# Fort Worth Hazard Mitigation Action Plan

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## FOREWORD

The *Fort Worth Hazard Mitigation Action Plan* has been prepared by staff from a number of local and regional government agencies. Staff from all participating jurisdictions and external agencies are to be congratulated for their excellent work and cooperation in the development of this document.

This plan is and will remain a "living" document that will be reviewed, revised, and updated on an annual basis. The development of this initial plan as a deliverable document to the Texas Division of Emergency Management and FEMA represents the state of the Mitigation Program at the time the plan is submitted for approval and is a work in progress.

The format of this plan is designed to make it user friendly for the participating jurisdictions. Information pertinent to all participating jurisdictions is contained in the basic plan portion. Following are sections for each jurisdiction which contain information specific to that jurisdiction including hazard and vulnerability information as well as mitigation actions.

Potential mitigation projects identified in this plan range from information gathering to public education to large scale flood control projects. The variety of projects will provide an opportunity for all participating jurisdictions to take part in mitigation projects in the short term, as well as pursuing longer term goals.

The Tarrant County Hazard Mitigation Team will continue to develop and refine hazard mitigation strategies and projects. Public meetings will be held on a semi-annual basis in various cities and area of the County. In addition, a Tarrant County Hazard Mitigation Council has been formed to identify and coordinate mitigation projects that cross jurisdictional boundaries or may affect other jurisdictions. The Tarrant County Hazard Mitigation Council is composed of representatives from across the County, including some jurisdictions that did not participate in the *Fort Worth Hazard Mitigation Action Plan.*

## EXECUTIVE SUMMARY

Fort Worth is vulnerable to a number of hazards, both natural and technological. This plan focuses on natural hazards. Fort Worth has experienced a variety of natural disasters including flooding, tornadoes, and severe hailstorms. Technological events have included large hazardous material spills, chemical plant fires, petroleum plant fires, and a number of gasoline tanker accidents.

Preparation of the Fort Worth Hazard Mitigation Action Plan has been coordinated by the Fort Worth – Tarrant County Office of Emergency Management. The jurisdictions participating in this plan represent unincorporated portions of Tarrant County as well as nineteen of the forty-one cities in the County. The Tarrant County Hazard Mitigation Team consisting of staff from all participating jurisdictions and external agencies participated in development of the Fort Worth Hazard Mitigation Action Plan. It is important to note that this plan was developed without reliance on a contractor or consultant. It is our plan. We firmly believe that planning is a process, not a product.

Specific hazards and risks in each jurisdiction have been identified and are addressed in each jurisdiction's section of this plan. The Fort Worth Hazard Mitigation Action Plan identifies natural hazards that pose a risk to our area. Vulnerabilities to those risks are identified and quantified as appropriate. Goals, strategies, and projects to mitigate those risks are identified and analyzed as part of the Fort Worth Hazard Mitigation Action Plan.

This Fort Worth Hazard Mitigation Action Plan will be incorporated into Annex P of the Fort Worth – Tarrant County Emergency Plan to meet planning standards of the Texas Division of Emergency Management. In addition, the Fort Worth Hazard Mitigation Action Plan can also serve as a stand-alone document to facilitate identification and analysis of risks as well as strategies and projects to mitigate those risks. It is anticipated that this document will undergo changes in future years as our mitigation process develops and matures.

## POINT OF CONTACT INFORMATION

| **Primary** | **Alternate** |
|---|---|
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**MULTI-JURISDICTIONAL PLAN ADOPTION**

Upon approval of the Fort Worth Hazard Mitigation Action Plan by the Texas Division of Emergency Management and FEMA, the governing body of each of the jurisdictions represented in the plan will adopt the plan.

Jurisdictions represented in the Plan are:
City of Fort Worth
Tarrant County (Unincorporated Areas)
City of Azle
City of Blue Mound
City of Dalworthington Gardens
City of Edgecliff Village
City of Everman
City of Haslet
City of Keller
City of Kennedale
City of Lakeside
City of Lake Worth
City of Pelican Bay
City of River Oaks
City of Saginaw
City of Sansom Park
City of Westlake
City of Westover Hills
City of Westworth Village
City of White Settlement

**SAMPLE DRAFT RESOLUTION FOR APPROVAL OF HAZARD MITIGATION ACTION PLAN**

WHEREAS, *(Insert name of Jurisdiction*), with the assistance from the Fort Worth - Tarrant County Office of Emergency Management has gathered information and prepared the Fort Worth Hazard Mitigation Action Plan; and,

WHEREAS, the Fort Worth Hazard Mitigation Action Plan has been prepared in accordance with FEMA requirements at 44 C.F.R. 201.6; and,

WHEREAS, *(Insert name of Jurisdiction*) is a local unit of government that has afforded the citizens an opportunity to comment and provide input in the Plan and the actions in the Plan; and

WHEREAS, *(Insert the name of the governing body)* has reviewed the Plan and affirms that the Plan will be updated no less than every five years;

NOW THEREFORE, BE IT RESOLVED by *(Insert the name of the governing body)* that *(Insert name of Jurisdiction*) adopts the Fort Worth Hazard Mitigation Action Plan as this jurisdiction's Multi-Hazard Mitigation Plan, and resolves to execute the actions in the Plan subject to available funding.

ADOPTED this _____ day of _____, 200__ at the meeting of the *(Insert the name of the governing body).*

*Insert appropriate signature lines and dates*

_____

*Mayor/County Judge Signature*

**NOTE:** This draft resolution will be reviewed and revised by the current legal counsel of each jurisdiction after the plan is approved by FEMA.

## PLANNING PROCESS

### Description

Preparation of the Fort Worth Hazard Mitigation Action Plan has been coordinated by the Fort Worth – Tarrant County Office of Emergency Management. The Tarrant County Hazard Mitigation Team consisting of city and county staff as well as representatives from external agencies participated in development of the Fort Worth Hazard Mitigation Action Plan.

We feel it is significant that the Fort Worth Hazard Mitigation Action Plan has been developed by the jurisdictions participating in the plan and interested external agencies. We did not use a contractor to develop the plan and deliver a product to us. We have benefited from conducting the process ourselves. An axiom of emergency management is that "planning is a process, not a product." Once this plan is approved by FEMA we will continue the process to identify hazards and projects to mitigate the hazards. We have no plans to delegate that responsibility to an outside contractor.

The basis of the Fort Worth Hazard Mitigation Action Plan is the Local Hazard Mitigation Plan Review Crosswalk developed by FEMA Region 6 and the Texas Governor's Division of Emergency Management. The Fort Worth Hazard Mitigation Action Plan was developed as an appendix to Annex P - Hazard Mitigation of the Fort Worth - Tarrant County Emergency Management Plan.

The Fort Worth Hazard Mitigation Action Plan consists of a basic plan containing information about the planning process, mitigation strategies, and methods for updating the plan followed by appendices for each participating jurisdiction. This format makes the plan more user friendly. Each jurisdiction can easily access information about their hazards, vulnerabilities, and mitigation projects by referring to their section of the plan.

All twenty jurisdictions participating in the Fort Worth Hazard Mitigation Action Plan also participate in a multi-jurisdictional emergency management program. The process used to develop this Mitigation Action Plan was an enhanced version of the process used to develop and update our Emergency Management Plan and annexes. Staff from the Fort Worth - Tarrant County Office of Emergency Management involved all participating jurisdictions as well as external agencies in the planning process through meetings, telephone calls and e-mails. Many of the participating jurisdictions have very limited staff and can seldom spare time to attend meetings away from their city. Deviating from the process used for all other emergency management planning and coordination was not practical. FEMA Document #386-8, *Multi-Jurisdictional Mitigation Planning* (August 2006) States:

> *"Any reasonable way to organize the participants will be acceptable if the jurisdiction demonstrates some kind of direct or representative participation. Make sure the plan clearly describes jurisdictional representation or formally authorized representation in the process."*

We believe the process we used to develop this plan is reasonable and appropriate for our jurisdictions. The participating jurisdictions were involved in developing this plan through meetings, e-mails, and telephone calls specific to this planning effort. Hazard mitigation planning was also addressed during our normal day-to-day interactions with the participating jurisdictions.

Gathering the required information for the Fort Worth Hazard Mitigation Action Plan from twenty jurisdictions was both problematic and an opportunity. Many of the participants in this plan are smaller cities with extremely limited staff and resources, so in some cases information and mitigation programs are also limited. Fort Worth - Tarrant County Office of Emergency Management staff e-mailed, telephoned, and met with each of the participating jurisdictions to obtain information and conduct planning for the Fort Worth Hazard Mitigation Action Plan. This provided an opportunity to promote emergency management in general and mitigation in particular. As with other components of our emergency management program, Fort Worth - Tarrant County Office of Emergency Management staff frequently represented the jurisdictions at planning and public meetings since those jurisdictions typically cannot spare staff for meetings.

Representatives from participating jurisdictions and interested parties organized as the Tarrant County Hazard Mitigation Team. This team played an active leadership role in the development of the Fort Worth Hazard Mitigation Action Plan by identifying and assessing hazards, setting goals, identifying potential projects, writing and reviewing drafts of this plan, and by providing invaluable technical expertise and jurisdictional knowledge.

The Tarrant County Hazard Mitigation Team began by reviewing the *NCTCOG Multi-Hazard Risk Assessment* and *Mitigation Strategies for Geologic, Severe Weather & Climatic Hazards*. We also reviewed the *Texas Mitigation Plan* and specifically discussed the Texas State Mitigation Strategy. Although the NCTCOG documents were developed to serve as region-wide documents, they provide an excellent assessment of the types of hazards that could affect jurisdictions in Tarrant County. Each jurisdiction's history, geography, and any other pertinent factors were analyzed to determine the risks and vulnerabilities of the hazards within the jurisdiction.

After the most significant hazards had been identified for each jurisdiction, an assessment of vulnerable populations and facilities in each jurisdiction was begun. Potential mitigation projects designed to mitigate those vulnerabilities were discussed in all meetings and became the subject of numerous telephone calls and e-mails. Factors such as project effectiveness, cost, possibility of federal funding, availability of matching funds, and the difficulty of administering the projects were considered in determining which projects to include in our initial Mitigation action Plan. A decision was made to include projects that would provide protection for our citizens and emergency facilities as well as have the best chance to be funded and have successful outcomes. The adage that "success breeds success" was mentioned on

several occasions. Successful mitigation projects will build public and political support for mitigation. The projects included in this plan - Safe Rooms, Weather Alert Radios, determining feasibility of strengthening emergency facilities, and flood mitigation – are all achievable for our jurisdictions.

The integrated urban nature of Tarrant County and the entire Fort Worth - Dallas Metroplex requires careful consideration of potential effects of hazards and mitigation projects on neighboring communities. A mitigation project in one jurisdiction may either eliminate or worsen the effects of that hazard in a neighboring jurisdiction. For example, increased development has resulted in more impervious cover and increased rainfall runoff; which has led to more destructive flash flood events downstream.

The need for coordination of projects that cross jurisdictional boundaries was discussed at all meetings. The obvious example of flood mitigation projects that might speed the flow of water downstream into another jurisdiction was discussed at length. Due to complexity and cost, inter-jurisdictional projects were not included as proposed projects in this initial Mitigation Action Plan. Two potential projects were discussed at length, thus laying the groundwork for future, larger scale projects. Those potential projects were Farmers Branch Creek which rises in far west Fort Worth and flows through White Settlement, Naval Air Station Fort Worth, and Westworth Village before emptying into the West Fork of the Trinity River. Farmers Branch flooded in 2000 and 2004 resulting in Small Business Administration Disaster Declarations. The other inter-jurisdictional project discussed at length was along big Fossil Creek, which rises in north Fort Worth and flows through several cities before emptying into the Clear fork of the Trinity River. Portions of both creeks have been the subject of flood studies by a variety of agencies including the US Army Corps of Engineers.

The Fort Worth – Tarrant County Office of Emergency Management prepared an initial preliminary draft Fort Worth Hazard Mitigation Action Plan that was presented to the Tarrant County Hazard Mitigation Team, participating jurisdictions, and external partners for review on October 13, 2004. Subsequent drafts were submitted on October 25, 2004, October 28, 2004, and November 5, 2004. The Fort Worth Hazard Mitigation Action Plan was submitted to the Texas Division of Emergency Management in December of 2004. It was returned for revision in March 2005. Subsequent attempts to reconcile comments with the Texas Division of Emergency management were suspended in August 2005 due to the diversion of resources to our response to Hurricanes Katrina and Rita.

In late 2006 efforts to complete the Fort Worth Hazard Mitigation Action Plan were restarted through the North Central Texas Council of Governments. All participating jurisdictions were contacted by telephone, e-mail, and meetings to ensure full understanding and participation in the planning process as well as to update pertinent information. An additional public meeting was held on March 5, 2007. In early June 2007 a revised draft of the Fort Worth Hazard Mitigation Action Plan was provided to all participating jurisdictions and agencies for review. Comments were resolved and

changes coordinated with all participating jurisdictions through meetings, telephone calls, and e-mails. A revised plan was submitted to the North Central Texas Council of Governments on June 24, 2007.

Subsequent developments in December 2007 led to the decision to submit the Fort Worth Hazard Mitigation Action Plan separate from the North Central Texas Council of Governments. Once again, the plan was disseminated to participating jurisdictions and agencies for review and updating of pertinent information. An additional Public Meeting was held on January 25, 2008. As with the other meetings, no members of the public attended. Comments were resolved and changes coordinated with all participating jurisdictions through meetings, telephone calls, and e-mails.

Upon approval of this plan by the Texas Governor's Division of Emergency Management and FEMA the participating jurisdictions, the Hazard Mitigation Council, and our Hazard Mitigation Team will meet and move forward with mitigation projects in our participating jurisdictions. In addition, prior to the required five year update of this plan we will develop a Tarrant County comprehensive risk assessment.

This is not the final version of the Fort Worth Hazard Mitigation Action Plan. We view this plan as a living document and will continually review, revise, and update the plan as more or updated information becomes available, projects are completed, and additional projects are identified.

**Meetings**

NCTCOG Meetings

- August 14, 2003 NCTCOG Hazard Mitigation Action Plan Coordination Meeting
- September 23, 2003 NCTCOG Regional Hazard Mitigation Action Plan Review Meeting
- October 30, 2003 NCTCOG Regional Hazard Mitigation Action Plan Meeting
- May 5, 2004 NCTCOG Floodplain/Regional Hazard Mitigation Action Plan Meeting
- December 18, 2007 NCTCOG Regional Hazard Mitigation Action Plan Meeting
- January 25, 2007 NCTCOG Regional Hazard Mitigation Action Plan Meeting

Tarrant County Meetings

- May 28, 2004 Tarrant County Hazard Mitigation Council Initial Meeting
- June 8, 2004 Tarrant County Hazard Mitigation Workshop
- July 7, 2004 Tarrant County Hazard Mitigation Team Meeting
- July 29, 2004 Tarrant County Hazard Mitigation Council Meeting
- August 20, 2004 Tarrant County Hazard Mitigation Council Meeting
- September 15, 2004 Hazard Mitigation Action Plan Review with Tarrant Regional Water District Staff
- October 1, 2004 Tarrant County Hazard Mitigation Team Meeting
- October 13, 2004 Tarrant County Hazard Mitigation Team Meeting
- October 25, 2004 Tarrant County Hazard Mitigation Team Meeting

Meetings With Participating Jurisdiction Staff

NOTE: HazMAP was also addressed in many other non-HazMAP specific meetings, e-mails, telephone calls and conversations as part of our normal emergency management coordination process.

HazMAP specific meetings with participating jurisdictions included:

- September 30, 2004 Fort Worth
- October 12, 2004 Tarrant County
- October 13, 2004 Kennedale
- October 15, 2004 Westlake, White Settlement
- October 18, 2004 Haltom City, Dalworthington Gardens
- October 19, 2004 Westover Hills, Lakeside
- October 20, 2004 Westworth Village, Pelican Bay, Fort Worth
- October 26, 2004 Haslet
- October 27, 2004 Haslet, Blue Mound, Pelican Bay
- October 28, 2004 Westworth Village
- October 29, 2004 Fort Worth
- November 1, 2004 Lake Worth
- November 2, 2004 Sansom Park
- November 11, 2004 Edgecliff Village
- February 12, 2007 Saginaw
- February 26, 2007 Lakeside, Azle, White Settlement
- March 1, 2007 Keller
- March 2, 2007 Saginaw
- March 6, 2007 River Oaks
- March 14, 2007 Everman
- March 26, 2007 White Settlement
- June 19, 2007 Edgecliff Village

Staff from all participating jurisdictions have read and assented to this plan.

**Public Meetings**

- November 11, 2003 NCTCOG Jurisdiction & Public Meeting
- May 24, 2004 NCTCOG Hazard Mitigation Action Plan Public Forum On Regional Mitigation Strategies
- June 8, 2004 NCTCOG Hazard Mitigation Action Plan Public Meeting
- October 27, 2004 Public Meeting on Fort Worth Hazard Mitigation Action Plan
- March 5, 2007 Public Meeting on Fort Worth Hazard Mitigation Action Plan
- January 25, 2008 Public Meeting on Fort Worth Hazard Mitigation Action Plan

**Participants Involved**

In addition to the Fort Worth - Tarrant County Emergency Management Office, staff from each participating jurisdictions as well as external agencies participated in the planning process. The Tarrant County Hazard Mitigation Team, led by the Fort

Worth – Tarrant County Office of Emergency Management Hazard Mitigation Officer, is composed of representatives from the jurisdictions and agencies listed below. Team member roles are also described.

Tarrant County Administrator's Office
- Policy decisions
- Gauge/Solicit Political Support
- Leadership Role

Tarrant County Engineer's Office
- Identify Potential Mitigation Projects
- Technical Review of Potential Projects
- Disaster History
- Mitigation Project History

Tarrant County District Attorney
- Review Legal Issues

Fort Worth - Tarrant County Office of Emergency Management (Also under Fort Worth)
- Coordination of Planning Process
- Leadership Role
- Primary Point-of-Contact

Tarrant County Environmental Specialist
- Review Potential Environmental Issues of Projects

Tarrant County Governmental Relations
- Gauge/Solicit Political Support

Tarrant County Public Information Office
- Identify Potential Public Education Mitigation Projects
- Assist in Coordinating Public Education and Public Meetings

Tarrant County Risk Management
- Identify Potential Mitigation Projects Based on Previous Claims
- Review Exposure of Potential Mitigation Projects

Tarrant County Tax Office
- Identify Tax Impacts of Potential Mitigation Projects Such as Property Buy-Outs

Tarrant County Transportation Services
- Identify Potential Mitigation Projects
- Provide Disaster History
- Provide Local Knowledge of Unincorporated Areas

Azle City Manager's Office
- Provide Management Review
- Identify Potential Mitigation Projects
- Provide Jurisdiction Specific History
- Provide Jurisdiction Local Knowledge

Azle Fire Department/Emergency Management
- Primary Point-of-Contact
- Identify Potential Mitigation Projects
- Provide Jurisdiction Specific History
- Provide Jurisdiction Local Knowledge

Azle Parks/Streets Department
- Provide Cost Estimates
- Provide Technical Review of Mitigation Projects
- Identify Potential Mitigation Projects
- Provide Jurisdiction Specific History
- Provide Jurisdiction Local Knowledge

Azle Utilities Department
- Provide Cost Estimates
- Provide Technical Review of Mitigation Projects
- Identify Potential Mitigation Projects
- Provide Jurisdiction Specific History
- Provide Jurisdiction Local Knowledge

Blue Mound Fire Department/Emergency Management
- Identify Potential Mitigation Projects
- Provide Jurisdiction Specific History
- Provide Jurisdiction Local Knowledge

Dalworthington Gardens Police Department/Emergency Management
- Identify Potential Mitigation Projects
- Provide Jurisdiction Specific History
- Provide Jurisdiction Local Knowledge

Edgecliff Village Fire Department/Emergency Management
- Identify Potential Mitigation Projects
- Provide Jurisdiction Specific History
- Provide Jurisdiction Local Knowledge

Everman Emergency Services/Police Department/Emergency Management
- Identify Potential Mitigation Projects
- Provide Jurisdiction Specific History

- Provide Jurisdiction Local Knowledge

Everman Public Works Department
- Identify Potential Mitigation Projects
- Provide Technical Review of Mitigation Projects
- Provide Jurisdiction Specific History
- Provide Jurisdiction Local Knowledge

Fort Worth Budget Office
- Identify Potential Funding for Mitigation Projects
- Identify Budgetary Impacts of Potential Mitigation Projects Such as Property Buy-Outs

Fort Worth Code Compliance Department
- Identify Potential Mitigation Projects
- Provide Jurisdiction Local Knowledge

Fort Worth Development Department
- Identify Potential Mitigation Projects
- Review Potential Economic Development Impacts of Mitigation Projects

Fort Worth - Tarrant County Office of Emergency Management (Also under Tarrant County)
- Coordination of Planning Process
- Leadership Role
- Primary Point-of-Contact

Fort Worth Engineering Department (Floodplain Management)
- Identify Potential Mitigation Projects
- Technical Review of Potential Projects
- Disaster History
- Mitigation Project History

Fort Worth Environmental Management Department
- Identify Potential Mitigation Projects
- Review Potential Environmental Issues of Mitigation Projects

Fort Worth Public Health Department
- Identify Potential Mitigation Projects
- Review of Projects for Public Health Benefits/Impacts

Fort Worth City Manager Public Information Office
- Identify Potential Public Education Mitigation Projects
- Assist in Coordinating Public Education and Public Meetings

Fort Worth Transportation & Public Works Department
- Identify Potential Mitigation Projects
- Provide Technical Review of Mitigation Projects
- Provide Disaster History

Fort Worth Water Department
- Identify Potential Mitigation Projects
- Provide Technical Review of Mitigation Projects

Haslet Fire Department/Emergency Management
- Identify Potential Mitigation Projects
- Provide Jurisdiction Specific History
- Provide Jurisdiction Local Knowledge

Keller Fire Department/Emergency Management
- Identify Potential Mitigation Projects
- Provide Jurisdiction Specific History
- Provide Jurisdiction Local Knowledge

Keller Community Development
- Identify Potential Mitigation Projects
- Provide Keller Mitigation History
- Review Potential Economic Development Impacts of Mitigation Projects

