually	existing	road way and storm drain improvements in flooding areas	Integrate mitigation strategies into the Capital improvement Plan

Jurisdiction	Type of Plan	Department Responsible	Review Timeline	New or Existing?	Actions to be Integrated	Process for Integrating Mitigation Actions into Planning Mechanisms
Westlake	Westlake has both a capital improvement plan (reviewed on an annual basis) and is nearing completion of its first comprehensive plan. Historically, all Westlake Codes and Ordinances that touch on construction, grading, floodplain, natural or man-made hazard, have been written and approved with the reduction of risk and hazard management in mind. Further, all controlling ordinances currently in effect meet or exceed FEMA, State, EPA or any other regulatory agency mandate or requirement.					Westlake ensures proper integration of risk reduction strategies and hazard management in the following manner. At meetings where any documents, plans, or ordinances may be adopted, created or updated that may have an effect on vulnerability to any known hazard, Westlake consults the most recent guidance form the State and Federal Government and the most recent Hazard Mitigation Plan. Provided that here is sufficient political, fiscal ,and administrative capability, actions detailed in the HAZMAP and other guidance will be integrated wherever applicable.
Westworth Village	Vision Plan	City Administration	Every 2 years	Existing	Ensure that future city plans mitigate hazards and effectively plan for known issues.	The EMC will attend meetings as EMC deems appropriate and will be giving the ability to review plans prior to implementation.

Section 7
SUMMARY

7.1 Conclusion

Through the development of this plan, Tarrant County has developed a thorough hazard history, an inventory of critical facilities, and an updated contact list for emergency contacts at critical facilities. This data, when used in conjunction with the updated information about hazard threats and vulnerabilities, will prove to be invaluable to Tarrant County and its cities and townships.

Natural and technological hazards have been identified countywide. Possible mitigation projects that would reduce the risk of lives and property due to the identified threats have been compiled and prioritized.

The creation of the Tarrant County Local Mitigation Action Planning Committee (LMAPC) has brought together stakeholders from communities and organizations into one planning team. This group has been able to work together effectively and efficiently to produce this document and establish a greater awareness of our risks and our mitigation strategies.

This plan will continue to evolve as necessary to properly represent the threats and vulnerabilities affecting Tarrant County.

Continued public participation is encouraged and will be continued through the ongoing multijurisdictional hazard mitigation process.

7.2 References

- Publications
  - FEMA Pre-Disaster Mitigation How-to-Guides #1, 2, 3, 7
  - Texas Emergency Management Supplements to FEMA Pre-Disaster How-to-Guides
- Websites
  - FEMA (www.fema.gov)
  - Texas Division of Emergency Management (http://www.txdps.state.tx.us/dem/)
  - Tarrant County (www.tarrantcounty.com)
  - National Climatic Data Center (www.ncdc.noaa.gov)
  - National Weather Service (www.srh.noaa.gov/ffc/default.html)
- Other Sources
  - American Red Cross
  - Tarrant County
  - Texas Forestry Commission

- Texas Department of Natural Resources
- National Weather Service
- U.S. Geological Survey
- Dallas Fort Worth Threat and Hazard Identification and Risk Analysis (THIRA)