Kennedale Fire Department/Emergency Management
- Identify Potential Mitigation Projects
- Provide Jurisdiction Specific History
- Provide Jurisdiction Local Knowledge

Lakeside City Administrator's Office
- Primary Point of Contact
- Provide Management Review of Projects and Process

Lakeside Emergency Management
- Coordination with City Staff
- Identify Potential Mitigation Projects
- Provide Jurisdiction Specific History
- Provide Jurisdiction Local Knowledge

Lakeside Police Department
- Identify Potential Mitigation Projects
- Provide Jurisdiction Specific History
- Provide Jurisdiction Local Knowledge

Lakeside Water Department
- Identify Potential Mitigation Projects
- Provide Technical Review of Projects

Lake Worth Fire Department/Emergency Management
- Identify Potential Mitigation Projects
- Provide Jurisdiction Specific History
- Provide Jurisdiction Local Knowledge

Pelican Bay Mayor's Office
- Provide Executive Review
- Identify Potential Mitigation Projects
- Provide Jurisdiction Specific History
- Provide Jurisdiction Local Knowledge

Pelican Bay Fire Department/Emergency Management
- Identify Potential Mitigation Projects
- Provide Jurisdiction Specific History
- Provide Jurisdiction Local Knowledge

River Oaks Fire Department/Emergency Management
- Identify Potential Mitigation Projects
- Provide Jurisdiction Specific History
- Provide Jurisdiction Local Knowledge
- Technical Review of Mitigation Projects

River Oaks Public Works
- Identify Potential Mitigation Projects
- Provide Jurisdiction Specific History
- Provide Jurisdiction Local Knowledge
- Technical Review of Mitigation Projects

Sansom Park Fire Department/Emergency Management
- Identify Potential Mitigation Projects
- Provide Jurisdiction Specific History
- Provide Jurisdiction Local Knowledge

Westlake Department of Public Safety
- Identify Potential Mitigation Projects
- Provide Jurisdiction Specific History
- Provide Jurisdiction Local Knowledge

Westover Hills City Manger & Police Chief
- Identify Potential Mitigation Projects
- Provide Jurisdiction Specific History

- Provide Jurisdiction Local Knowledge

Westworth Village Fire Department/Emergency Management
- Identify Potential Mitigation Projects
- Provide Jurisdiction Specific History
- Provide Jurisdiction Local Knowledge

White Settlement Fire Department
- Identify Potential Mitigation Projects
- Provide Jurisdiction Specific History
- Provide Jurisdiction Local Knowledge

White Settlement Police Department/Emergency Management
- Identify Potential Mitigation Projects
- Provide Jurisdiction Specific History
- Provide Jurisdiction Local Knowledge

White Settlement Public Works
- Identify Potential Mitigation Projects
- Technical Review of Mitigation Projects
- Provide Jurisdiction Specific History
- Provide Jurisdiction Local Knowledge

American Red Cross Emergency Services Department
- External Contributor
- Identify Potential Mitigation Projects
- Provide Disaster History Regarding Red Cross Services
- Provide Jurisdiction Local Knowledge

Naval Air Station Fort Worth/Joint Reserve Base Emergency Management
- External Contributor
- Identify Potential Mitigation Projects
- Provide Disaster History Regarding Base Damage and Emergency Services Requested by Off-Base Jurisdictions
- Provide Base Local Knowledge

Naval Air Station Fort Worth/Joint Reserve Base Public Works Department
- External Contributor
- Support Technical Reviews of Potential Mitigation Projects
- Identify Potential Mitigation Projects
- Provide Disaster History Regarding Base Damage and Emergency Services Requested by Off-Base Jurisdictions
- Provide Base Local Knowledge

Tarrant Regional Water District Engineering Department

- External Contributor
- Support Technical Reviews of Potential Mitigation Projects
- Identify Potential Mitigation Projects
- Provide Disaster History Regarding Lakes and Levees
- Provide Coordination with Customers

National Weather Service West Gulf River Forecast Center
- Identify Potential Mitigation Projects
- Provide Disaster History Regarding Lakes and Levees
- Potential Flood Event Modeling

**Public Involvement**

Public comment on the plan during the drafting stage was solicited through a series of public meetings and notices. A draft copy of the plan was placed on the City of Fort Worth website front page as well as on the Fort Worth – Tarrant County Office of Emergency Management website front page. A current draft copy of the HazMAP remains on the Fort Worth – Tarrant County Office of Emergency Management website.

NCTCOG staff and a representative from the Fort Worth – Tarrant County Office of Emergency Management (OEM) attended a public HazMAP meeting at the Fort Worth Summerglen Branch Public Library from 9 am until 11 am on November 11, 2003. No citizens attended the meeting.

Tarrant County Office of Emergency Management staff participated in the NCTCOG Public Forums on Mitigation Strategies held from 9:30 am until 12 pm on May 25, 2004 at the NCTCOG offices in Arlington. The forums provided detailed information on the NCTCOG mitigation strategies. Staff from a number of cities across the region and Tarrant County attended the forums.

NCTCOG staff along with a representative from the Fort Worth – Tarrant County Office of Emergency Management held a public HazMAP meeting at the NCTCOG offices in Arlington at 7 pm on June 8, 2004. No citizens attended the meeting.

A Public meeting was held on October 27, 2004 at 6:30 pm at the Fort Worth Intermodal Transportation Center in downtown Fort Worth. The meeting was advertised in a Media Release to print, radio, and television stations in the area. No citizens attended the meeting.

A Public meeting was held on March 5, 2007 at 7 pm at the Fort Worth Intermodal Transportation Center in downtown Fort Worth. The meeting was advertised in a Media Release to print, radio, and television stations in the area. No citizens attended the meeting.

A Public meeting was held on January 25, 2008 at 7 pm at the Fort Worth Intermodal Transportation Center in downtown Fort Worth. The meeting was advertised in a

Media Release to print, radio, and television stations in the area as well as on the front page of the City website and Fort Worth – Tarrant County Office of Emergency Management website front page. No citizens attended the meeting.

**ANNUAL REVIEW STAKEHOLDER MEETINGS**

All stakeholders will be invited to review the Fort Worth Hazard Mitigation Action Plan through the means identified under the Continued Public Participation section. In addition, the Tarrant County Hazard Mitigation Team and Tarrant County Hazard Mitigation Council will actively seek to involve stakeholders in the planning and review process.

Potential stakeholders will include organizations such as neighborhood associations, home-owner associations, and civic service organizations.

**COMMUNITIES DESIGNATED FOR SPECIAL CONSIDERATION**

Tarrant County has two communities that meet the criteria for Small and Impoverished Communities found in 44 CFR Section 201.2 per data from the 2000 Census.

Blue Mound has a population of 2,388 and a per capita income of $16,553.

Pelican Bay has a population of 1,505 and a per capita income of $12,408.

**NEIGHBORING COMMUNITIES & INTERESTED PARTY INVOLVEMENT**

We participated in early portions of the HazMAP planning process conducted by the NCTCOG. Representatives from cities throughout Tarrant County and surrounding counties participated in this process which included communities from throughout the region. The NCTCOG facilitated a number of regional HazMAP meetings which we used as opportunities to contact neighboring jurisdictions, local agencies, businesses, and any other attendees to offer participation in developing the Fort Worth Hazard Mitigation Action Plan.

Separate from the NCTCOG meetings; Fort Worth - Tarrant County Office of Emergency Management staff used e-mail and telephone calls to contact neighboring counties, nearby cities and other potentially interested parties to solicit interest in the HazMAP process. Among the interested parties contacted were Texas Christian University, U.S. Army Corps of Engineers, the Red Cross, Naval Air Station Fort Worth, Tarrant Regional Water District, and the National Weather Service.

Of the agencies contacted, the following elected to take an active role in the Fort Worth Hazard Mitigation Action Plan:

- Tarrant Regional Water District
- Naval Air Station Fort Worth – Joint Reserve Base (Emergency Management Office and Public Works)
- Chisholm Trail Chapter of the American Red Cross

- National Weather Service, Fort Worth Forecast Office
- National Weather Service, West Gulf River Forecast Center

These agencies participated in development of the Fort Worth Hazard Mitigation Action Plan by providing information, attending meetings, and reviewing drafts of the plan. All have indicated they will remain actively involved in our mitigation program. It is anticipated that additional interested parties and agencies will become involved in the Fort Worth Hazard Mitigation Action Plan as the planning process develops, matures, and becomes more widely known.

A number of informal meetings of emergency management staff from cities throughout Tarrant County were held to discuss the HazMAP process and coordinate potential mitigation projects. On the morning of June 8, 2004 a Tarrant County-Wide HazMAP workshop was held with NCTCOG staff to review the latest guidance from the Texas Division of Emergency Management and FEMA as well as continue coordination among the jurisdictions preparing HazMAPs.

The Tarrant County Hazard Mitigation Team will continue to seek coordination with existing groups such as the recently created Fort Worth Storm Water Utility District, U.S. Army Corps of Engineers, local engineering firms involved in flood plain management and consulting, neighborhood associations, and any other interested parties.

**REVIEW/INCORPORATION OF EXISTING PLANS, STUDIES, REPORTS, & TECHNICAL INFORMATION**

A number of existing documents have been or are in the process of being incorporated in the Fort Worth Hazard Mitigation Action Plan, and vice versa. Those documents include:

- Fort Worth – Tarrant County Emergency Management Plan
- NCTCOG Multi-Hazard Risk Assessment
- City of Fort Worth Comprehensive Plan
- Farmer's Branch Creek Study (White Settlement & USACE)
- Big Fossil Creek Watershed Study (NCTCOG)
- Little Fossil Creek Watershed Study (USACE)
- State of Texas Mitigation Plan
- FEMA Flood Insurance Rate Maps
- Tarrant Regional Water District Report: Hazard Mitigation Action Plan Information
- Trinity River Project Central City, Fort Worth, Texas (USACE)

The Basic Plan section of the Fort Worth – Tarrant County Emergency Management Plan provides the basis for emergency planning, including mitigation planning, in the participating jurisdictions. The Basic Plan was reviewed to ensure that the Fort Worth Hazard Mitigation Action Plan would function as a part of the overall emergency plan.

The Fort Worth Hazard Mitigation Action Plan has been developed as an appendix to Annex P - Hazard Mitigation of the Fort Worth – Tarrant County Emergency Management Plan per instructions from the Texas Governor's Division of Emergency Management. Annex P provides processes and describes responsibilities for implementing a hazard mitigation program. The processes and responsibilities in Annex P were used as a guide for the HazMAP process. Processes and procedures in Annex P were adapted to meet Fort Worth Hazard Mitigation Action Plan needs and requirements.

The NCTCOG Multi-Hazard Risk Assessment provides an excellent assessment of hazards in our area. Information from the assessment on each hazard was reviewed to determine potential applicability to participating jurisdictions.

The City of Fort Worth's Comprehensive Plan is the city's official guide for making decisions about growth and development. The plan provides a wealth of information about recommended policies, strategies, programs, and projects that the City plans to pursue. Population and economic trends in the Comprehensive plan provided a valuable perspective for identifying potential mitigation projects.

Hazard specific studies such as the Farmer's Branch Creek Study (White Settlement & USACE), Big Fossil Creek Watershed Study (NCTCOG), and Little Fossil Creek Watershed Study (USACE) were reviewed to provide potential mitigation projects. Of particular interest in these studies was the potential for multi-jurisdictional projects that could compliment each other and provide a maximum level of mitigation for the dollars invested.

The State of Texas Mitigation Plan was reviewed to provide guidance for identifying and prioritizing mitigation projects. Area FEMA Flood Insurance Rate Maps were reviewed to identify hazard areas and potential mitigation projects.

Tarrant Regional Water District staff provided information from studies and models of floodway and reservoir operations to provide data on the main stem river floodways in Fort Worth. Tarrant Regional Water District operates reservoirs on the West Fork of the Trinity River above Fort Worth. They also maintain the levees along the West Fork and Clear Fork on the Trinity River through Fort Worth.

**METHOD AND SCHEDULE FOR MONITORING THE PLAN**

The Fort Worth – Tarrant County Office of Emergency Management is responsible for providing bi-annual reports regarding the status of the Fort Worth Hazard Mitigation Action Plan in the months of January and July of each year to the Tarrant County Hazard Mitigation Team and Hazard Mitigation Council. These reports shall at a minimum contain:

- A current Hazard Mitigation Team roster
- Status of any hazard mitigation projects in process
- Status of any funding
- Potential funding opportunities

- Any new or changed risks or vulnerabilities
- Any revisions to the Fort Worth Hazard Mitigation Action Plan

**METHOD AND SCHEDULE FOR EVALUATING THE PLAN**

Fort Worth – Tarrant County Office of Emergency Management staff shall ensure that the Fort Worth Hazard Mitigation Action Plan is reviewed and updated annually during the month of October. The Tarrant County Hazard Mitigation Team, neighboring communities, the public, and external agencies will be invited to participate in Fort Worth Hazard Mitigation Action Plan evaluations.

Criteria for evaluating the Fort Worth Hazard Mitigation Action Plan will include:

- Successful implementation of mitigation projects
- Success in increasing public involvement in the hazard mitigation
- Success in increasing external agency involvement in hazard mitigation
- FEMA Hazard Mitigation Program regulations and guidance
- Texas Governor's Division of Emergency Management Standards
- Applicable City & County codes and ordinances
- Current NCTCOG hazard mitigation programs
- Review of the status of National Flood Insurance Plan participation by other jurisdictions within Tarrant County and neighboring counties
- National Flood Insurance Plan policy status (number and location of policies in effect, any increase or decrease in policies)
- Status of repetitive loss properties (number of claims, new claims, property purchased)

**METHOD AND SCHEDULE FOR UPDATING THE PLAN ON A FIVE-YEAR CYCLE**

Fort Worth Hazard Mitigation Action Plan will be reviewed annually during the month of October. The FEMA/GDEM Plan Review Crosswalk for Review of Local Mitigation Action Plans and GDEM Planning Standards will be the criteria for review and updates. Updates to this plan will be coordinated by Fort Worth – Tarrant County Office of Emergency Management staff with participating jurisdictions, the Tarrant County Hazard Mitigation Team, City and County departments, the public, and external agencies.

Notice of significant updates will be posted on the Fort Worth - Tarrant County Office of Emergency Management website and communicated to the public and affected/interested parties by the Hazard Mitigation Officer and other OEM staff.

Updates to the Plan will include additional information on new or changed risks and vulnerabilities, the reduction of risks or vulnerabilities as projects are implemented, the removal of projects as they are implemented, and the addition of new projects where new risks or vulnerabilities are identified.

The Fort Worth Hazard Mitigation Action Plan will be updated every five years or more often as necessary.

## OTHER LOCAL PLANNING MECHANISMS AVAILABLE FOR INCORPORATING THE REQUIREMENTS OF THE MITIGATION ACTION PLAN

Other local planning mechanisms and organizations that are available to support incorporating requirements of the Fort Worth Hazard Mitigation Action Plan include:

- Tarrant County Local Emergency Planning Committee (Technological hazard identification and mitigation projects)
- Tarrant County Emergency Manager's Committee (Coordination of hazard identification and mitigation projects)
- Tarrant County Fire Chief's Association (Hazard area identification and coordination of mitigation projects)
- NCTCOG (Technical support for hazard area identification and mitigation projects, regional mitigation project coordination)
- City of Fort Worth Comprehensive Plan (Review for information regarding population and economic trends)
- Tarrant Regional Water District (Incorporate Fort Worth Hazard Mitigation Action Plan strategies into their plans and coordinate mitigation projects)
- United States Army Corps of Engineers (Coordination of mitigation projects with other projects)
- City of Fort Worth Transportation and Public Works Department Storm Water Technical Review Committee (Technical review of mitigation projects and coordination of Fort Worth Hazard Mitigation Action Plan strategies and projects with the City's storm water management program)

## PROCESS BY WHICH LOCAL GOVERNMENT WILL INCORPORATE THE REQUIREMENTS IN OTHER PLANS WHEN APPROPRIATE

The Fort Worth Hazard Mitigation Action Plan has been developed as an appendix to Annex P - Hazard Mitigation of the Fort Worth – Tarrant County Emergency Management Plan and will be incorporated into that plan upon approval. All jurisdictions participating in the Fort Worth Hazard Mitigation Action Plan participate in and sign onto in the Fort Worth - Tarrant County Emergency Management Plan.

The Point of Contract for each participating jurisdiction will ensure that their jurisdiction annually reviews any jurisdiction specific comprehensive plans, capital improvement plans, master drainage plans, ordinances, and codes identified in their portion of this plan to incorporate the requirements of this plan, and hazard mitigation in general, into those documents whenever feasible.

Fort Worth – Tarrant County Office of Emergency Management staff will ensure that hazard mitigation strategies and mitigation projects are provided to the City of Fort Worth Planning Department for inclusion into the City of Fort Worth Comprehensive Plan. The Emergency Management Coordinator and Hazard Mitigation Officer will at a minimum present hazard mitigation strategies and mitigation projects to the Planning Department annually during the call for Comprehensive Plan revisions.

Fort Worth – Tarrant County Office of Emergency Management staff will ensure that hazard mitigation strategies and mitigation projects related to flooding will be provided to the City of Fort Worth Transportation and Public Works Department for coordination and inclusion in their Storm Water Management Goals and Policies. This will be accomplished by presenting strategies and mitigation projects to the Fort Worth Transportation and Public Works Department Storm Water Technical Review Committee to the Committee during their quarterly. The Hazard Mitigation Officer will be responsible for coordinating this process with the Storm Water Management Division

The Hazard Mitigation Officer will develop a schedule of review/revisions of planning documents for all jurisdictions participating in the Fort Worth Hazard Mitigation Action Plan and actively work to incorporate mitigation actions into those documents as appropriate. Each participating jurisdiction will incorporate the Fort Worth Hazard Mitigation Action Plan into capital improvement plans, drainage plans, comprehensive master plans, and any other appropriate plans by including Fort Worth Hazard Mitigation Action Plan hazard mitigation strategies, goals, and projects in those plans. The Hazard Mitigation Officer will be responsible for coordination of this process with participating jurisdictions.

**CONTINUED PUBLIC PARTICIPATION**

Continued public involvement will be solicited through:

- A public meeting at City Council adoption of the mitigation plan by each participating jurisdiction
- Periodic public meetings to be scheduled at least annually as part of the annual review of the Fort Worth Hazard Mitigation Action Plan
- Public meetings to be scheduled as significant new information becomes available
- Advertising of the Fort Worth - Tarrant County Office of Emergency Management website for Fort Worth Hazard Mitigation Action Plan information
- Placing a hazard mitigation survey on the Fort Worth - Tarrant County Office of Emergency Management website
- Advertising of the Office of Emergency Management e-mail address as a means for citizens to provide input or request more information on hazard mitigation
- Addressing the Fort Worth Hazard Mitigation Action Plan and hazard mitigation in general during meetings and in presentations to citizen groups (neighborhood associations, clubs, faith-based, service organizations, etc.)
- Newspaper articles on the Fort Worth Star-Telegram City Page
- Direct contact with citizens, especially those affected by flooding and storms
- Contacts with neighborhood associations in flood prone areas

- Formation of a Hazard Mitigation Citizens' Advisory Committee to provide a consistent means of public input into the mitigation process.

**RISK/HAZARD ASSESSMENT**

Natural hazards that can affect the planning area are discussed below. Detailed information pertaining to each participating jurisdiction is located in that jurisdiction's appendix as appropriate.

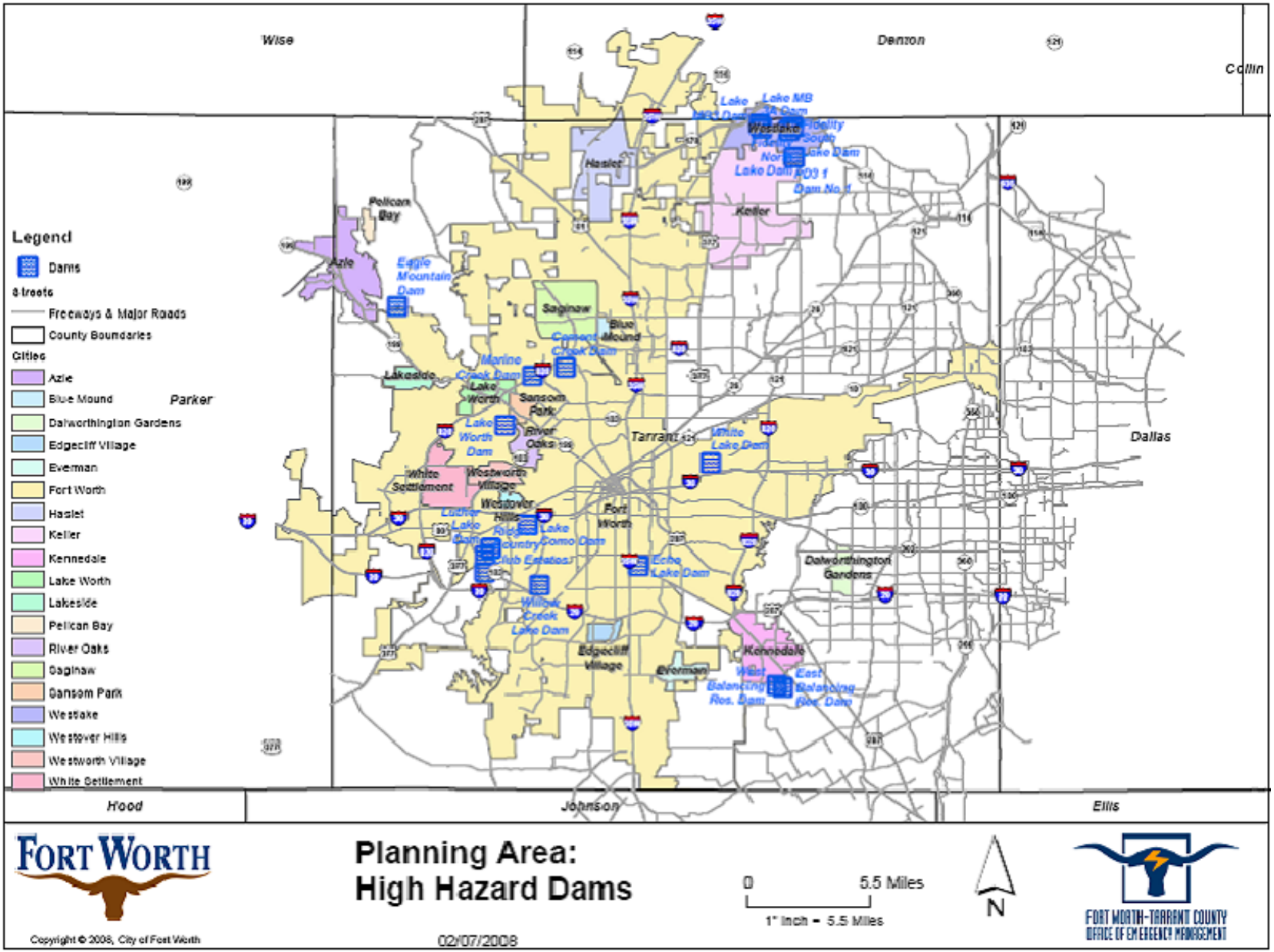
DAM FAILURE

A dam failure is an accidental or unintentional collapse, breach, or other failure of an impoundment structure that results in downstream flooding.

Location

| Location | Dam Name | Latitude | Longitude | River/Stream |
|---|---|---|---|---|
| Fort Worth | Bal Lake Dam | 32.706933 | -97.431150 | Clear Fork Trinity |
| Fort Worth | Cement Creek Dam | 32.828872 | -97.368108 | Cement Creek |
| Fort Worth | Eagle Mountain Dam | 32.869872 | -97.497031 | West Fork Trinity |
| Fort Worth | Echo Lake Dam | 32.698860 | -97.313194 | Sycamore Creek |
| Fort Worth | Lake Como Dam | 32.726667 | -97.398333 | Clear Fork Trinity |
| Fort Worth | Lake Worth Dam | 32.791667 | -97.415000 | West Fork Trinity |
| Fort Worth | Luther Lake Dam | 32.711551 | -97.427055 | Clear Fork Trinity |
| Fort Worth | Marine Creek Dam | 32.823836 | -97.393454 | Marine Creek |
| Fort Worth | Ridglea Country Club Estates | 32.695957 | -97.431828 | Mary's Creek |
| Fort Worth | White Lake Dam | 32.765579 | -97.257263 | West Fork Trinity |
| Fort Worth | Willow Creek Lake Dam | 32.687025 | -97.389622 | Willow Creek |
| Tarrant County | East Balancing Res. Dam | 32.618506 | -97.203333 | Village Creek |
| Tarrant County | West Balancing Res. Dam | 32.620000 | -97.208333 | Village Creek |
| Westlake | Fidelity North Lake Dam | 32.984606 | -97.190670 | Marshall Branch |
| Westlake | Fidelity South Lake Dam | 32.981992 | -97.193453 | Marshall Branch |
| Westlake | Lake MB 3A Dam | 32.983814 | -97.214606 | Marshall Branch |
| Westlake | Lake MB3 Dam | 32.986270 | -97.216414 | Marshall Branch |
| Westlake | PD3 1 Dam No 1 | 32.964464 | -97.189902 | Kirkwood Branch |

*"Dams in the high hazard potential category are usually those in or near urban areas where failure would be expected to cause loss of human life, extensive damage to agricultural, industrial or commercial facilities, important public utilities (including the design purpose of the facility), main highways or railroads."*
Source: Texas Administrative Code


Wise
Denton
Collin
Parker
Tarrant
Dallas
Hood
Johnson
Ellis
Legend
Dams
Streets
Freeways & Major Roads
County Boundaries
Cities
Azle
Blue Mound
Dalworthington Gardens
Edgecliff Village
Everman
Fort Worth
Haslet
Keller
Kennedale
Lake Worth
Lakeside
Pelican Bay
River Oaks
Saginaw
Sansom Park
Westlake
Westover Hills
Westworth Village
White Settlement
Planning Area:
High Hazard Dams
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1" Inch = 5.5 Miles
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OFFICE OF EMERGENCY MANAGEMENT

Extent - The extent of dam failure in the planning area has not been determined. Inundation studies are a mitigation action/project for participating jurisdictions with high hazard dams in their jurisdiction. (Please see Extent Scales Appendix)

Previous Occurrences - There is no record of a dam failure in the planning area.

Probability of Future Events – There is a low probability of future dam failures. The exact probability of future events is difficult to predict based on the lack of previous occurrences. There is some concern that farm ponds are being converted to park lakes and detention structures in newly developing areas without proper engineering reviews.

Vulnerability - Vulnerability of the planning area to dam failure cannot be determined until completion of inundation studies for high-hazard dams.

Impact - Failure of a high hazard dam has the potential to cause significant damage to urban structures, main highways, and utilities, as well as potential to cause loss of life (Natural Resources Conservation Service). Infrastructure could be damaged and rendered unusable for extended periods of time.

DROUGHT

Drought is a water shortage caused by the natural reduction in the amount of precipitation expected over an extended period of time, usually a season or more in length. It can be aggravated by other factors such as high temperatures, high winds, and low relative humidity. The severity of drought can depend on the duration, intensity, geographic extent, and the regional water supply demands made by human activities and vegetation. Most raw water sources for the planning area comes from three reservoirs on the West Fork of the Trinity River in northwest Tarrant County and from two reservoirs located well southeast of Tarrant County. These diverse supply locations help mitigate the effects of a local drought. An additional reservoir location well northeast of Tarrant County is being pursued. There has been some preliminary discussion of constructing a pipeline to carry water from southern Oklahoma. The Tarrant Regional Water District is installing pipelines to interconnect area water supply lakes with water treatment plants in order to provide maximum flexibility in water supply and treatment.

Location - Throughout the planning area. Drought typically occurs simultaneously in all parts of the planning area.

Extent - As of June 21, 2008, the planning area was at “1 - 0.5 Incipient Dry Spell” on the Palmer Drought Severity Index. Droughts are often associated with wildfires in the planning area. Below is a table of the longest number of consecutive days without measurable rain in the Fort Worth – Dallas Metroplex:

DFW Consecutive Days Without Measurable Rain

| Rank | # of days | Date |
|---|---|---|
| 1 | 84 | July 1 - Sep 22, 2000 |
| 2 (tie) | 58 | Nov 4 - Dec 31, 1950 |
| | 58 | May 25 - July 21, 1934 |
| 4 | 56 | Jul 11 - Sep 4, 1999 |
| 5 | 54 | Oct 7 - Nov 29, 1955 |
| 6 | 52 | Dec 12, 1985 - Feb 1, 1986 |
| 7 | 48 | Sep 20 - Nov 6, 1924 |
| 8 | 44 | Dec 7, 1922 - Jan 19, 1923 |
| 9 (tie) | 41 | Sep 22 - Nov 1, 1975 |
| | 41 | Jul 26 - Sep 4, 1929 |
| | 41 | Jul 28 - Sep 6, 1913 |
| | 41 | Nov 1 - Dec 11, 1903 |

Previous Occurrences - National Climatic Data Center records indicate that in the past ten years there have been three periods of drought in the planning area, 1996 - 1998, 2000, and 2005 - 2006. Historically, significant droughts occur every 20 – 25 years. The most severe recorded droughts occurred in the early 1930s and the drought of record from 1950 – 1957. Those droughts decimated crops and livestock, dried up area lakes, and caused the City of Dallas to begin laying an emergency overland water supply pipeline to Lake Texoma before steady soaking rains ended the drought in 1957.

Probability of Future Events – Although droughts in the planning area are infrequent, there is a high probability of future droughts. Droughts are certain to occur again in the planning area. Significant droughts significantly affecting water supply and resulting in mandatory restrictions traditionally occur on a twenty year cycle. Based on National Climatic Data Center recent records, we can anticipate that drought conditions will occur approximately every three years with significant droughts every 20 – 25 years.

Vulnerability – Drought can affect everyone in the planning area but the effects of a drought are generally economic. While lives may be affected by economic impacts, property is typically not at risk from damage due to drought. Secondary effects of a drought can include wildfire and damage from expansive soils. There are no known special or critical facilities that are directly vulnerable to a drought.

Impact – An extended drought can lead to loss of water for basic needs such as drinking and fire-fighting. Droughts are associated with increased wildfire and damage from expansive soils. More common impacts are damage to landscaping and reduced recreation due to low lake levels. Prolonged droughts may lead to reduced development in the area due to lack of water supply for new construction.

EXPANSIVE SOIL

Soils and soft rock that tend to swell or shrink due to changes in moisture content are commonly known as expansive soils. Changes in soil volume present a hazard primarily to structures built on top of expansive soils.

Location - Throughout the planning area.

Extent - The extent of expansive soils in the planning area is believed to be Very Low (0% - 20%) to Low (21% - 50%). (Please see the Extent Scales Appendix)

Previous Occurrences - We could find no empirical data on previous occurrences of damage from expansive soils, but it is believed that expansive soils have caused problems since the first buildings were constructed in this area.

Probability of Future Events - There is a high probability of future occurrences of expansive soil. Due to the variability of soil types and construction quality, it is very difficult to predict the specific probability future occurrences of problems with expansive soils. However, a study published in the fall 2003 issue of *Environmental Geology* cited in the September 19, 2003 *Dallas Business Journal* indicates that many new developments in the Fort Worth – Dallas Metroplex are being built on soil that is more unstable than soils built on prior to 1990. This could lead to a higher incidence of expansive soil related damage in the future.

Vulnerability – Expansive soils can affect everyone in the planning area but the effects of expansive soils are generally economic. Expansive soils have caused damage to some structures in the planning area. However, damage has been limited to relatively small geographic areas and there are no reports of significant damage to commercial structures or infrastructure.

Impact - The impact of expansive soils ranges from cosmetic cracks in walls to substantial foundation and structural damage that can result in the need to demolish the building. Infrastructure such as pipelines can be damaged causing increased maintenance and repairs, damaged beyond repair requiring replacement, damaged to the point of failure.

EXTREME HEAT

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

Location - Throughout the planning area.

Extent - Summer temperatures can reach as high as 113 degrees. Fort Worth is also subject to high humidity. (Please see the Extent Scales Appendix)

Previous Occurrences - This is an annual occurrence. The summer of 1980 was a record year with 69 consecutive days of temperatures of 100 degrees or more. We were unable to find a reliable record of deaths or injuries related to heat.

Probability of Future Events - There is a high probability of future occurrences of extreme heat. Hot summer temperatures are certain to continue to occur annually in the planning area.

Vulnerability - Summer heat and humidity can occur anytime from May through October. Community health services actively work with at risk populations to prevent heat related deaths and injuries. The elderly, very young people and people with poor health are most at risk from summer heat. People who work outside or in un-air-conditioned buildings are also at high risk to the direct effects of summer heat. Summer heat can also lead to electrical service outages if equipment fails or demand exceeds available supply. Most public safety and special facilities are equipped with emergency generators.

Impact - Summer heat can cause widespread electrical outages resulting in dangerous conditions, especially for at-risk populations. Occasionally "cooling centers" are opened at community centers to provide a safe place for citizens to seek refuge from the heat. Extreme heat can have economic impacts if construction work is curtailed or outdoor special events are cancelled.

FLOOD

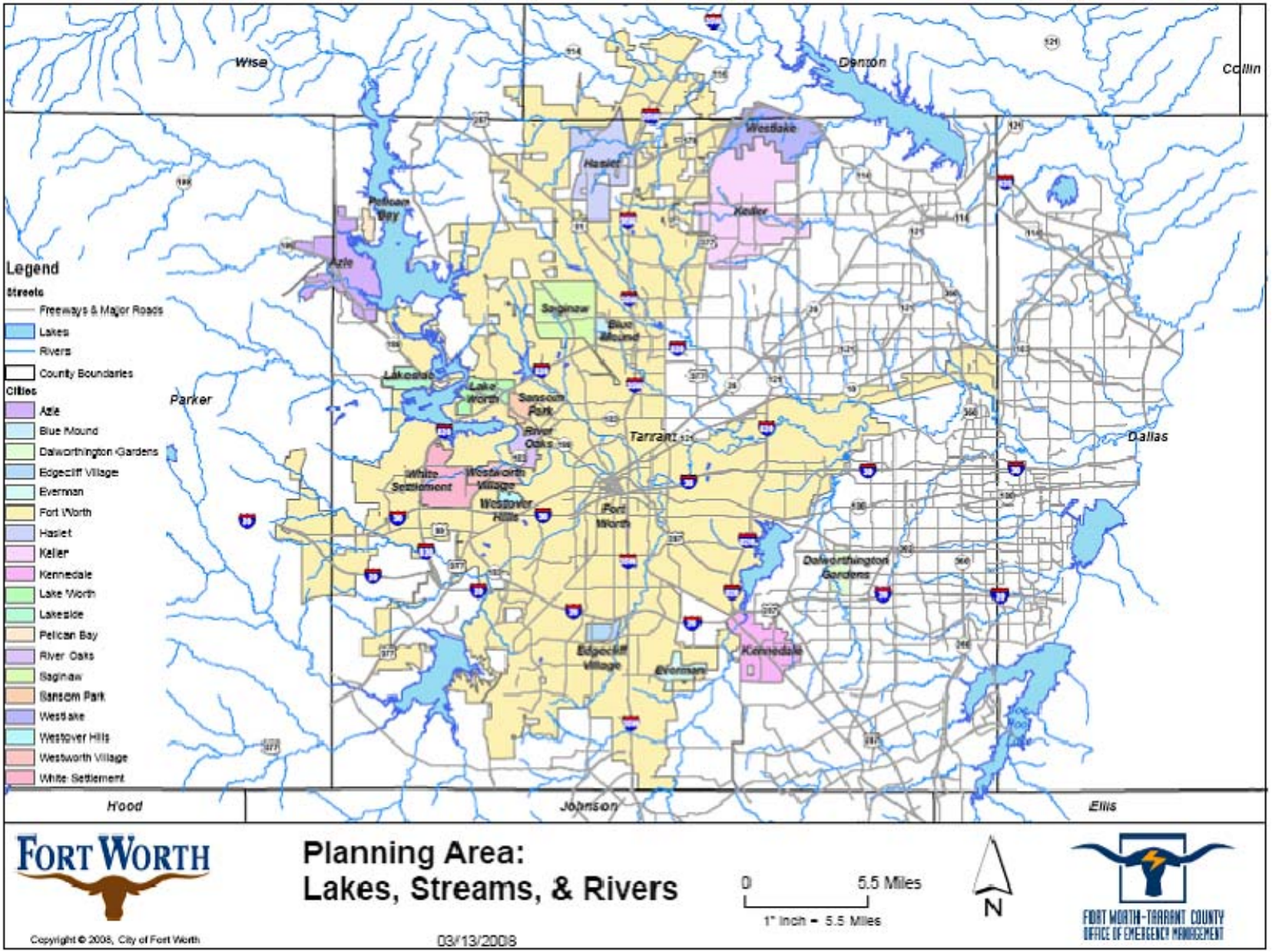
Flooding is an overflowing of water onto land that is normally dry. Flooding can also be defined as the accumulation of water within a water body and the overflow of excess water onto adjacent floodplain lands. A flash flood is a rapid rise of water along a stream or low-lying urban area. Flash flooding occurs within six hours of a significant rain event and is usually caused by intense storms that produce heavy rainfall in a short amount of time.

Location - Throughout the planning area along rivers, creeks, and drainage structures as well as flooding of lakefront property on Lake Worth. Flood plain maps for each participating jurisdiction are included in that jurisdiction's section of the plan. These maps are illustrative only and are included in the plan for FEMA review purposes. Detailed GIS maps and FEMA Flood Insurance Rate Maps are available for review by contacting the Fort Worth – Tarrant County Office of Emergency Management. Locations of recent flood events include:

- Schwartz Creek/Lebow Channel on the north side of the area
- Marine Creek on the northwest side of the area
- Mary's Creek on the west side of the area
- Big Fossil Creek on the far north side of the area
- Rush Creek on the east side of the area
- Chambers Creek on southeast side of the area

Extent – Flood incidents in the Planning Area can range from minor street flooding of three inches or more to seven feet in low-lying areas.

Flash floods are the most common type of flooding in the planning area. The flash floods tend to occur and recede very quickly. Flooding around Lake Worth can reach a depth of several feet in homes on the lake.


Wise
Denton
Collin
Parker
Tarrant
Dallas
Hood
Johnson
Ellis
Legend
Streets
Freeways & Major Roads
Lakes
Rivers
County Boundaries
Cities
Azle
Blue Mound
Dalworthington Gardens
Edgecliff Village
Everman
Fort Worth
Haslet
Keller
Kennedale
Lake Worth
Lakeside
Pelican Bay
River Oaks
Saginaw
Sansom Park
Westlake
Westover Hills
Westworth Village
White Settlement
Planning Area:
Lakes, Streams, & Rivers
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1" Inch = 5.5 Miles
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Previous Occurrences - Between 1993 and 2006 the National Weather Service reported approximately 155 flash flood events in the planning area. Minor flooding occurs frequently, especially during the spring and early summer. Recent significant events include:

- June 2000 - Rains of up to 11 inches fell in a few hours on far west portions of the planning area causing major damage to homes and streets.
- June 2004 - Significant flooding occurred in many other parts of the city following heavy rain. Homes, businesses, the zoo, and utilities were affected by the flooding. Some portions of the County received two separate "500-Year" rain events. Tarrant County declared a Local State of Disaster on June 9th and again on August 2nd primarily due to widespread flooding.
- June 2007 - Heavy rains damaged or destroyed several homes in far north portions of the planning area.

Probability of Future Events - There is a high probability of future flood events. Based on previous experience the planning area is certain to suffer flash flood events every year. National Weather Service records indicate an average of 11 flash flood events per year in Tarrant County. Continued development throughout the County and the resulting increase in impervious cover will increase the likelihood and severity of flooding.

Vulnerability - The topography of the planning area combined with the frequency of severe thunderstorms results in frequent flash flood events. There have been 17 deaths in the planning area due to flash flooding on roadways since 1986. There is a low risk of riverine flooding due to the presence of a well-maintained levee system. FEMA records indicate only 39 Repetitive Loss Properties in all of Tarrant County. However, this is probably more a reflection of the low number of flood insurance polices than vulnerability to flooding. Homes, businesses, roadways, and some special facilities are vulnerable to flood events in the planning area. Further analysis using GIS and field verification can specifically identify vulnerable structures.

Impact - Flash floods kill more people than any other hazard associated with thunderstorms. Property damage from flash flooding is seldom covered by insurance, which makes it very difficult for citizens to recover from the flood. Due to the very rapid rate of development and growth throughout the planning area we are experiencing problems with determining actual building footprints within flood plains and will be using planimetric GIS data from the NCTCOG to resolve this issue when it becomes available. At that time we will be able to accurately identify the number and types of buildings vulnerable to flooding; as well as access other data associated with those locations such as appraised value, census data, and owner information.

<u>HAILSTORM</u>

Hail is a form of precipitation that occurs when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere where they freeze into ice.

Location - Throughout the planning area.

Extent - Fort Worth is subject to the hazards of severe thunderstorms, including large hail. Hail stones up to the size of grapefruit (H9 on the Combined NOAA/TORRO Hailstorm Intensity Scales) have been reported in the planning area. (Please see Extent Scales Appendix)

Previous Occurrences - In 1980 a hailstorm struck the west side of the planning area with hailstones up to 4.5 inches in diameter causing $60 million in damages. Hail was reported to penetrated roofs of homes and cause damage to the interior of homes in southwest Fort Worth. Many vehicles received significant damage and numerous windows in buildings were broken.

On May 5th a supercell thunderstorm developed very rapidly over the planning area. The thunderstorm dropped very large hail and moved eastward into Dallas County. Mayfest, a festival held during the first week of May along the banks of the Trinity River in Fort Worth, was in the path of the storm and was subjected to baseball size hail. Damage caused by wind speeds up to 70 miles per hour, softball-size hail, and high-intensity rain caused this storm to be deemed the "costliest thunderstorm event in history" by the National Weather Service. The maximum rainfall intensity was almost 3 in. in 30 minutes. 109 people were injured by hail. Across the north central Texas area twenty lives were lost, and over $1 billion in damage was reported.

Probability of Future Events - There is a high probability of future large hailstorms. Thunderstorms with large hail are certain to continue to occur again in the planning area. Hail falls on about two or three days per year, ordinarily with only slight and scattered damage (*National Weather Service*).

Vulnerability - Severe thunderstorms and the associated hazard of large hail are a hazard event in the planning area. Tarrant County averages eleven significant thunderstorm events (large hail, high winds) per year according to National Weather Service records. Most structures in the planning area can resist the effects of all but the most severe hailstorms. The planning area does have a number of mobile and manufactured home parks which are more vulnerable to severe weather than site built structures. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to hailstorms. Vehicles have proven to be vulnerable to hailstorms with widespread severe vehicle damage reported in 1980 and 1995.

Impact - The impact from hailstorms can be significant in extreme events such as the hailstorms of 1980 and 1995. Thousands of homes and vehicles can be damaged in a single storm with millions of dollars in damages. Vehicles are especially impacted by large hails with windshields being the vulnerable part. A recurring problem following hailstorms is broken windshields in vehicles belonging to populations who do not have vehicle insurance and cannot afford the replacements costs, resulting in the owners having difficulty traveling to work, medical appointments, etc.

HIGH WINDS

Damaging winds are classified as those exceeding 50-60 mph from any source. In Fort Worth high winds are most often associated with severe thunderstorms and occasionally with a strong cold weather front in the spring or fall.

Location - Throughout the planning area.

Extent - Severe thunderstorms with high winds with speeds in excess of 90 mph have been reported in the planning area. (Please see Extent Scales Appendix)

Previous Occurrences – In June 2004 a squall line of thunderstorms moved across the planning area causing scattered light damage to structures and numerous electrical service interruptions.

Probability of Future Events - There is a high probability of future high winds events. Based on previous experience the planning area can expect to experience an average of ten significant high wind events in association with severe thunderstorms per year.

Vulnerability - Severe thunderstorms and the associated hazard of high winds are a common hazard in the planning area. Tarrant County averages ten reported significant thunderstorm events (large hail, high winds) per year. In addition, strong weather fronts can sometimes be accompanied by high winds which occasionally cause damage. Most structures in the planning area can resist the effects of all but the most severe high wind events. The planning area does have a number of mobile and manufactured home parks which are more vulnerable to severe weather than site built structures. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to high winds.

Impact - Records on high wind events are difficult to separate from severe thunderstorm records. High winds in the planning area typically cause little damage to commercial buildings. More often high winds cause damage to roofs, trees, and signs.

LANDSLIDE

A landslide is the movement of a mass of earth or rock from a higher elevation to a lower level under the influence of gravity.

Location - Along road cuts in the planning area's west and northwest areas. On the southeast side of Lake Worth near Inspiration Point.

Extent - A landslide could result in objects below being covered by several feet of dirt and rocks. (Please see the Extent Scale Appendix)

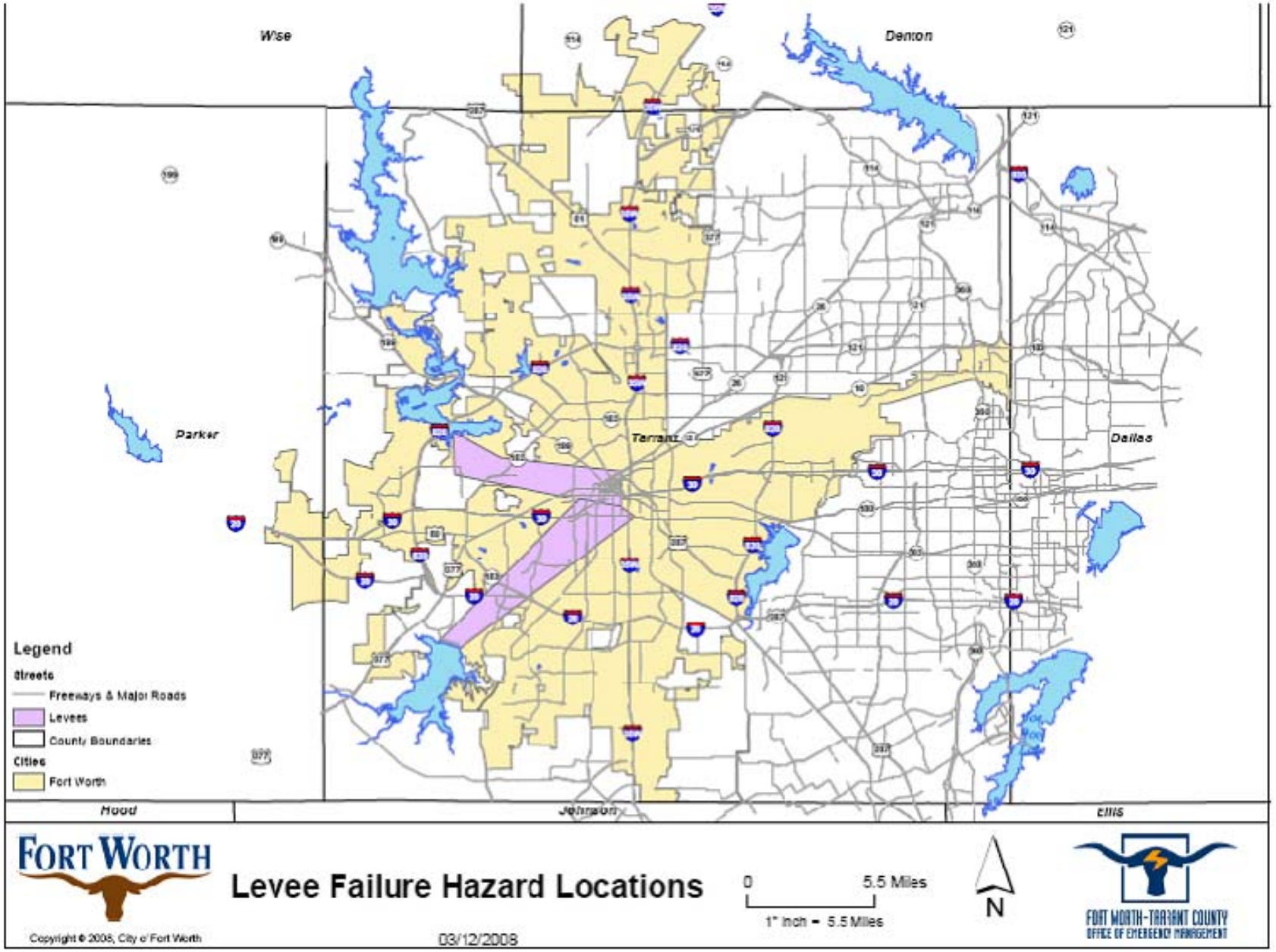
Previous Occurrences - In 2001 a road cut on Vickery Blvd., east of Southwest Blvd. developed a cavity and was in danger of collapsing onto Vickery Blvd., potentially

blocking a major roadway and a railway. Transportation & Public Works staff mitigated the problem before damage occurred.

Probability of Future Events – There is a low probability of future landslides. The exact probability is difficult to determine with a limited history or previous events.

Vulnerability - Other than infrequent slumping along highways at overpasses, there is no history of landslides in the planning area. However, there are areas that may be susceptible to landslides.

Impact - A landslide could block roadways and railways as well as damaging structures and infrastructure.


Wise
Denton
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Dallas
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Legend
Streets
Freeways & Major Roads
Levees
County Boundaries
Cities
Fort Worth
FORT WORTH
Levee Failure Hazard Locations
0
5.5 Miles
1" inch = 5.5 Miles
N
FORT WORTH-TARRANT COUNTY
OFFICE OF EMERGENCY MANAGEMENT
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03/12/2008

LEVEE FAILURE

A levee failure is an accidental or unintentional collapse, breach, or other failure of a levee that results in downstream flooding.

Location - Along the Clear Fork of the Trinity River in the southwest portions of the planning area and along the West Fork of the Trinity River on the west side of the planning area. Please see attached map. Additional information about specific areas that might be affected by a levee failure is included in the Fort Worth and Westworth Village sections of the plan.

Extent - If the levees failed during a flood event water could reach 10 feet in depth in homes.

Previous Occurrences - In 1949 a levee failure exacerbated the effects of a flood on the Clear Fork of the Trinity River that had backed up the channel of the West Fork.

Probability of Future Events - There is a low probability of future levee failures. It is very unlikely that the levees will fail based on the design of the levees (designed for a 500 year flood event) and the excellent maintenance they receive.

Vulnerability - There are levees protecting some areas of the planning area. The levees are maintained by the Tarrant Regional Water District. The levees are designed to protect against a 500 year flood event and are extremely well maintained.

Impact - A levee failure would destroy homes, roadways, infrastructure, and businesses.

LIGHTNING

Lightning is a gigantic electrostatic discharge (the same kind of electricity that can shock you when you touch a doorknob) between the cloud and the ground, other clouds, or within a cloud. Lighting is generated by the buildup of charged ions in a thundercloud, and the discharge of a lightning bolt interacts with the best conducting object or surface on the ground. The air channel of a lightning strike reaches temperatures higher than 50, 000 degrees Fahrenheit. The rapid heating and cooling of the air near the channel causes a shock wave, which produces thunder.

Location - Throughout the planning area.

Extent - We could find no references to the average number of strikes per storm in the planning area. However, lightning is by definition associated with thunderstorms. (Please see Extent Scales Appendix)

Previous Occurrences – The planning area experiences 30 – 50 thunderstorm days per year. From 1995 – 2004 one person was killed and five were injured by lightning in Tarrant County (*National Weather Service*). Throughout Texas 34 people were killed

by lightning, there were 184 injuries, and an estimated 23 million dollars in damages due to lightning from 1995 - 2004 (*National Weather Service*).

Probability of Future Events - There is a high probability of future occurrences of lightning. Based on past experience the planning area will experience 30 – 50 thunderstorm days each year. Some days will have more than one thunderstorm during a given thunderstorm day.

Vulnerability – Everyone in the planning area is vulnerable to lightning. People who are outside are much more vulnerable. The most vulnerable groups include people attending outdoor sporting events, athletes at outdoor events, and people who work outdoors. All structures are vulnerable to lightning. Commercial structures and critical infrastructure facilities are generally better protected from lightning than residences.

Impact - Although lightning is the second most common cause of storm related deaths in Texas, lightning deaths remain relatively rare. Lightning does cause property damage several times per year (we could not find statistical data to validate this observation).

SEVERE THUNDERSTORM

A severe thunderstorm contains one or more of the following: hail three-quarter inch or greater, winds gusting in excess of 50 knots (57.5 mph), tornado.

Location - Throughout the planning area.

Extent - Fort Worth is subject to the hazards of severe thunderstorms of all magnitudes.

Previous Occurrences -

- May 1980 – Severe thunderstorm with large hail caused widespread damage on the west and southwest portions of the planning area. Hailstones were reported to have crashed through roofs and ceilings into homes in the Wedgwood neighborhood.
- May 1995 – Severe thunderstorm with large hail resulting in over 200 injuries and over $1 billion in damages. Storm is cited by the Weather Channel as the “most expensive thunderstorm in US history”.
- March 2000 – Tornado moved through the west side of the planning area into the downtown area resulting in two deaths, 100 injuries, $500 million in damages, and a Presidential Disaster Declaration. Flash floods resulted in two additional deaths. Large hail caused one death.
- June 2000 – Rainfall amounts up to 11 inches fell in far west portions of the planning area causing a flash flood. The flood resulted in a Small Business Administration Disaster Declaration.
- April 2002 – Tornado moved through the Carver Heights East and Handley neighborhoods causing few injuries but an estimated $5 million in damages.
- June 2004 – Severe thunderstorms caused widespread loss of electrical service (largest in the history of Texas Utilities) with some residents without electrical service for 9 days, flash floods, and numerous trees downed in streets.

- June 2004 – Additional heavy rains ("500 year" rain event in northwest portions of the County) resulted in additional flash floods as well as flooded homes around Lake Worth.
- July 2004 – Severe thunderstorms and heavy rains ("500 year" rain event in southeast portions of the planning area) caused flash floods.
- July 2007 – Heavy rains caused flooding in far north portions of the planning area damaging homes and roadways.

Probability of Future Events - There is a high probability of future severe thunderstorms. Severe thunderstorms will occur in the planning area an average of eleven times per year.

Vulnerability - Severe thunderstorms are the most common hazard in the planning area. From 1950 through August 2007 Tarrant County averaged eleven reported severe thunderstorm events county-wide per year. Most structures in the planning area can resist the effects of all but the most severe thunderstorms. The planning does have a number of mobile and manufactured home parks which are more vulnerable to severe weather than site built structures. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to thunderstorms.

Impact - A single severe thunderstorm can cause damage from hail, high winds, lightning, and/or tornadoes to thousands of structures.

SEVERE WINTER STORM

A severe winter storm is a blizzard, heavy snowfall, heavy sleet, extreme cold and/or ice storm that causes adverse effects.

Location - Throughout the planning area.

Extent – Most severe winter storms leave only a light coating or glaze of ice.
- Severe ice storms have resulted in accumulations in excess of two inches,
- The coldest temperature recorded in Fort Worth was -8 degrees Fahrenheit
- The greatest one day snowfall was 7.8 inches

Previous Occurrences - Severe Winter Storms are typically regional events. The planning area averaged two winter storms per year since 2000. Most winter storms resulting only minor inconveniences and a few motor vehicle accidents.

In 1978 up to an inch of ice coated area trees and roadways causing $14 million in damages region-wide and making travel almost impossible for two days.

In 1996 a winter storm dropped two to four inches of a mixture of sleet, freezing rain, and snow in the planning area over Thanksgiving weekend causing many motor vehicle accidents and some electrical service outages.

In 2003 a winter storm dropped one inch of sleet across the planning area resulting in numerous motor vehicle accidents and closing schools for two days.

Probability of Future Events – There is a high probability of future severe winter storms. The planning area can expect to experience two winter storms per year with a severe winter storm once each ten years.

Vulnerability - Since 2000 the National Weather Service has reported 14 Winter Storm/Ice events. Winter storms in the planning area usually consist of short-lived icing events (ice on the roads for a few hours) that primarily affect traffic and cause numerous motor vehicle accidents. Occasionally an ice storm will cause widespread power outages for as long as several days. ONCOR Electric Delivery has an aggressive tree trimming program. Most structures in the planning area can resist the effects of all but the most severe winter storms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to winter storms. Electrical service outages are usually the most serious threat in this area. Most public safety and special facilities are equipped with generators.

Impact - Winter storms can cause widespread electrical and telephone service outages, make travel dangerous or impossible, and damage structures. Deaths and injuries due to vehicle accidents and slips/falls are common during ice storms. Occasional deaths and injuries from carbon monoxide poisoning due to improper heating have occurred. Economic losses due to lost production can be significant. Damage from frozen pipes can lead to significant expenses for homeowners.

STREAM BANK EROSION

The removal of soil from stream banks by the direct action of stream flow and/or wind/wave action typically occurring during periods of high flow.

Location - Along creeks throughout the planning area. Creeks of particular concern for stream bank erosion are:

- Schwartz Creek/Lebow Channel on the north side
- Marine Creek on the northwest side
- Mary's Creek on the west side
- Big Fossil Creek on the far north side

Extent - Stream banks can erode several feet during a single flood event.

Previous Occurrences - Minor flooding associated erosion occurs frequently, especially during the spring and early summer. Flood events on 2000, 2004, and 2007 caused some erosion on stream banks on west and north portions of the planning area.

Probability of Future Events – There is a high probability of future stream bank erosion. The planning area is certain to experience stream bank erosion in the future. Continued development and the resulting impervious cover will increase the likelihood and severity of flooding and associated erosion. It is likely that flooding will cause some damage in the next five years.

Vulnerability - Some homes, businesses, and roadways are vulnerable to stream bank erosion. Most buildings are a safe distance from the current path of the creek. Further analysis using GIS and field verification can specifically identify vulnerable structures.

Impact - Extreme stream bank erosion could destroy homes, businesses, and/or roadways. Roadway damage can restrict access for emergency responders, home/business owners and cause minor to major inconveniences to for drivers.

TORNADO

A tornado is a violently rotating column of air extending from a thunderstorm to the ground.

Location - Throughout the planning area.

Extent – The planning area is subject to tornadoes of all magnitudes, including F5 tornadoes. (Please Extent Scales Appendix)

Previous Occurrences - A tornado on March 28, 2000 caused significant damage in the west side and downtown areas of the planning area killing two people, resulting in a Presidential Disaster Declaration. On April 16, 2002 a tornado struck the Carver Heights East neighborhood causing several minor injuries and $5 million in damages.

Probability of Future Events – There is a high probability of future tornadoes. The planning area has averaged one reported tornado per year and we can expect that average to continue.

Vulnerability - All structures in the planning area are vulnerable to tornadoes. The planning area has a number of mobile and manufactured home parks that are particularly vulnerable to tornadoes. Very few structures can withstand the effects of an F5 tornado. However, the March 28, 2000 F3 tornado that struck Fort Worth provided good evidence that well built structures can protect people who take appropriate shelter inside those buildings.

Impact - Tornadoes can cause deaths, injuries and property damage/destruction. Special facilities such as hospitals, fire stations, and utilities can be damaged or destroyed. Citizens who live in neighborhoods struck by tornadoes can experience disruption of their life styles and traditions. Areas struck by tornadoes can experience increased demand for mental health services as people deal with grief and stress.

WILDFIRE

A wildfire is any fire occurring on grassland, forest, or prairie, regardless of ignition source, damages or benefits. According to the 2000 National Fire Plan, authorities now consider the wildfire risk as “the most significant fire service problem of the Century.” Wildfires are fueled almost exclusively by natural vegetation. Interface or intermix fires are urban/wildfires in which vegetation and the built-environment provide fuel.

Location - The areas of most concern are:

- Lake Worth Nature Refuge in northwest area
- Far southwest areas (Developing Area)
- Far north areas (Developing Area)
- Far west areas (Developing Area)

Access to fight wildfires in these areas is often difficult due to thick trees and undergrowth, semi-swampy terrain, and lack of roads.

Extent – Wildfire can affect areas ranging from less than an acre to several hundred acres.

Previous Occurrences - December of 2005 was the most recent significant wildfire occurrence. Fires in the rural-urban interface in Kennedale, Mansfield, and Arlington resulted in the loss of several homes. Since 2000 there have also been significant wildfires in unincorporated Tarrant County, Fort Worth, and Keller.

Probability of Future Events - There is a high probability of future wildfires. Wildfires are likely to occur annually and increase in frequency and severity as the population continues to increase and formally rural areas are developed.

Vulnerability – The planning area has a significant amount of rural-urban interface that is subject to wildfires. Homes are most vulnerable to wildfires. The tendency to locate homes on tree covered lots and lack of fire breaks (such as parking lots around businesses) can enable fires to spread more easily to homes. Special facilities tend to be less vulnerable due to construction type (brick or metal).

Impact - Wildfires can result in the need for rapid evacuations, casualties, loss of homes and businesses, and loss of wildlife habitat and recreational areas.

**Probability of Future Events**

The probability of future events is as stated for each hazard. If a specific probability is not known; hazards are rated as high, medium, low, or undetermined (as defined below).

High – Likely to occur within three years
Medium – Likely to occur within seven years
Low – Likely to occur 10 years
Undetermined – Insufficient data to determine a probability

**Additional Jurisdictional Risk Information**

More information about the risks specific to each jurisdiction are identified and discussed in each jurisdiction's portion of this plan and summarized in the Summary of Vulnerability by Jurisdiction table below.

Future versions of this plan will address technological hazards such as truck routes, railways, pipelines, and underground storage tanks. A new activity worth further analysis

is the drilling of natural gas wells in the planning area. Over 1,000 natural gas wells are expected to be drilled through the year 2010.

## ASSESSING VULNERABILITY

Each jurisdiction participating in this plan has assessed the unique and varied vulnerabilities and their impact. Vulnerabilities specific to each jurisdiction are identified and discussed in the jurisdiction's portion of this plan and summarized in the Summary of Vulnerability by Jurisdiction table below.

**Summary of Vulnerability by Jurisdiction**

| | Dam Failure | Drought | Expansive Soil | Extreme Heat | Flood | Hailstorm | High Winds | Landslides | Levee Failure | Lightning | Severe Thunderstorm | Severe Winter Storm | Stream Bank Erosion | Tornado | Wildfire |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tarrant County (Unincorporated) | L | M | L | H | H | M | M | - | - | M | H | M | - | H | M |
| Azle | - | M | L | H | H | M | M | - | - | M | H | M | M | H | M |
| Blue Mound | - | M | L | H | L | M | M | - | - | M | H | M | - | H | L |
| Dalworthington Gardens | - | M | L | H | H | M | M | - | - | M | H | M | M | H | L |
| Edgecliff Village | - | M | L | H | H | M | M | - | - | M | H | M | M | H | L |
| Everman | - | M | L | H | H | M | M | - | - | M | H | M | M | H | M |
| Fort Worth | L | M | L | H | H | M | M | L | L | M | H | M | L | H | M |
| Haslet | - | M | L | H | H | M | M | - | - | M | H | M | - | H | M |
| Keller | - | M | L | H | H | M | M | - | - | M | H | M | M | H | M |
| Kennedale | - | L | L | H | H | M | M | - | - | M | H | M | M | H | M |
| Lakeside | - | M | L | H | H | M | M | - | - | M | H | M | - | H | M |
| Lake Worth | U | L | L | H | H | M | M | - | - | M | H | M | - | H | M |
| Pelican Bay | - | L | L | H | H | M | M | - | - | M | H | M | - | H | M |
| River Oaks | - | M | L | H | H | M | M | - | - | M | H | M | - | H | L |
| Saginaw | - | M | L | H | H | M | M | - | - | M | H | M | - | H | M |
| Sansom Park | - | L | L | H | H | M | M | - | - | M | H | M | - | H | L |
| Westlake | L | M | L | H | H | M | M | - | - | M | H | M | - | H | M |
| Westover Hills | - | M | L | H | H | M | M | - | - | M | H | M | M | H | L |
| Westworth Village | U | M | L | H | H | M | M | L | L | M | H | M | - | H | L |
| White Settlement | - | L | L | H | H | M | M | - | - | M | H | M | M | H | M |

**-** Indicates that the hazard is not found in this jurisdiction.
**L** Low likelihood or little damage potential (minor damage to less than 5% of the jurisdiction or unlikely to occur).
**M** Moderate likelihood or moderate damage potential (causing partial damage to 5% - 10% of the jurisdiction or infrequent occurrence).
**H** High likelihood or major damage potential (destructive event or damage to more than 10% of the jurisdiction or regular occurrence).
**U** Undetermined Vulnerability

Where the information is available, Types & Numbers of Existing Buildings, Infrastructure, and Critical Facilities, Potential Dollar Losses, and Land Use and Development Trends are discussed in each participating jurisdiction's section where

applicable and available. Efforts are underway to develop a comprehensive listing of this data on a county-wide basis using a GIS based system.

## MITIGATION STRATEGIES

*"Mitigation is the effort to reduce loss of life and property by lessening the impact of disasters. It creates safer communities by reducing loss of life and property damage. It lessens the financial impact on individuals, communities, and society as a whole." (FEMA Website)*

Our primary mitigation goal is to reduce the loss of life and property by assessing hazards and taking steps to reduce vulnerabilities. All participating jurisdictions agree to and adopt the following mitigation goals and objectives.

Our Specific goals and accompanying objectives are:

1. Reduce the adverse effects of flood events.
   Objectives:
   a. Remove structures from flood prone areas.
   b. Reduce the number of low water crossings.
   c. Develop effective flood mitigation public education materials.

2. Reduce loss of life and property damage resulting from severe weather events.
   Objectives:
   a. Encourage storm resistant construction.
   b. Improve warning of citizens about severe weather.
   c. Enhance public education concerning severe weather preparedness.

3. Reduce the effects of wildfire events.
   a. Enhance public preparedness education concerning wildfire mitigation.
   b. Encourage reduction of fuel buildup near structures.

4. Increase the effectiveness of warning systems.
   Objectives:
   a. Increase the number of homes and businesses with Weather Alert Radios.
   b. Improve public education on hazards and warning systems.
   c. Educate the public about hazards.

5. Identify and implement hazard mitigation projects to reduce the impact of hazard events and disasters.
   Objectives:
   a. Conduct annual hazard identification survey.
   b. Conduct annual vulnerability assessment.
   c. Identify and implement mitigation feasible projects.

## EXISTING HAZARD MITIGATION EFFORTS

Existing hazard mitigation efforts are identified in each jurisdiction's section of this plan. Following is a list of some ongoing hazard mitigation projects in the planning area.

- Public Education – The Fort Worth - Tarrant County Office of Emergency Management provides public emergency preparedness education programs throughout the County.
- KnowWhat2Do is a regional public education campaign coordinated by Fort Worth – Tarrant County Office of Emergency Management staff designed to complement existing Red Cross and National Weather Service public education programs. KnowWhat2Do received a Public Education Award in 2007 from the International Association of Emergency Managers.
- Public Education – The Tarrant County Radio Amateur Radio Emergency Services SkyWarn Severe Weather Spotter Training coordinated by Fort Worth – Tarrant County Office of Emergency Management staff is open to the public and conducted on the last Saturday of each January.
- Park Land in Flood Prone Areas – Marine Creek Linear Park is an example; a flood prone creek was converted into a linear park by purchasing all property along the creek, converting low-water street crossings into cul-de-sacs and park access parking areas, and installing a hike/bike trail. This park is an excellent example of a mitigation project that reduces flood casualties and property losses and improves the quality of life in the park vicinity.
- Park Land in Flood Prone Areas – Fort Worth has begun converting another flood prone creek into a linear park. The City has been purchasing property and conducting planning to create a linear park similar to Marine Creek Park.
- Outdoor Warning Systems – Several of the cities participating in the Fort Worth Hazard Mitigation Action Plan have outdoor warning systems (sirens). The systems are most commonly used to warn residents of severe weather, but can also be used to provide warning of hazardous material releases or any other incident in which citizens should go indoors and tune to local TV/Radio Stations for more information.
- Tarrant Regional Water District – Tarrant Regional Water District has been in existence since 1922. As owner and operator of four flood control reservoirs, the Fort Worth Floodway, a 78-mile parallel raw-water supply pipeline along with utilization of three terminal storage reservoirs, hazard mitigation is an integral part of daily operations. Some of the many hazard mitigation/controls in place to stabilize hydrologic risks are:
  - Dam safety policies and evaluations.
  - Studies and models of the Floodway and reservoir operations.
  - Protection of natural resources.
  - Public education and awareness activities.
  - Structural and stream bank rehabilitation projects.
- Tarrant Regional Water District is also involved in the study that Halff Associates is currently conducting, in an effort to update Flood Insurance Rate Maps (FIRMs) and flood data, in order to produce GIS-based digital FIRMs to assist with development in flood prone areas, emergency response, and planning/design throughout the County. It is certain that the new maps will produce changes in delineation of the flood hazard areas in Tarrant County.

- The Fort Worth - Tarrant County Office of Emergency Management has been working to develop a County-Wide GIS based tool that would identify:
  - Properties in the 100 year flood plain
  - Buildings in the 100 year flood plain
  - Special facilities in the 100 year flood plain
  - Locations of flood damage reports
  - Historically flood prone areas
  - Dam Failure Inundation Areas
  - Creek Water Sheds

  The GIS tool will be able to generate GIS layers that can be combined with other layers such as zoning, development trends, etc for analysis. The tool could also be used for analysis of other hazards such as tornado tracks, thunderstorm downburst events, etc.

**PRIORITIZATION OF MITIGATION ACTIONS**

The Tarrant County Hazard Mitigation Team and participating jurisdictions have reviewed, approved, and prioritized the actions in this plan. While the Tarrant County Hazard Mitigation Team has no authority to approve or disapprove any jurisdiction's mitigation actions, all participating jurisdictions understand the value of the Team's support and the need to ensure that mitigation actions are coordinated among with concerned/affected parties.

The Mitigation Planning Team prioritized our mitigation actions using the STAPLE+E criteria, a planning tool used to evaluate alternative actions. Following is an explanation of the STAPLE+E criteria:

**S** Social - Mitigation actions are acceptable to the community if they do not adversely affect a particular segment of the population, do not cause relocation of lower income people, and if they are compatible with the community's social and cultural values.

**T** Technical - Mitigation actions are technically most effective if they provide long term reduction of losses and have minimal secondary adverse impacts.

**A** Administrative - Mitigation actions are easier to implement if the jurisdiction has the necessary staffing and funding.

**P** Political - Mitigation actions can truly be successful if all stakeholders have been offered an opportunity to participate in the planning process and if there is public support for the action.

**L** Legal - It is critical that the jurisdiction or implementing agency have the legal authority to implement and enforce a mitigation action.

**E** Economic - Budget constraints can significantly deter the implementation of mitigation actions. Hence, it is important to evaluate whether an action is cost-effective, as determined by a cost benefit review, and possible to fund.

**E** Environmental - Sustainable mitigation actions that do not have an adverse effect on the environment, that comply with Federal, State, and local environmental regulations, and that are consistent with the community's environmental goals, have mitigation benefits while being environmentally sound.

Based on the criteria above, actions were assigned a High, Moderate, or Low priority according to the following definitions:
High Priority – Action should be implemented as soon as possible. This action will immediately reduce the risk to life and property. Vulnerability will be reduced. Community and political support is high. Funding is available.
Medium Priority – Action should be implemented in the near future. Lives and property will be protected. Community and political support is high. Funding may be available.
Low Priority – Action should be implemented over the long term. Cost of the project may render it unfeasible. There may be political, historical, or environmental issues.

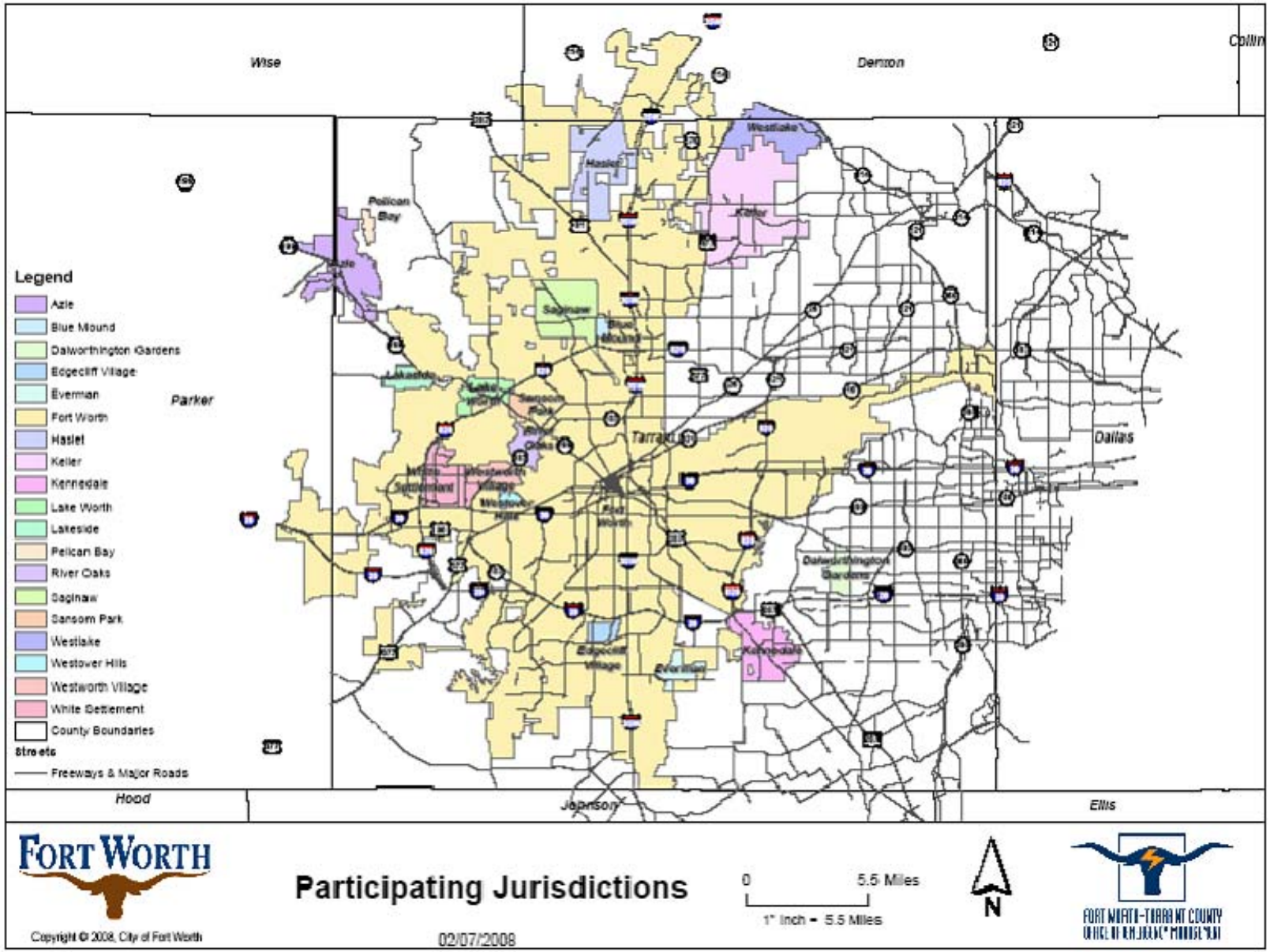
**COST-BENEFIT ANALYSIS**
Only a general cost-benefit analysis was considered in the process of selecting and prioritizing mitigation actions for each jurisdiction. For most of the projects selected, a quantitative analysis would be impossible. For example, how do you measure the value of lives saved due to better warning or use of safe rooms?

The relative merits and potential costs of many projects were discussed. Projects of all sizes and types were considered. One element considered in addition to the STAPLE+E method was feasibility. Many of our participating jurisdictions are relatively small and have limited resources. The ability to successfully implement a project and demonstrate its benefits is important ion that it will foster support for more and larger projects.

Through the planning process a number of projects emerged as being both cost effective and beneficial to the community. Some of those projects were adopted by many, if not all, of the participating jurisdictions as their action items.

As stated above we used the STAPLE+E tool to prioritize our mitigation actions and assigned a priority of High, Medium, or Low to each action. Mitigation actions with a high priority were those determined to be the most cost effective and/or most compatible with each jurisdiction's unique needs. A more detailed cost-benefit analysis will be applied to specific projects as this plan and process matures, or as part of the mitigation grant application process.

**IMPLEMENTATION & ADMINISTRATION OF ACTIONS**
All actions will be implemented, coordinated, and administered by the jurisdiction in which the project is being conducted. Support will be provided by the Fort Worth - Tarrant County Office of Emergency Management upon request by individual jurisdictions. The Tarrant County Hazard Mitigation Team will assist with coordination of any action upon request by any participating jurisdiction. The Team will take an active role in the coordination of actions which may have inter-jurisdictional impacts such as flood mitigation.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Everman
Fort Worth
Haslet
Keller
Kennedale
Lake Worth
Lakeside
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River Oaks
Saginaw
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Westlake
Westover Hills
Westworth Village
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FORT WORTH-TARRANT COUNTY

# Tarrant County - Unincorporated Areas

Jurisdiction Profile

Tarrant County has an area of 897.6 square miles and a NCTCOG 2007 population estimate of 1,745,050. Temperatures range from an average low of 35° F in January to an average high of 96° in July. Rainfall averages a little more than thirty-two inches per year, and the growing season extends for 230 days.

Tarrant County is an urban county with Fort Worth serving as the county seat and is one of the fastest growing urban counties in the United States today. Tarrant County consists of gently sloping to level terrain with elevation ranging from 420 feet in the southeast to 960 feet in the northwest. The Trinity River is the major watercourse and flows from the northwest to the southeast across the county, with the Clear Fork and the West Fork draining the western half and other smaller tributaries draining the eastern half. Major lakes in the county include Arlington, Benbrook, Eagle Mountain, Grapevine, and Lake Worth. Four natural regions are found from east to west: the Blackland Prairie in the southeast is a rolling grassland with rich clayey and loamy soil, the Eastern Cross Timbers is made up of deep loamy soil that supports blackjack oak and post oak, the Grand Prairie has shallow, clayey soil and alternating layers of limestone and marl, and the Western Cross Timbers has very shallow to deep loamy and clay soils that support shinnery oak and post oak. Hardwoods such as American elm, pecan, and box elder are found throughout most of the county along rivers and creeks. Mineral resources are sand, gravel, stone, and natural gas.

Total Tarrant County Population (NCTCOG)
(Estimate for unincorporated area population only is not available)

| 1990 | 2000 | 2006 | 2007 |
|---|---|---|---|
| 1,170,103 | 1,446,219 | 1,706,300 | 1,745,050 |

County Point-Of-Contact

Keith Wells, Assistant Emergency Management Coordinator, Fort Worth - Tarrant County Office of Emergency Management.

Land Use & Development

Tarrant County has been described as having more undeveloped land than any other urban county in the United States. The county's population is increasing rapidly and is expected to surpass 2.2 million by 2030. Land previously used for agriculture is rapidly being converted to more urban uses with the accompanying problems such as increases in impervious cover and storm water runoff. Development trends include substantial increases in residential and commercial areas as well as light to medium industry.

Jurisdiction Unique Hazards

Hazards in unincorporated areas of Tarrant County are discussed below.

**DAM FAILURE**

Low Vulnerability – The Texas Commission of Environmental Quality has identified two High Hazard Dams in unincorporated southeast Tarrant County. Both dams are co-located balancing reservoirs on a water supply pipeline owned and operated by the Tarrant Regional Water District. These dams are well maintained and monitored. Implementing the Mitigation Actions in this plan will provide validation of our low vulnerability assessment or indicate the need to revise our assessment.

Location – The two known High Hazard Dams in Tarrant County are located in southeast Tarrant County near the City of Everman (please see maps: *High Hazard Dams in Tarrant County* and *High Hazard Dams in Unincorporated Tarrant County*). However, pending completion of inundation studies it is not clear if Tarrant County could be affected by the failure of High Hazard Dams in other jurisdictions.

| Location | Dam Name | Latitude | Longitude | River/Stream |
|---|---|---|---|---|
| Tarrant County | East Balancing Res. Dam | 32.618506 | -97.203333 | Village Creek |
| Tarrant County | West Balancing Res. Dam | 32.620000 | -97.208333 | Village Creek |

Some areas that could be affected by failure of each dam are identified below. Inundation studies to identify specific areas that would be affected are Tarrant County Dam Failure Mitigation Action #1 below.

| Dam Name | Potentially Affected Areas |
|---|---|
| East and West Balancing Reservoirs | Other than to the north, the area surrounding the reservoirs is undeveloped. A few homes and businesses could be impacted by a dam failure. |

Extent – There have been no reports of dam failures in Tarrant County.

Previous Occurrences – There have been no reports of dam failures in Tarrant County.

Probability of Future Events – The probability of future events is difficult to predict based on the lack of previous occurrences. There is some concern that farm ponds are being converted to park lakes and detention structures in newly developing areas without proper engineering reviews.

Impact – Failure of a high hazard dam has the potential to cause significant damage to urban structures, main highways, and utilities, as well as potential to cause loss of life (Natural Resources Conservation Service). Infrastructure could be damaged and rendered unusable for extended periods of time.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Tarrant County Dam Failure Mitigation Action #1** | Conduct Inundation Studies and develop Emergency Action Plans for all High Hazard Dams in unincorporated Tarrant County. |

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| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events.<br>1. a. Remove structures from flood prone areas |
| **Priority** | Medium |
| **Estimated Cost** | $80,000 ($40,000 for each of two dams) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Dam Owner |
| **Potential Matching Funding Sources** | • County Funds<br>• Dam Owner |
| **Responsible Agency** | • Tarrant County Transportation Service Department (County Engineer)<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will identify areas that should be excluded from development and plan for emergency response should the dam fail. |
| **Effect on Existing Buildings** | This action will identify existing buildings that may be subject to inundation should a dam failure occur, and develop plans for emergency response should the dam fail. |
| **Cost Effectiveness** | Cost Effective - Dam failures tend to be low probability/high consequence events. The relatively low cost of conducting these studies and developing plans compared to the potential benefits in terms of lives saved and property protected make this project cost effective. |
| **Discussion:** Inundation studies of high hazard dams will provide data necessary to assess the vulnerability of downstream people and structures. Vulnerable structures and infrastructure can be identified and relocated or protected as necessary. Emergency Action Plans will provide the framework necessary to protect lives and property should the dam fail. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Tarrant County Dam Failure Mitigation Action #2** | Coordinate results of existing inundation studies for all high hazard dams that could affect Tarrant County. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events.<br>1. a. Remove structures from flood prone areas |
| **Priority** | Medium |
| **Estimated Cost** | $25,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Dam Owners |
| **Potential Matching Funding Sources** | • County Funds<br>• Dam Owners |

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| **Responsible Agency** | • Tarrant County Transportation Service Department (County Engineer)<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This action will potentially identify areas that should be excluded from development. |
| **Effect on Existing Buildings** | This action will identify existing buildings that may be subject to inundation should a dam failure occur. |
| **Cost Effectiveness** | Cost Effective - Dam failures tend to be low probability/high consequence events. The low cost of coordinating these studies compared to the potential benefits in terms of lives saved and property protected make this project cost effective. |
| **Discussion:** There have been inundation studies of some high hazard dams that could affect Tarrant County, including dams outside of the County. Coordination of the results of existing inundation studies for high hazard dams that could affect jurisdictions in Tarrant County will provide a more realistic analysis of the effects of a dam failure on the County. It is likely that this action will result in recognition of the need to complete inundation studies of all high hazard dams in the region. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Tarrant County Dam Failure Mitigation Action #3** | Conduct a search for previously unidentified High Hazard Dams county-wide. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events.<br>1. a. Remove structures from flood prone areas.<br><br>2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | $20,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Dam Owners |
| **Potential Matching Funding Sources** | • County Funds<br>• Dam Owners |
| **Responsible Agency** | Fort Worth - Tarrant County OEM |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will potentially identify new hazard areas that should be excluded from development. |
| **Effect on Existing Buildings** | This action will potentially identify existing buildings that may be subject to inundation should a dam failure occur. |

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| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of locating previously unknown High Hazard Dams. |
| **Discussion:** As the County continues to grow there is concern that farm pond dams are being converted to park dams or housing development detention structures without proper engineering review. This project will conduct a search for previously unknown High Hazard Dams. Any dams located can then be evaluated for safety and vulnerable populations, structures, or infrastructure below the dams. | |

**DROUGHT**

Moderate Vulnerability - Almost all water supplies in Tarrant County are surface water and thus subject to drought. Citizens living in unincorporated areas of the County rely a combination of well water, water from small water systems, and city owned water systems for their water supply. All are vulnerable to drought. Cities throughout Tarrant County are working with residents and businesses to reduce water consumption.

Most cities in Tarrant County purchase water from the Tarrant Regional Water District (TRWD). TRWD water supply comes from three reservoirs on the West Fork of the Trinity River in northwest Tarrant County and from two reservoirs located well southeast of Tarrant County. These diverse supply locations help mitigate the effects of a local drought. An additional reservoir location well northeast of Tarrant County is being pursued. There has been some preliminary discussion of constructing a pipeline to carry water from southern Oklahoma.

TRWD is installing pipelines to interconnect area water supply lakes with water treatment plants in order to provide maximum flexibility in water supply and treatment.

Location – Drought can affect all of Tarrant County.

Current Extent – As of February 2008, Tarrant County was at DO – Abnormally Dry on the Palmer Drought Severity Index.

Previous Occurrences – National Climatic Data Center records indicate that in the past ten years there have been three periods of drought in Tarrant County, 1996 - 1998, 2000, and 2005 - 2006.

Probability of Future Events – Droughts are certain to occur again in Tarrant County. Significant droughts significantly affecting water supply and resulting in mandatory restrictions traditionally occur on a twenty year cycle. Based on the previously cited National Climatic Data Center recent records, we can anticipate that drought conditions will occur approximately every three years.

Impact – Drought can lead to loss of water for basic needs such as drinking and fire-fighting. Droughts are associated with increased wildfire and damage from expansive soils. More common impacts are damage to landscaping and reduced recreation due to low lake levels.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Tarrant County Drought Mitigation Action #1** | Design and implement Tarrant County specific water conservation public education efforts to compliment existing programs. |
| **Mitigation Goal/Objective** | 1. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $10,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • County Funds<br>• Water Suppliers |
| **Responsible Agency** | • Tarrant County Public Information Officer<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One year |
| **Effect on New Buildings** | This action will publicize water conservation efforts that can be incorporated into new construction. |
| **Effect on Existing Buildings** | This action will publicize water conservation efforts that can be incorporated into existing construction. |
| **Cost Effectiveness** | Cost Effective – Public education programs can provide significant results for relatively low costs. |
| **Discussion:** Most cities in the area have existing water conservation programs designed to educate the public and businesses on ways to conserve water. This action will develop a Tarrant County specific program that will compliment existing programs. Jurisdictional public education efforts have been very successful in attracting the attention of local citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Tarrant County Drought Mitigation Action #2** | Develop a county-wide contingency plan to identify additional 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. Impacts identified in this plan will be included in updates to the Hazard Mitigation Action Plan. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $20,000 |

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| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • County Funds<br>• Water Suppliers |
| **Responsible Agency** | Fort Worth - Tarrant County OEM |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will identify drought impacts in Tarrant County thus providing specific information for builders of new structures to incorporate drought mitigation into the structures. |
| **Effect on Existing Buildings** | This action will identify drought impacts in Tarrant County thus providing specific information for owners of existing structures to incorporate drought mitigation into the structures. |
| **Cost Effectiveness** | Cost Effective – This planning effort will have a low cost with the potential for significant benefits for the entire community. |
| **Discussion:** This planning effort will focus attention on the effects of drought on the community. Specific drought effects will be identified and efforts can be made to mitigate those effects. | |

**EXPANSIVE SOILS**

Low Vulnerability - Expansive soils have caused damage to some structures in some portions of the County. However, damage has been limited to relatively small geographic areas and there are no reports of significant damage to commercial structures or infrastructure.

Location – Expansive soils are found in various areas of the County. We could not locate a map of expansive soils in Tarrant County.

Extent – The extent of expansive soils in Tarrant County is believed to be Very Low (0% - 20%) to Low (21% - 50%).

Previous Occurrences – We could find no empirical data on previous occurrences of damage from expansive soils, but it is believed that expansive soils have caused problems since the first buildings were constructed in this area.

Probability of Future Events – Due to the variability of soil types and construction quality, it is very difficult to predict future occurrences of problems with expansive soils. However, a study published in the fall 2003 issue of *Environmental Geology* cited in the September 19, 2003 *Dallas Business Journal* indicates that many new developments in the Metroplex are being built on soil that is more unstable than soils built on prior to 1990. This could lead to a higher incidence of expansive soil related damage in the future.

Impact – The impact of expansive soils ranges from cosmetic cracks in walls to substantial foundation and structural damage that can result in the need to demolish the building. Infrastructure such as pipelines can be damaged causing increased maintenance and repairs, damaged beyond repair requiring replacement, damaged to the point of failure.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Tarrant County Expansive Soils Mitigation Action #1** | Improve construction techniques to mitigate expansive soils damage through building code enhancements. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined (Minimal – Staff Time Only) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building permit fees |
| **Potential Matching Funding Sources** | • County Funds<br>• Building permit fees |
| **Responsible Agency** | • Tarrant County Transportation Service Department (County Engineer)<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will make new buildings more resistant to damage from expansive soils. |
| **Effect on Existing Buildings** | This action will require modifications to existing buildings to be more resistant to damage from expansive soils. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will improve construction quality and reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Tarrant County Expansive Soils Mitigation Action #2** | Educate construction contractors, home owners, and business owners about mitigation techniques. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $10,000 |

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| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building Permit Fees |
| **Potential Matching Funding Sources** | • County Funds<br>• Building Permit Fees |
| **Responsible Agency** | • Tarrant County Transportation Service Department (County Engineer)<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will provide builders of new construction with expansive soil mitigation techniques that will reduce damage. |
| **Effect on Existing Buildings** | This action will provide owners of existing buildings with expansive soil mitigation techniques that will reduce damage. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will provide construction contractors and home/business owners with techniques designed to reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**EXTREME HEAT**

High Vulnerability - Summer heat and humidity can occur anytime from May through October. Community health services actively work with at risk populations to prevent heat related deaths and injuries. The elderly, very young people and people with poor health are most at risk from summer heat. People who work outside or in un-air-conditioned buildings are also at high risk to the direct effects of summer heat. Summer heat can also lead to electrical service outages if equipment fails or demand exceeds available supply. Most public safety and special facilities are equipped with emergency generators.

Location - Throughout the County

Extent - Summer temperatures can reach as high as 113 degrees. Tarrant County is also subject to high humidity.

Previous Occurrences - This is an annual occurrence. The summer of 1980 was a record year with 69 consecutive days of temperatures of 100 degrees or more. We were unable to find a reliable record of deaths or injuries related to heat.

Probability of Future Events - Hot summer temperatures are certain to continue to occur in Tarrant County.

Impact - Summer heat can cause widespread electrical outages resulting in dangerous conditions, especially for at-risk populations. Occasionally “cooling centers” are opened at community centers to provide a safe place for citizens to seek refuge from the heat.

Extreme heat can have economic impacts if construction work is curtailed or outdoor special events are cancelled.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Tarrant County Extreme Heat Mitigation Action #1** | Determine feasibility of expanding monitoring of populations at risk from extreme heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined. Staff time and GIS resources |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Other State or Federal Public Health Grants |
| **Potential Matching Funding Sources** | • County Funds |
| **Responsible Agency** | • Tarrant County Public Health<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | None - This action is intended to expand monitoring of people only. |
| **Effect on Existing Buildings** | None - This action is intended to expand monitoring of people only. |
| **Cost Effectiveness** | Pending, but believed to be Cost Effective |
| **Discussion:** This action would determine the feasibility of expanding monitoring of populations at risk from extreme heat. Existing at risk population monitoring programs will be reviewed to ensure all known populations at risk from extreme heat are included. Any newly discovered at risk populations will be evaluated for inclusion in existing monitoring programs. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Tarrant County Extreme Heat Mitigation Action #2** | Increase public education programs on the dangers of excessive heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness |
| **Priority** | Medium |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program |
| **Potential Matching Funding Sources** | • County Funds<br>• Other State or Federal Public Health Grants |
| **Responsible Agency** | • Tarrant County Public Health<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | Six Months |

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| **Effect on New Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Effect on Existing Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits. |
| **Discussion:** Public education on severe weather in Tarrant County has traditionally focused on severe thunderstorms and associated hazards (tornadoes, lighting, flooding, high winds). This action would expand public education to include hazards from extreme heat. | |

**FLOOD**

High Vulnerability - The topography of Tarrant County combined with the frequency of severe thunderstorms results in frequent flash flood events. There is a low risk of riverine flooding due to the presence of a well-maintained levee system. FEMA records indicate only 39 Repetitive Loss Properties in all of Tarrant County. However, this is probably more a reflection of the low number of flood insurance polices than vulnerability to flooding.

Location - Throughout the County along creeks and drainage structures. Creeks in unincorporated Tarrant County with a history of flooding include Big Fossil Creek in northeast Tarrant County and Village Creek in southeast Tarrant County. In addition, there have been isolated instances of overland flooding on high ground due to intense rainfall on saturated soil.

Extent - Flash floods are the most common type of flooding in Tarrant County. Flash floods in Tarrant County tend to occur and recede very quickly. There is a low risk of riverine flooding due to the presence of a well-maintained levee system.

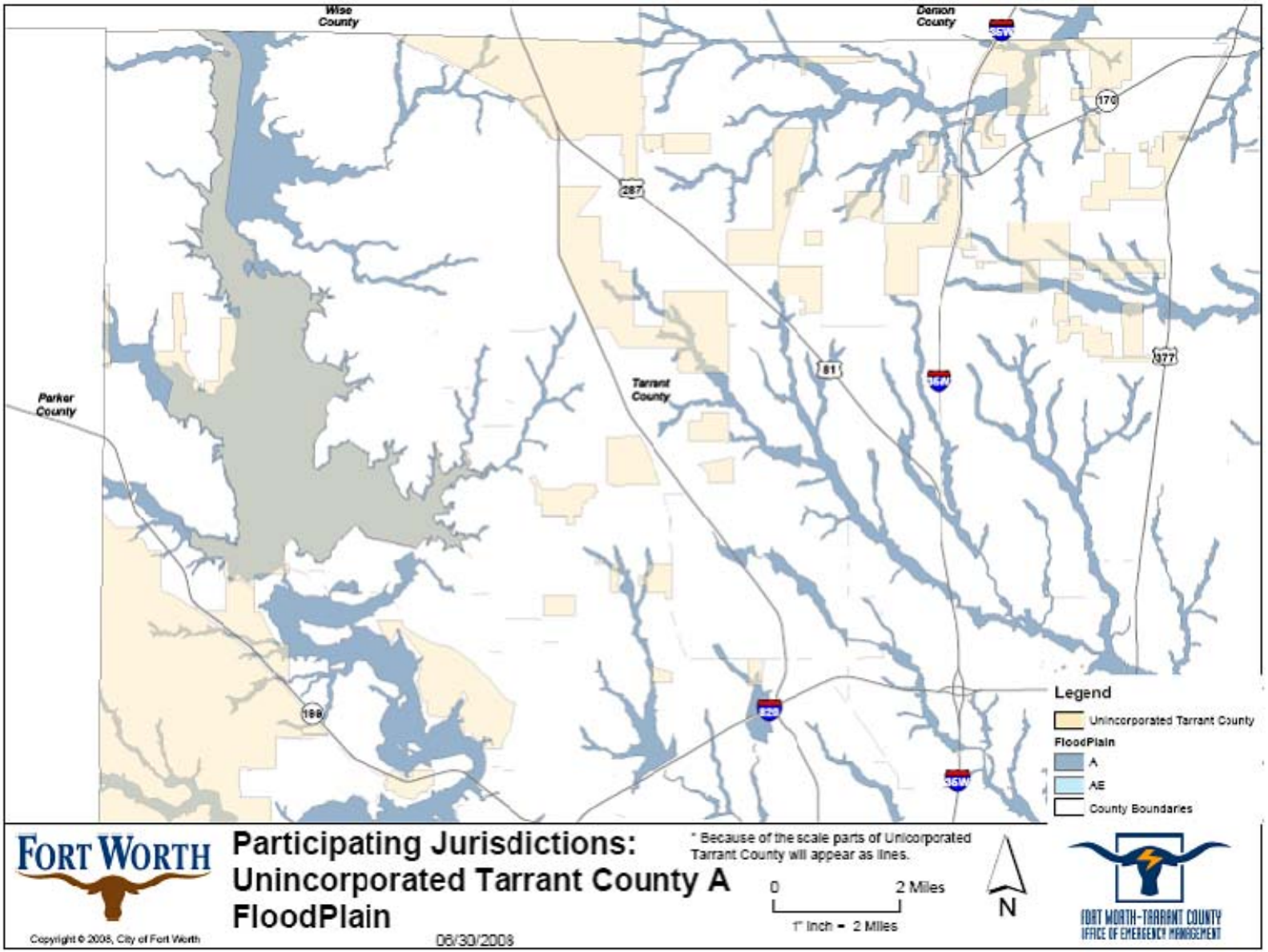
Previous Occurrences - Between 1993 and 2006 the National Weather Service reported 155 flash flood events in Tarrant County.

In the summer of 2004 some portions of the County received two separate "500-Year" rain events. Tarrant County declared a Local State of Disaster on June 9th and again on August 2nd primarily due to widespread flooding.

Probability of Future Events – Based on previous experience Tarrant County is certain to suffer flash flood events every year. National Weather Service records indicate an average of 11 flash flood events per year in Tarrant County. Continued development throughout the County and the resulting increase in impervious cover will increase the likelihood and severity of flooding.

Impact - Flash floods kill more people than any other hazard associated with thunderstorms. Property damage from flash flooding is seldom covered by insurance, which makes it very difficult for citizens to recover from the flood. Due to the very rapid rate of development and growth in Tarrant County we are experiencing problems with determining actual building footprints within flood plains and will be using planimetric

GIS data from the NCTCOG to resolve this issue when it becomes available. At that time we will be able to accurately identify the number and types of buildings vulnerable to flooding; as well as access other data associated with those locations such as appraised value, census data, and owner information.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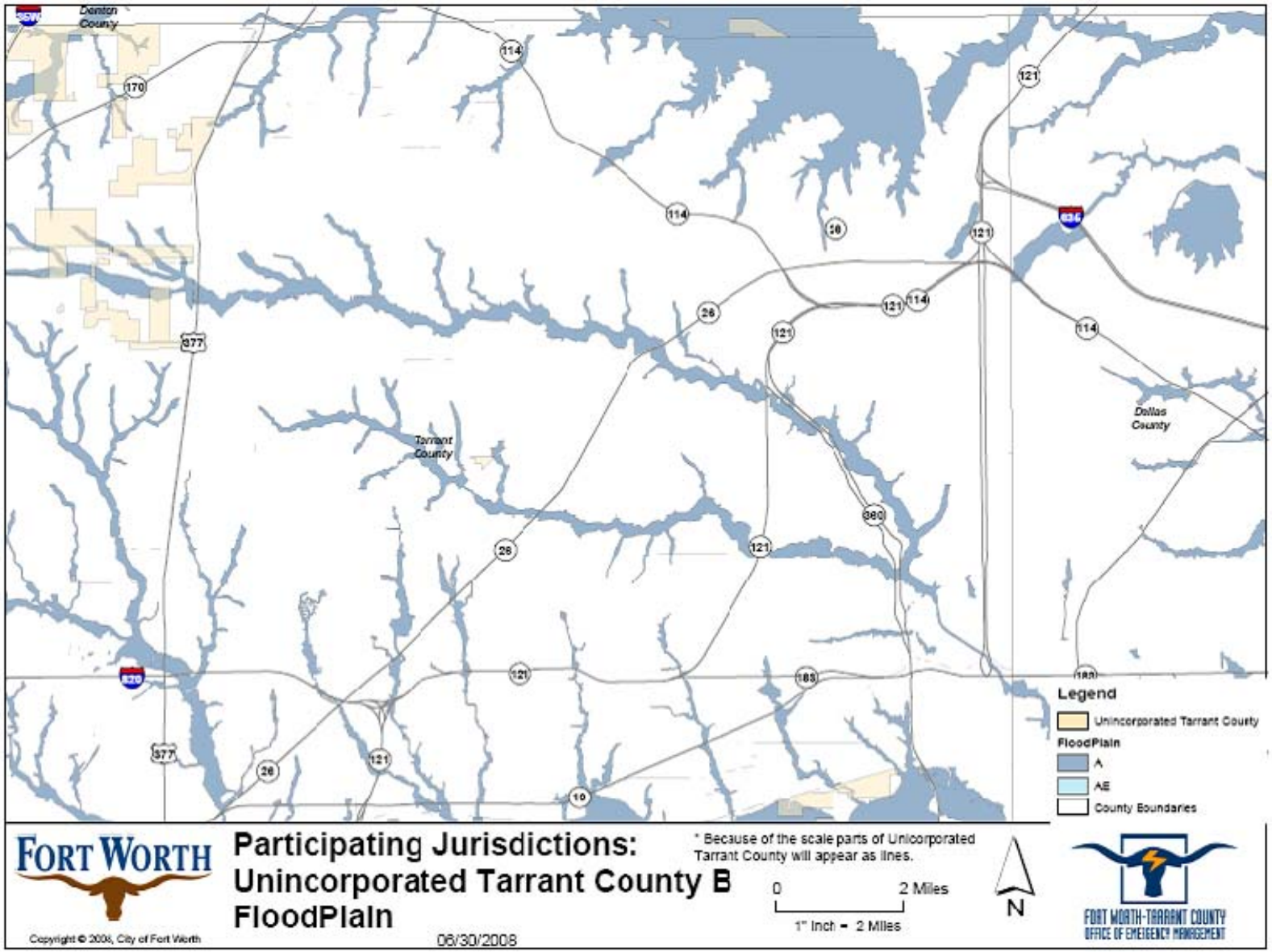
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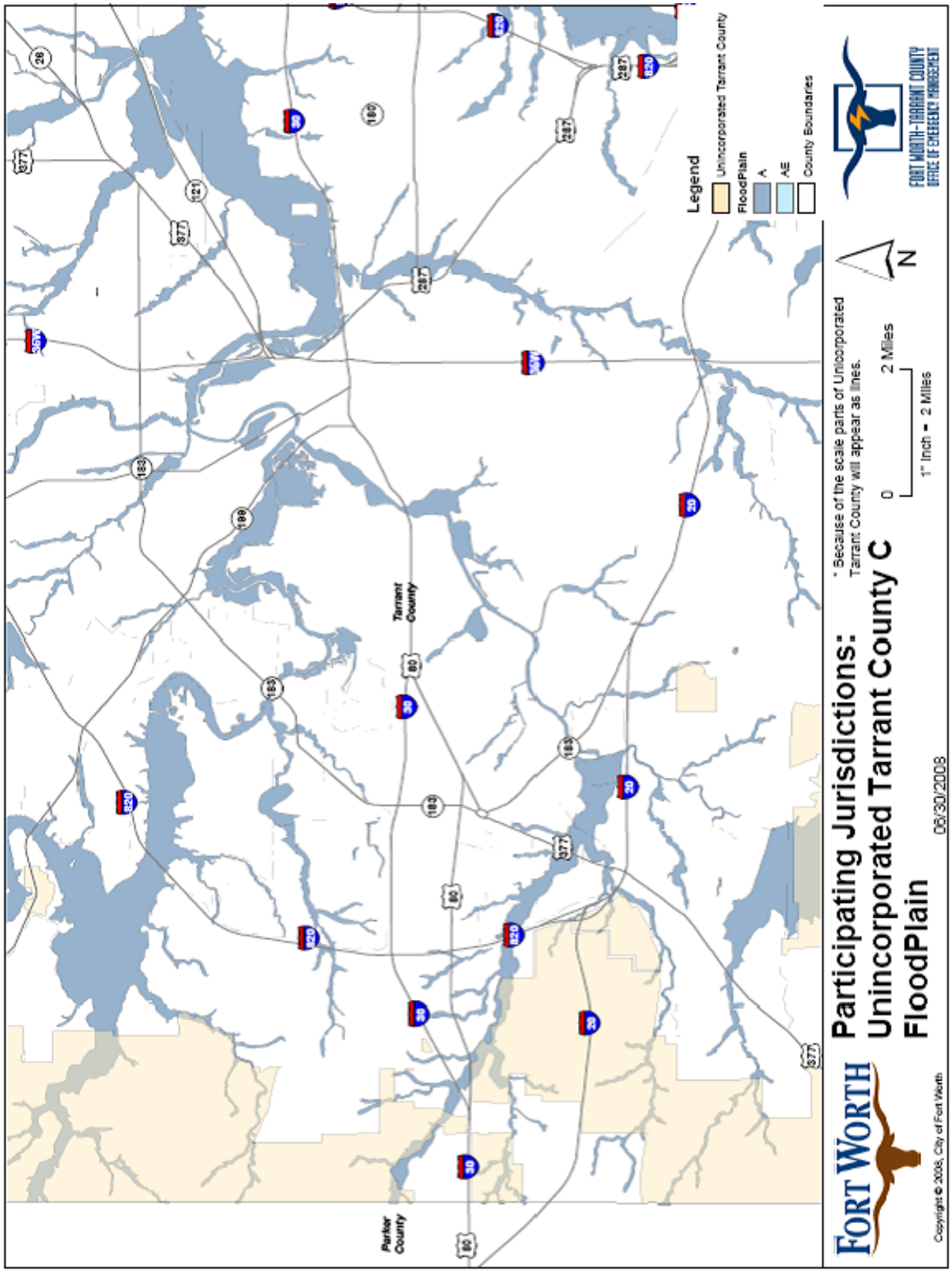
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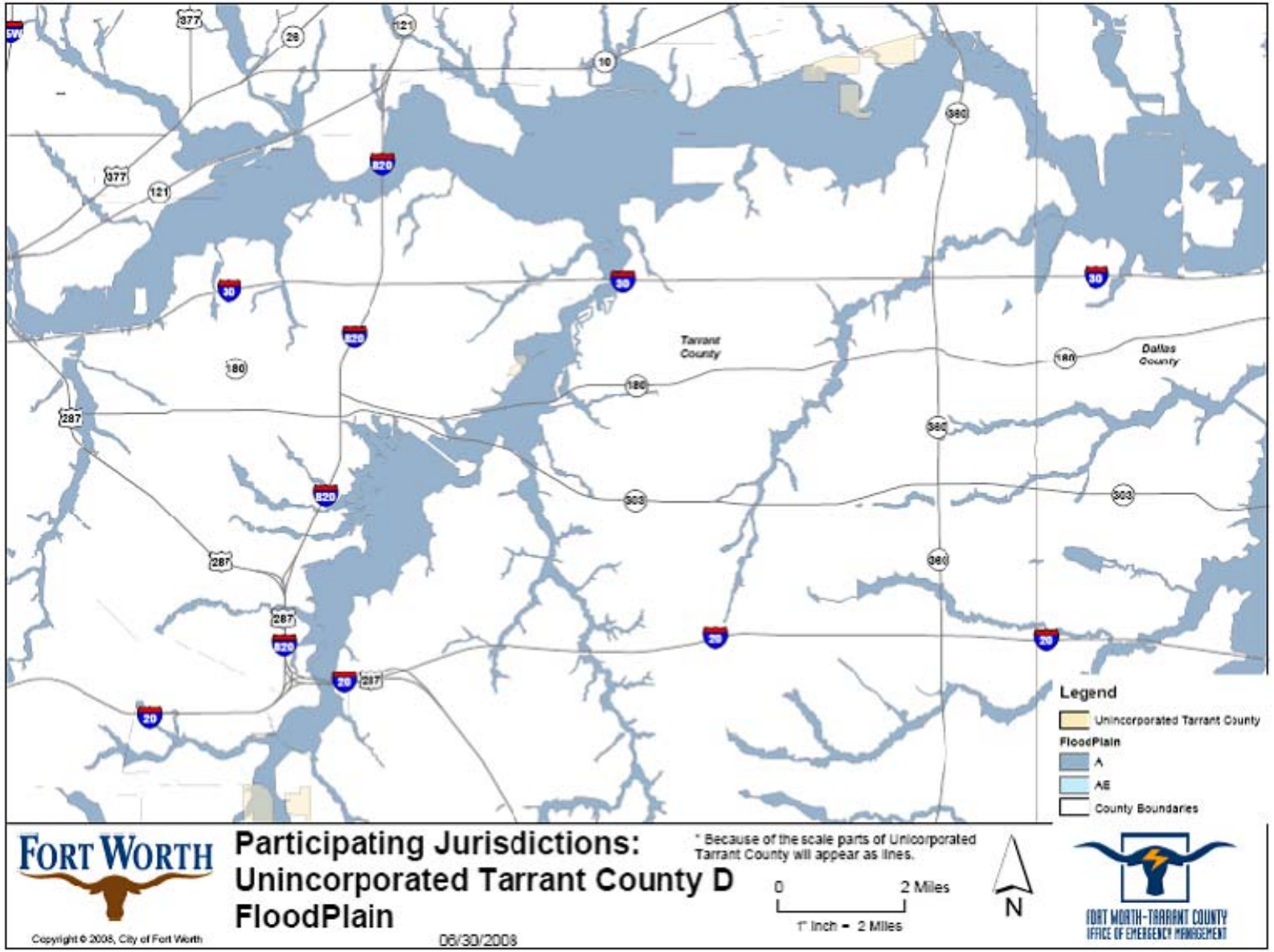
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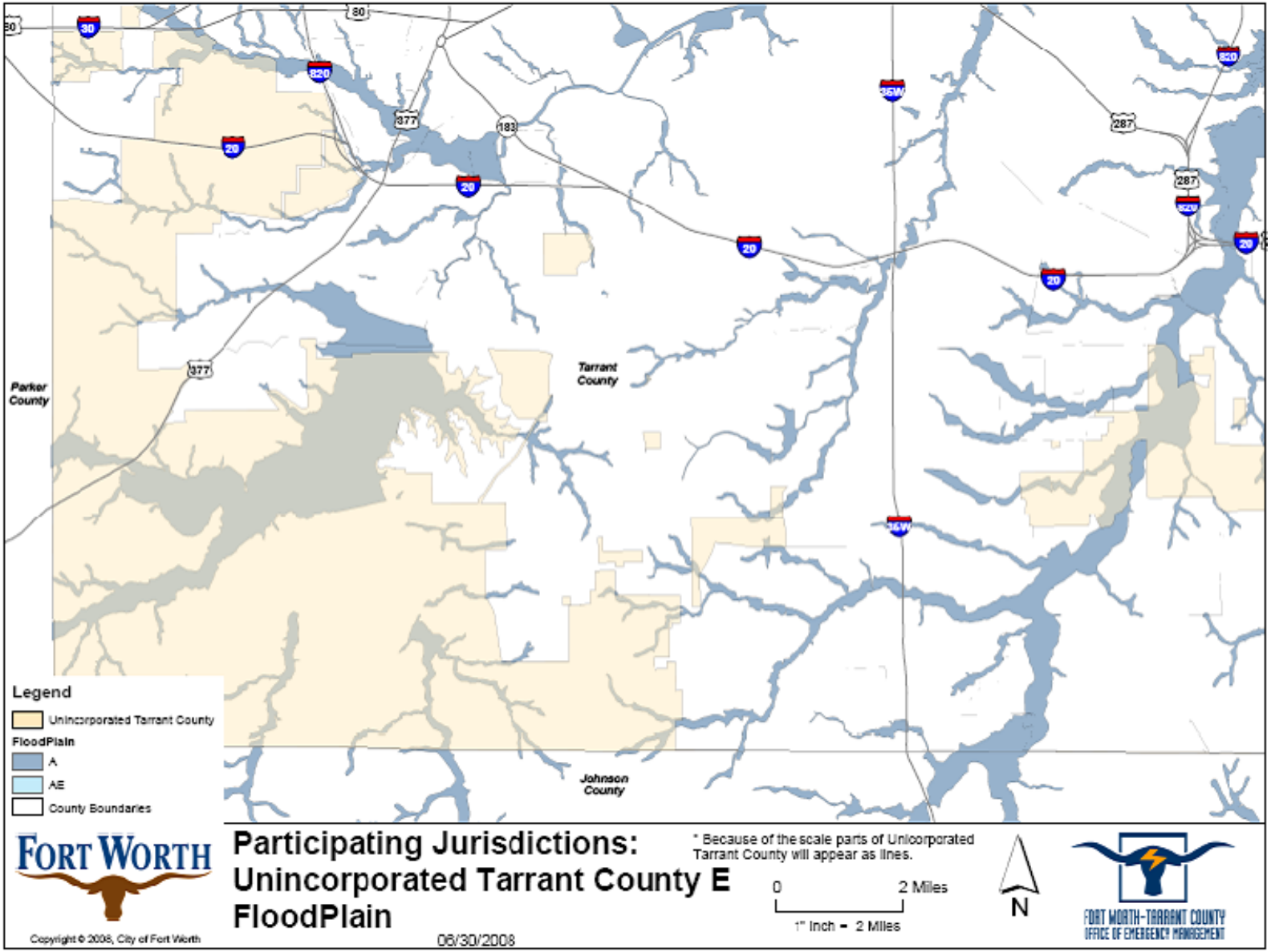
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**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Tarrant County Flood Mitigation Project #1** | Develop Tarrant County specific "Flood Preparedness" brochure. |
| **Hazard Addressed** | Flooding |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of Flood events.<br>1. c. Develop effective flood mitigation public education materials. |
| **Priority** | High |
| **Estimated Cost** | $9,000 |
| **Potential Funding Sources** | Hazard Mitigation Grant Program<br>Private Foundations<br>Private Sector Donations |
| **Potential Matching Funding Sources** | County Budget<br>Private Foundation Grants |
| **Responsible Agency** | Fort Worth - Tarrant County OEM |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This action will provide flood mitigation techniques for owners of new buildings. |
| **Effect on Existing Buildings** | This action will provide flood mitigation techniques for owners of existing buildings. |
| **Cost Effectiveness** | Cost Effective - This project will provide valuable information to the public in a relatively short time and with relatively low costs. It will also have the added benefit of increasing public awareness of mitigation. The estimated cost could easily be offset by reduced losses to the public in a single small flood event. |

**Discussion**: Develop Tarrant County specific "Flood Preparedness" brochure. Once developed, the brochure will be distributed County-Wide. Historically flood prone areas will be targeted for door-to-door distribution and neighborhood meetings to present the brochure and solicit input for *Fort Worth Hazard Mitigation Action Plan* revisions.

The brochure will include:

- Description of Tarrant County flood hazards
- "Case Studies" of previous flood events in Tarrant County
- Preparedness and "self-help" mitigation information
- Benefits of city participation in NFIP
- Advantages of flood insurance
- Risks of not having flood insurance
- Warnings that typical homeowner's insurance does not cover rising water
- Solicitation of input for the *Fort Worth Hazard Mitigation Action Plan*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Tarrant County Flood Mitigation Action #2** | Improve drainage structure on Wagley Robertson Road at Big Fossil Creek, and raise road level. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined pending engineering analysis |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• County Road and Bridge funds |
| **Potential Matching Funding Sources** | • County Road and Bridge funds |
| **Responsible Agency** | Tarrant County Transportation Service Department (County Engineer) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will improve drainage on a roadway and have little or no effect on new buildings. |
| **Effect on Existing Buildings** | This action will improve drainage on a roadway and have little or no effect on new buildings. |
| **Cost Effectiveness** | Cost Effective – This project will reduce the hazard to life and property at a low water crossing that is known to flood. It will also reduce maintenance costs related to pavement repair following flood events. |
| **Discussion:** This project improves a drainage structure and raises the road level to eliminate a low water crossing and stretch of road that floods periodically. The project reduces the danger to life and property from flash flooding and reduces the need to repair pavement damage from flooding events. This population in this portion of the County is growing rapidly thus increasing the likelihood of causalities as well as delays in traffic as the road is closed for high water or road repairs. | |

**HAILSTORM**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of large hail are a hazard event in Tarrant County. Tarrant County averages eleven significant thunderstorm events (large hail, high winds) per year according to National Weather Service records. Most structures in Tarrant County can resist the effects of all but the most severe hailstorms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to hailstorms. Vehicles have proven to be vulnerable to hailstorms with widespread severe vehicle damage reported in 1980 and 1995.

Location - Throughout the County

Extent - Tarrant County is subject to the hazards of severe thunderstorms, including large hail. Hail stones up to the size of grapefruit (H9 on the Combined NOAA/TORRO Hailstorm Intensity Scales) have been reported in Tarrant County.

Previous Occurrences - In 1980 a hailstorm struck the west side of Tarrant County with hailstones up to 4.5 inches in diameter causing $60 million in damages. Hail was reported to penetrated roofs of homes and cause damage to the interior of homes in southwest Fort Worth. Many vehicles received significant damage and numerous windows in buildings were broken.

On May 5th a supercell thunderstorm developed very rapidly over the west side of Fort Worth and moved across Tarrant and Dallas Counties. The thunderstorm dropped very large hail on Fort Worth and moved eastward into Dallas County. Mayfest, a festival held during the first week of May along the banks of the Trinity River, was in the path of the storm and was subjected to baseball size hail. Damage caused by wind speeds up to 70 miles per hour, softball-size hail, and high-intensity rain caused this storm to be deemed the "costliest thunderstorm event in history" by the National Weather Service. The maximum rainfall intensity was almost 3 in. in 30 minutes. 109 people were injured by hail. Across the region twenty lives were lost, and over $1 billion in damage was reported.

Probability of Future Events - Thunderstorms with hail are certain to continue to occur in Tarrant County. Hail falls on about two or three days per year, ordinarily with only slight and scattered damage (*National Weather Service*).

Impact – The impact form hailstorms can be significant in extreme events such as the hailstorms of 1980 and 1995. Thousands of homes and vehicles can be damaged in a single storm with millions of dollars in damages. Vehicles are especially impacted by large hails with windshields being the vulnerable part. A recurring problem following hailstorms is broken windshields in vehicles belonging to populations who do not have vehicle insurance and cannot afford the replacements costs, resulting in the owners having difficulty traveling to work, medical appointments, etc.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Tarrant County Hailstorm Mitigation Action #1** | Develop public education campaign to encourage "hail resistant" roofing in new construction and roof replacements. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• Building /Permit Fees<br>• County Funds |
| **Responsible Agency** | • Tarrant County Public Information Office<br>• Fort Worth - Tarrant County OEM (Support) |

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| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will potentially decrease the damage caused by most hailstorms in new buildings. |
| **Effect on Existing Buildings** | This action will potentially decrease the damage caused by most hailstorms in existing buildings. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing hailstorm damage. One long term benefit will be reduced property insurance as claims related to hail damage are reduced. |
| **Discussion**: Public education has proven to be a low cost effective means to achieve changes public behavior. Encouraging hail resistant roofing can benefit citizens through reduced damage, business through reduced damage to their buildings and reduced claims against insurance companies, and government through reduced request for assistance. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Tarrant County Hailstorm Mitigation Action #2** | Evaluate County buildings to determine feasibility of installing hail resistant roofing and window coverings with a focus on critical infrastructure. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• County Funds |
| **Responsible Agency** | Tarrant County Facilities Management |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on new County buildings. |
| **Effect on Existing Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on existing County buildings. |
| **Cost Effectiveness** | Cost Effective – Although currently undetermined, this project is believed to be cost effective. |
| **Discussion:** Installing hail resistant roofing and window coverings on new County buildings could prevent or limit damage to County buildings thus avoiding costs to the County as well as preventing or limiting loss of use of damaged facilities. | |

**HIGH WINDS**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of high winds are a hazard in Tarrant County. Tarrant County averages ten reported significant thunderstorm events (large hail, high winds) per year. In addition, strong weather fronts can sometimes be accompanied by high winds which occasionally cause damage. Most structures in Tarrant County can resist the effects of all but the most severe high wind events. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to high winds.

Location - Throughout the County.

Extent - Severe thunderstorms with high winds with speeds in excess of 90 mph have been reported in Tarrant County.

Previous Occurrences – We could find no records of high wind damage in unincorporated Tarrant County. There are unconfirmed reports of high winds causing damage to aircraft and hangers at Hicks Field in northern Tarrant County.

Probability of Future Events – Based on previous experience Tarrant County can expect to experience an average of ten significant thunderstorm events with high winds per year.

Impact – Records on high wind events are difficult to separate from severe thunderstorm records. High winds in Tarrant County typically cause little damage to commercial buildings. More often high winds cause damage to roofs, trees, and signs.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Tarrant County High Winds Mitigation Action #1** | Determine legality of the County to enact building codes to reduce damages from high winds, and enact codes if able to do so. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined – Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program |
| **Potential Matching Funding Sources** | • County Funds |
| **Responsible Agency** | • Tarrant County District Attorney<br>• Tarrant County Transportation Service Department (County Engineer) |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will potentially identify a means to reduce high wind damage on new buildings. |
| **Effect on Existing Buildings** | This action will potentially identify a means to reduce high wind damage on new buildings. |

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| **Cost Effectiveness** | Cost Effective – Although costs are undetermined, this action is believed to be cost effective since the action will require staff time only. |
| **Discussion:** Counties in Texas are restricted from many of the powers associated with cities, such as building codes. If the legal authority exists, enhanced building codes will reduce damages from high wind events. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Tarrant County High Winds Mitigation Action #2** | Educate builders and residents about mitigating wind damage. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | $10,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • County Funds<br>• Insurance Companies |
| **Responsible Agency** | • Tarrant County Transportation Service Department (County Engineer)<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on new buildings. |
| **Effect on Existing Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost of developing and providing high wind mitigation compared with savings to the community make this action cost effective. |
| **Discussion:** Public education has proven to be a low cost and effective means to achieve changes public behavior. High winds have not been a focus of severe weather preparedness. | |

**LANDSLIDES**

No Vulnerability - Although there is some relatively steep terrain in portions of unincorporated Tarrant County, the relief is associated with rocky outcrops and not susceptible to landslides. Other than infrequent slumping along highways at overpasses, there is no history of landslides in unincorporated Tarrant County. Based on the lack of vulnerability, landslides will receive no further consideration in this plan for unincorporated Tarrant County. However, landslide hazards will be reviewed during the annual review of this plan and we will continue looking for areas with landslide potential during hazard surveys.

**LEVEE FAILURE**

No Vulnerability – There are no levees or areas that would be affected by levee failure in unincorporated Tarrant County. Based on the lack of vulnerability, levee failure will receive no further consideration in this plan for unincorporated Tarrant County.

**LIGHTNING**

Moderate Vulnerability – Lightning is one of the most common hazards in Tarrant County. Thunderstorms (and by definition, lightning) occur an average of 30 – 50 days per year (*Oklahoma Climatological Survey*). Lightning is the second most common cause of weather-related deaths in Texas (*National Weather Service*). Lightning information is available only for Tarrant County on a county-wide basis.

Location – Throughout the County.

Extent – We could find no references to the average number of strikes per storm in Tarrant County. However, lightning is by definition associated with thunderstorms.

Previous Occurrences – Tarrant County experiences 30 – 50 thunderstorm days per year. From 1995 – 2004 one person was killed and five were injured by lightning in Tarrant County (*National Weather Service*). Throughout Texas 34 people were killed by lightning, there were 184 injuries and an estimated 23 million dollars in damages due to lightning from 1995 - 2004 (*National Weather Service*).

Probability of Future Events – Based on past experience Tarrant County will experience 30 – 50 thunderstorm days each year. Some days will have more than one thunderstorm during a given thunderstorm day.

Impact – Although lightning is the second most common cause of storm related deaths in Texas, lightning deaths remain relatively rare. Lightning does cause property damage several times per year (we could not find statistical data to validate this observation).

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Tarrant County Lightning Mitigation Action #1** | Provide lightning mitigation materials with building permit packets. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program |
| **Potential Matching Funding Sources** | • County Funds |
| **Responsible Agency** | Tarrant County Transportation Service Department (County Engineer) |

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| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will provide materials that will reduce the vulnerability of new buildings to lightning. |
| **Effect on Existing Buildings** | This action will provide materials that will reduce the vulnerability of existing buildings that are being remodeled to lightning. |
| **Cost Effectiveness** | Cost Effective – The low cost of this project would be offset by eliminating just one lightning caused building loss. |
| **Discussion:** Lightning mitigation materials will be included in all building permit packets distributed to builders or citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Tarrant County Lightning Mitigation Action #2** | Ensure all County critical infrastructure has adequate lightning mitigation in place and upgrade protection as necessary. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | $20,000 |
| **Potential Funding Sources** | Hazard Mitigation Grant Program |
| **Potential Matching Funding Sources** | County Funds |
| **Responsible Agency** | Tarrant County Facilities Management |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will ensure new buildings that house critical infrastructure have adequate lightning mitigation. |
| **Effect on Existing Buildings** | This action will ensure existing critical infrastructure has adequate lightning mitigation. |
| **Cost Effectiveness** | Cost Effective – The destructive and sometimes capricious nature of lighting warrant the expense of this action compared with the benefits of avoiding damage to critical infrastructure. |
| **Discussion:** Review and confirmation of the adequacy of lightning protection systems in County buildings housing critical infrastructure is worthwhile considering the number of thunderstorms experienced in Tarrant County. | |

**SEVERE THUNDERSTORM**

High Vulnerability - Severe thunderstorms are the most common hazard in Tarrant County. From 1950 through August 2007 Tarrant County averaged eleven reported severe thunderstorm events county-wide per year. Most structures in Tarrant County can resist the effects of all but the most severe thunderstorms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to thunderstorms.

Location - Throughout the County

Extent - Tarrant County is subject to the hazards of severe thunderstorms of all magnitudes.

Previous Occurrences - Records are available only on a county-wide basis.

Probability of Future Events – Severe thunderstorms will occur in Tarrant County an average of eleven times per year.

Impact – A single severe thunderstorm can cause damage from hail, high winds, lightning, and/or tornadoes to thousands of structures.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Tarrant County Severe Thunderstorm Mitigation Action #1** | Determine feasibility of installing a county-wide outdoor warning system. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. b. improve warning of citizens about severe weather. |
| **Priority** | High |
| **Estimated Cost** | $25,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program |
| **Potential Matching Funding Sources** | • County Funds |
| **Responsible Agency** | Fort Worth - Tarrant County OEM |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will determine the feasibility of a county-wide outdoor warning system and will have no effect on new buildings. |
| **Effect on Existing Buildings** | This action will determine the feasibility of a county-wide outdoor warning system and will have no effect on existing buildings. |
| **Cost Effectiveness** | Cost Effective – The potential benefits of a county-wide outdoor warning system are well worth the estimated costs. |
| **Discussion:** Tarrant County has many opportunities for outdoor recreation. Most of the County is covered by city owned & operated outdoor warning systems. However, some areas are not covered. As citizens travel through the 41 cities across Tarrant County they are seldom aware that they have left one city and entered another. Most have no knowledge of whether a given city has an outdoor warning system. This action will determine the feasibility of providing outdoor warning county-wide. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Tarrant County Severe Thunderstorm Mitigation Action #2** | Encourage builders to install storm resistant construction such as "hurricane clips". |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | High |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • County Funds<br>• Insurance Companies |
| **Responsible Agency** | Tarrant County Transportation Service Department (County Engineer) |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will encourage storm resistant construction in new buildings. |
| **Effect on Existing Buildings** | This action will encourage storm resistant construction in existing buildings as they are remodeled. |
| **Cost Effectiveness** | Cost Effective – The low cost of this action will be offset by a reduction in damage from severe thunderstorms. |
| **Discussion:** Effective education on storm resistant construction can reduce damage from severe thunderstorms. Insurance companies may be willing to fund or provide educational materials and/or provide discounts to persons who install storm resistant devices. | |

**SEVERE WINTER STORMS**

Moderate Vulnerability - Since 2000 the national Weather Service has reported 14 Winter Storm/Ice events. Winter storms in Tarrant County usually consist of short-lived icing events (ice on the roads for a few hours) that primarily affect traffic and cause numerous motor vehicle accidents. Occasionally an ice storm will cause widespread power outages for as long as several days. ONCOR Electric Delivery has an aggressive tree trimming program. Most structures in Tarrant County can resist the effects of all but the most severe winter storms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to winter storms. Electrical service outages are usually the most serious threat in this area. Most public safety and special facilities are equipped with generators.

Location - Throughout the County

Extent - Severe ice storms have resulted in accumulations in excess of two inches. Most storms leave only a light coating or glaze of ice.

Previous Occurrences - Tarrant County has averaged two winter storms per year since 2000. Most winter storms resulting only minor inconveniences and a few motor vehicle accidents.

In 1978 up to an inch of ice coated area trees and roadways causing $14 million in damages region-wide and making travel almost impossible for two days.

In 1996 a winter storm dropped two to four inches of a mixture of sleet, freezing rain, and snow in Tarrant County over Thanksgiving weekend causing many motor vehicle accidents and some electrical service outages.

In 2003 a winter storm dropped one inch of sleet across Tarrant County resulting in numerous motor vehicle accidents and closing schools for two days.

Probability of Future Events - Tarrant County can expect to experience two winter storms per year with a severe winter storm once each ten years.

Impact - Winter storms can cause widespread electrical and telephone service outages, make travel dangerous or impossible, and damage structures. Deaths and injuries due to vehicle accidents and slips/falls are common during ice storms. Occasional deaths and injuries from carbon monoxide poisoning due to improper heating have occurred. Economic losses due to lost production can be significant. Damage from frozen pipes can lead to significant expenses for homeowners.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Tarrant County Severe Winter Storm Mitigation Action #2** | Increase public education concerning winter storm preparedness and mitigation. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | Medium |
| **Estimated Cost** | $10,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program |
| **Potential Matching Funding Sources** | • County Funds |
| **Responsible Agency** | Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into new buildings. |
| **Effect on Existing Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into existing buildings. |

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| **Cost Effectiveness** | Cost Effective – The low cost is effective when compared to benefits provided to citizens. |
| **Discussion:** Winter weather preparedness has not been emphasized in Tarrant County as much as severe thunderstorms. This action will provide preparedness information to citizens during the fall. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Tarrant County Severe Winter Storm Mitigation Action #2** | Purchase additional street sanding capacity |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | Hazard Mitigation Grant Program |
| **Potential Matching Funding Sources** | County Funds |
| **Responsible Agency** | Tarrant County Transportation Service Department |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will have no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Sanding streets is essential to allow emergency vehicles to respond during severe winter events. |
| **Discussion:** Sanding equipment can be mounted on existing vehicles to provide sanding capabilities. During severe winter weather events streets around hospitals, fire stations and other critical facilities are sanded along with major intersections and roadways. Additional sanding capacity would allow for quicker sanding of these areas and for more repeat sanding during prolonged winter weather events. This will improve public safety by facilitating emergency response as well as reducing motor vehicle accidents. | |

**STREAM BANK EROSION**

No Vulnerability - The predominantly low rolling topography of Tarrant County prevents stream bank erosion from causing a hazard except in a few locations. No vulnerability to stream bank erosion has been identified in unincorporated Tarrant County. Further analysis using GIS and field verification will continue to search for vulnerable structures or facilities.

**TORNADO**

High Vulnerability – All structures in Tarrant County are vulnerable to tornadoes. Very few structures can withstand the effects of an F5 tornado. However, the March 28, 2000 F3 tornado that struck Fort Worth provided good evidence that well built structures can protect people who take appropriate shelter inside those buildings.

Location - Tornadoes can occur anywhere in Tarrant County.

Extent - Tarrant County is subject to tornadoes of all magnitudes, including F5 tornadoes.

Previous Occurrences – We found no reports of tornados causing damage in unincorporated areas of Tarrant County. However, Tarrant County has an average of one tornado reported per year county-wide (Source: National Climatic Data Center). In 2007 there were eight tornadoes reported by storm spotters county-wide. Four of those tornados caused damage, all within incorporated areas. Since 2000 tornadoes have caused damage in Arlington, Benbrook, Euless, Everman, Fort Worth, Grand Prairie, Haltom City, Mansfield, North Richland Hills, and River Oaks.

Probability of Future Events - Tarrant County has averaged one reported tornado per year and can expect that average to continue. Increasing population and the spread of development into formally agricultural or undeveloped land increases the likelihood of a tornado causing casualties or property damage each year.

Impact - Tornadoes can cause deaths, injuries and property damage/destruction. Special facilities such as hospitals, fire stations, and utilities can be damaged or destroyed. Citizens who live in neighborhoods struck by tornadoes can experience disruption of their life styles and traditions. Areas struck by tornadoes can experience increased demand for mental health services as people deal with grief and stress.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Tarrant County Tornado Mitigation Project #1** | Assist citizens with funding for building tornado safe rooms or in-ground shelters. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction |
| **Priority** | High |
| **Estimated Cost** | $600,000 (150 Safe Rooms at $4,000 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Community Development Block Grant Funds |
| **Potential Matching Funding Sources** | Home/Building Owner |
| **Responsible Agency** | Fort Worth - Tarrant County OEM |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This project will encourage new buildings to be constructed with tornado safe rooms as part of the construction process. The safe room will enhance the overall storm resistance of the building. |
| **Effect on Existing Buildings** | This project will encourage homeowners to construct/install tornado safe rooms in their existing homes. A safe room will enhance the overall storm resistance of the building. |

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| **Cost Effectiveness** | Cost Effective - Safe rooms and in-ground shelters have been proven to reduce deaths and injuries during tornadoes and severe thunderstorms. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of safe rooms and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

**Discussion:**

This project will reimburse costs associated with tornado safe room or in-ground shelter installation in new or existing homes. Safe rooms provide increased protection for citizens during severe thunderstorms and tornados. Safe rooms have been proven to save lives and reduce injuries from severe weather events. FEMA publication 320 (*Taking Shelter from the Storm, Building a Safe Room Inside Your House*) provides the standards for safe rooms. As stated on the FEMA website: Although a "*residence may be built "to code," that does not mean it can withstand winds from extreme events such as tornadoes and major hurricanes. The purpose of a safe room or a wind shelter is to provide a space where you and your family can seek refuge that provides a high level of protection. To protect its occupants, a safe room must be built to withstand high winds and flying debris, even if the rest of the residence is severely damaged or destroyed."*

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to home owners will be for no more than $3,000 or 75% of cost, whichever is less
- Eligibility will be limited to individuals who own their home at the time of application
- The safe room or in-ground shelter must be constructed/installed in the primary residence of the applicant
- Each eligible homeowner can only receive one reimbursement, regardless of the number of shelters he/she may purchase/install
- In-ground shelters must meet requirements established in the National Performance Criteria for Tornado Shelters dated May 28, 1999.
- Safe Rooms must meet the requirements of FEMA Publication 320
- Safe Rooms and shelters must meet all applicable city and/or county codes
- Previously owned or used shelters will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Tarrant County Tornado Mitigation Project #2** | Assist citizens with funding for purchase of Weather Alert Radios |

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| **Mitigation Goal/Objective** | 4. Increase the effectiveness of warning systems in Tarrant County.<br>4. a. Increase the number of homes and businesses with Weather Alert Radios. |
| **Priority** | High |
| **Estimated Cost** | $100,000 (2,500 Weather Alert Radios at $40 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Private Sector Donations |
| **Potential Matching Funding Sources** | Citizen/Business Owner |
| **Responsible Agency** | Fort Worth - Tarrant County OEM |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings except for providing additional warning time of severe weather events thus allowing citizens more time to secure their home or business against approaching severe weather. |
| **Cost Effectiveness** | Cost Effective – Weather Alert Radios are a proven means to alert and warn citizens about severe weather and civil emergencies. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of Weather Alert Radios and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

***NOTE**: We are aware that Weather Alert Radios are on the "2007 Ineligible Planning Activities" list. It is our opinion that Weather Alert Radios should be considered eligible due to their very high benefit and very low cost.*

This project will reimburse 75% of the cost for citizens to purchase Weather Alert Radios, with the citizen responsible for the remaining 25%. Weather Alert Radios provide the best means for citizens to receive emergency alerts when they are indoors. Severe weather is the primary hazard in our area. Early alert and warning has proven to be a significant factor in saving lives during severe weather events.

In addition, the Weather Alert Radios can be activated for civil emergencies such as hazardous materials incidents. Effective warning saves lives, especially during severe weather events. Weather alert radios provide a proven means of indoor warning to citizens any time of the day or night and compose the vital indoor portion of our emergency warning system.

Warning systems have been shown to have value beyond the initial warning. Persons receiving warning relay the information to family and friends to ensure they are aware of the hazard. The secondary and tertiary warning can greatly amplify the effectiveness of the warning system.

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to citizens will be for no more than $30 or 75% of cost of the radio, whichever is less
- Eligibility will be limited to residents of Tarrant County
- The citizen must sign an agreement to keep the radio operational
- Each eligible homeowner can only receive one reimbursement, regardless of the number of radios purchased
- Previously purchased radios will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**WILDFIRE**

Moderate Vulnerability - Tarrant County has been cited as having more undeveloped land than any other urban county in the United States. The relatively large rural-urban interface has resulted in significant wildfires. Area fire departments are working to educate home and business owners on means to reduce their exposure to wildfires such as keeping grass mowed, planting fire resistant vegetation, removing wood roofing shingles, etc.

Location - Areas in the northwest and southwest parts of Tarrant County are subject to wildfires. Tarrant County still has many open undeveloped areas with significant brush and tree cover. The areas of most concern are the northwest, southwest, and southeast portions of the county.

Extent - The effects of wildfire are deaths, injuries, loss of structures, loss of wildlands, and loss of wildlife habitat.

Previous Occurrences - December of 2005 was the most recent significant wildfire occurrence. Fires in the rural-urban interface in Kennedale, Mansfield, and Arlington resulted in the loss of several homes. Since 2000 there have also been significant wildfires in unincorporated Tarrant County, Fort Worth, and Keller.

Probability of Future Events - Wildland fires are likely to occur annually and increase in frequency and severity as the population continues to increase and formally rural areas are developed.

Vulnerability - Homes are most vulnerable to wildfires. The tendency to locate homes on tree covered lots and lack of fire breaks (such as parking lots around businesses) can enable fires to spread more easily to homes. Special facilities tend to be less vulnerable due to construction type (brick or metal).

Impact - Wildland fires can result in the need for rapid evacuations, casualties, loss of homes and businesses, and loss of wildlife habitat and recreational areas.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Tarrant County Wildfire Mitigation Action #1** | Increase public education on how to reduce the risks from wildfires (construction, landscaping, etc.) |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | High |
| **Estimated Cost** | $10,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program |
| **Potential Matching Funding Sources** | • County Funds |
| **Responsible Agency** | • Tarrant County Fire Marshal<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will reduce the effects of wildfire on new buildings through increased use of wildfire mitigation measures. |
| **Effect on Existing Buildings** | This action will reduce the effects of wildfire on existing buildings through increased use of wildfire mitigation measures. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing the effects of wildfire. |
| **Discussion:** Wildfire mitigation measures are not widely known in urban areas such as Tarrant County. This action will increase that knowledge and reduce casualties and damages from wildfires. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Tarrant County Wildfire Mitigation Action #2** | Enact building permit process that encourages wildfire resistant construction. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program |
| **Potential Matching Funding Sources** | • County Funds<br>• Building Permit Fees |
| **Responsible Agency** | • Tarrant County Transportation Service Department (County Engineer)<br>• Tarrant County Fire Marshal<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will reduce the vulnerability of new structure to wildfire. |
| **Effect on Existing Buildings** | This action will reduce the vulnerability of existing buildings to wildfire if they are remodeled to the extent a building permit is required. |
| **Cost Effectiveness** | Cost Effective – This action will integrate wildfire mitigation into the building process at minimal cost. |
| **Discussion:** Integrating mitigation into building permitting provides a process to reduce vulnerability with few negative impacts. | |

**Other Projects Identified for Further Consideration**

1. Conduct a county-wide drainage study to evaluate how the rapid growth and urbanization of the county is impacting creeks and drainage patterns.

2. Identify flood prone structures around Eagle Mountain Lake (repetitive loss structures, structures located in floodplain/floodway, structures within flood easement, etc.), and develop and evaluate flood damage reduction alternatives including buyouts, flood proofing, and channel modifications.

3. Improve drainage structure on Wagley Robertson Road at Big Fossil Creek, and raise road level.

4. Work with NCTCOG, Texas Water Development Board, Corps of Engineers and local governments to develop a Flood Protection Study for Village Creek, similar to the study now underway for Big Fossil Creek.

5. Improve Willow Branch channel east and west of Bennett Lawson.

6. Improve Gilmore Creek channel from Grant's Lane to Morris Dido Newark Road.

7. Continue with channel improvements to small tributary located along Kennedale New Hope Road.

8. Evaluate flood warning system in un-incorporated sections of Tarrant County, and any needed improvements. This project is the responsibility of the Office of Emergency Management.

9. Develop county-wide damage reporting system. The system would provide a means for damage information to be promptly captured for response, recovery, and mitigation purposes. For mitigation, the information would be used to identify potential mitigation projects, provide data for cost-benefit analysis, and track effectiveness of mitigation measures. This project is the responsibility of the Office of Emergency Management.

10. NFIP Insurance Purchase Project - Most people who live in the flood plain do not have flood insurance. Some of those people will have low income and/or fixed income. For them, even the relatively low cost of flood insurance is an additional expense that they cannot afford. When a flood occurs, the real cost of helping uninsured victims is often more than dollar amount of actual damages. The initial response by emergency responders and the Red Cross is the same whether the victim is insured or uninsured. Long-term recovery for uninsured flood victims can and usually does result in significant additional expenses for the victims, volunteer groups, charitable agencies, and local government. One way to significantly reduce those long-term costs would be to purchase, or assist in purchasing, flood insurance on a temporary basis for persons living in the flood plain. Participants in this program would temporarily receive funds to purchase flood insurance and encouraged to relocate out of the flood prone area. Some considerations for this program would include:
    - Potential legal issues (Use of federal/local funds to purchase insurance)
    - Determination of income levels that would qualify
    - Determination of length of time for insurance to be purchased
    - Program administration costs

**Texas Standards That Exceed 44 CFR Requirements: Local Capability Assessments**

MAP 1

Projects funded under the following programs. Address the type of project that was funded. If you did not receive money from one of the below grants programs, then state that.

1.1: Hazard Mitigation Grant Program - No Funding Received
1.2: Pre-Disaster Mitigation Grant Program - No Funding Received
1.3: Project Impact - No Funding Received
1.4: Hurricane-Property Protection Mitigation - No Funding Received
1.5: Flood Mitigation Assistance - No Funding Received
1.6: 406 Mitigation (through the Public Assistance Program) - No Funding Received

MAP 2

Current Building Codes. Include the following information:
2.1: Date and type of code.
2.2: How is it being enforced?
No building codes or zoning allowed are in the County by state law. Tarrant County does require permits for septic systems and construction in floodplain.

MAP 3
Current Fire Codes. Include the following information:
3.1: Date and type of code.
3.2: How is it being enforced?
No building codes or zoning allowed are in the County by state law. Tarrant County does require permits for septic systems and construction in floodplain.

MAP 4
4.1: Any other codes, sub-division regulations, etc., that are in effect in your jurisdiction?
4.2: How are they being enforced?
No building codes or zoning allowed are in the County by state law. Tarrant County does require permits for septic systems and construction in floodplain.

MAP 5
Floodplain Management. Include the following information:
5.1: Ordinance/Order Date: Court Order #83505, August 23, 2000
5.2: Do you have a Floodplain Administrator? Yes
5.3: Is the person a Certified Floodplain Manager (CFM)? Yes
5.4: Date of current floodplain maps. August 23, 2000
5.5: Any codes, regulations, etc. that prohibit development in the floodway and/or floodplain.
Tarrant County Floodplain Regulations require that where construction is permitted, all finished floor elevations (FFE) shall be a minimum of one foot above the 100-year flood elevation. On the face of the final plat, the developer is required to include the Finished Floor Elevation, and a note stating that "A floodplain permit will be required from Tarrant County for any construction in the floodplain."

Construction is not allowed within the floodplain easement, or within a FEMA designated floodplain, without the written approval of the Tarrant County Floodplain Administrator. In order to secure approval, and a Floodplain Development Permit, the property owner must submit detailed engineering plans and/or studies for the improvements, satisfactory to the Floodplain Administrator. A permit will only be issued after the Floodplain Administrator determines that the work will not have an adverse impact on adjacent property owners, will not decrease the flood carrying capacity of the watercourse, and will not create a situation that is dangerous during flooding events.

New legislation relating to enforcement of the National Flood Insurance Program now makes it possible for Tarrant County to institute a civil suit in district court to halt illegal improvements in the floodplain, restore preexisting conditions and recover a civil penalty. This legislation is commonly known as HB 218 and amends Subchapter I,

Chapter 16 of the Water Code. Tarrant County makes full use of this legislation, as well as other sections of the Water Code and our Floodplain Ordinance, to regulate and control development in the floodplains under its jurisdiction.

Tarrant County receives approximately six permit requests per year for construction within the floodplain. There have been no variances granted in the last ten years.

MAP 6
Findings/results of Building Code Effectiveness Grading Report (BCEGS). Include date of report and score. Not applicable

MAP 7
Identify other plans that your jurisdiction has or have been done in your jurisdiction.
7.1: Capital Improvement Plans: None
7.2: Comprehensive Plans: None
7.3: Storm Water Management Plans: None
7.4: Master Drainage Plans: None
7.5: Corps of Engineers: None
7.6: Flood Mitigation Plan: None
7.7: Any other plans, studies, etc. that may have been done in your jurisdiction: None

BUILDING CODE EFFECTIVENESS GRADING REPORT FINDINGS & SCORE
Not Applicable

# City of Azle

Jurisdiction Profile

Azle has an area of 8.2 square miles and a NCTCOG 2007 population estimate of 10,600.

Azle is on State Highway 199, sixteen miles northwest of downtown Fort Worth, in the northwest corner of Tarrant County; the town extends partly into Parker County. The first post office opened in 1881, and the town took the name of O'Bar, in honor of the man who obtained the postal service. Soon, however, the name was changed at the request of Steward, who donated the land for a town site, in order to have the town named Azle. The community's economy was based on agriculture. Several crops were grown, including wheat, corn, peanuts, sorghum, and cotton. The population of Azle grew steadily, and by 1920, the census recorded 150 residents. By 1933, State Highway 34 (later State Highway 199), had reached Azle from Fort Worth, greatly improving transportation capabilities between the town and the city. Also, Eagle Mountain Lake was formed by a dam on the Trinity River, east of Azle. The population grew between 1940 and 1960 from 800 to 2,696. It was 5,822 by 1980. After the 1930s, agriculture gradually declined; fields were converted from wheat and corn production to housing developments. Manufacturing increased, and in 1984, Azle had twenty-six businesses. In 1985, the population was estimated at more than 7,000. The town's proximity to Fort Worth and its position as the "Gateway to Eagle Mountain Lake" have made Azle a popular place to live. In 1990, the population was 8,868. The population grew to 9,600 by 2000. Azle is a suburban community with a rural quality of life. Eagle Mountain Lake is the Eastern border, Cross Timbers Golf Course is in the newly annexed western portion of the city. Fort Worth is just down the highway and offers The Fort Worth Nature Center and Refuge, museums, Bass Performance Hall, theatres, and malls. Horses and cattle still have room to roam and homebuyers have the choice of new starter homes in the $80's to homes in excess of half a million dollars.

| 1990 | 2000 | 2006 | 2007 |
|---|---|---|---|
| 8,868 | 9,600 | 10,450 | 10,600 |
| 2007 Population Density (persons per square mile): 1,193.43 | | | |

Land Use & Development Trends

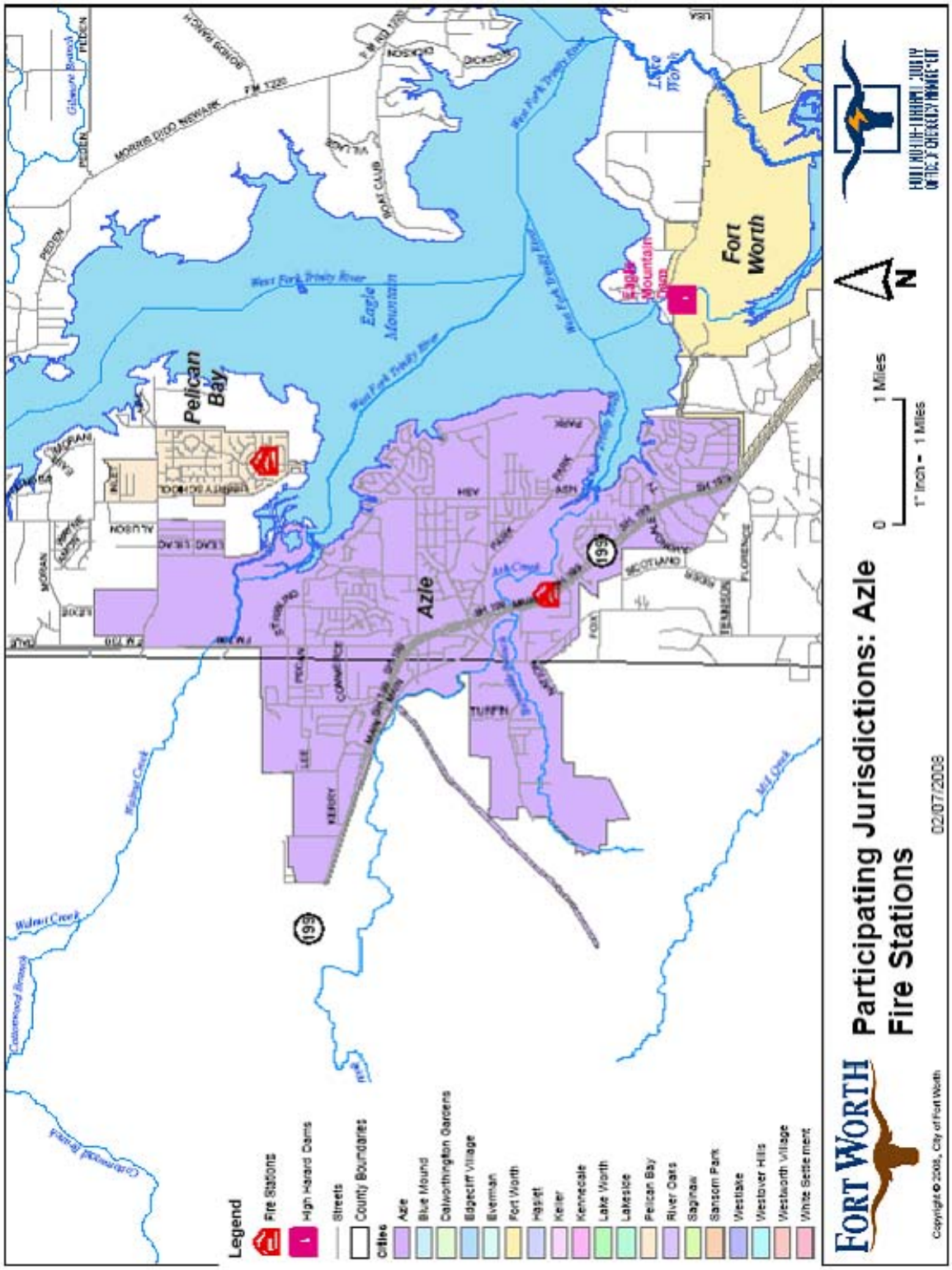
Azle is continuing to grow along with the entire region. Residential development is moving into formally agricultural or undeveloped areas of the city.

City Point-Of-Contact

Fire Chief/Emergency Management Coordinator Will Scott

Jurisdiction Unique Hazards

Hazards and vulnerabilities specific to Azle are discussed below.


Participating Jurisdictions: Azle
Fire Stations
02/07/2008
FORT WORTH
Copyright © 2008, City of Fort Worth
Legend
Fire Stations
High Hazard Dams
Streets
County Boundaries
Cities
Azle
Blue Mound
Dalworthington Gardens
Edgecliff Village
Everman
Fort Worth
Haslet
Keller
Kennedale
Lake Worth
Lakeside
Pelican Bay
River Oaks
Saginaw
Sansom Park
Westlake
Westover Hills
Westworth Village
White Settlement
Pelican Bay
Azle
Fort Worth
Eagle Mountain
Eagle Mountain Town
West Fork Trinity River
Lake Worth
0
1 Miles
1" Inch = 1 Miles
N

**DAM FAILURE**

No Vulnerability - There are no high hazard dams in Azle. The nearest upstream high hazard dam is Lake Bridgeport, approximately 30 miles from Azle. Completion of inundation studies for all high-hazard dams in the county will determine whether there is a dam failure hazard to Azle.

**DROUGHT**

Moderate Vulnerability – The water supply in Azle comes from surface water and is thus subject to drought. Azle purchases water from the Tarrant Regional Water District (TRWD). TRWD water supply comes from three reservoirs on the West Fork of the Trinity River in northwest Tarrant County and from two reservoirs located well southeast of Tarrant County. These diverse supply locations help mitigate the effects of a local drought. An additional reservoir location well northeast of Tarrant County is being pursued. There has been some preliminary discussion of constructing a pipeline to carry water from southern Oklahoma. TRWD is installing pipelines to interconnect area water supply lakes with water treatment plants in order to provide maximum flexibility in water supply and treatment.

Location – Drought can affect all of Azle.

Current Extent – As of February 2008 all of Tarrant County, including Azle, was at DO – Abnormally Dry on the Palmer Drought Severity Index.

Previous Occurrences – National Climatic Data Center records indicate that in the past ten years there have been three periods of drought in Azle; 1996 - 1998, 2000, and 2005 - 2006.

Probability of Future Events – Droughts are certain to occur again in Azle. Significant droughts significantly affecting water supply and resulting in mandatory restrictions traditionally occur on a twenty year cycle. Based on the previously cited National Climatic Data Center recent records, we can anticipate that drought conditions will occur approximately every three years.

Impact – Drought can lead to loss of water for basic needs such as drinking and fire-fighting. Droughts are associated with increased wildfire and damage from expansive soils. More common impacts are damage to landscaping and reduced recreation due to low lake levels.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Azle Drought Mitigation Action #1** | Participate in the design and implementation of the Tarrant County specific water conservation public education efforts to compliment existing programs. |

| | |
|---|---|
| **Mitigation Goal/Objective** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $2,000 for materials for distribution in Azle. |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • Water Customers<br>• City funds |
| **Responsible Agency** | • Azle Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One year |
| **Effect on New Buildings** | This action will publicize water conservation efforts that can be incorporated into new construction. |
| **Effect on Existing Buildings** | This action will publicize water conservation efforts that can be incorporated into existing construction. |
| **Cost Effectiveness** | Cost Effective – Public education programs can provide significant results for relatively low costs. |
| **Discussion:** Most cities in the area have existing water conservation programs designed to educate the public and businesses on ways to conserve water. This action will develop a Tarrant County specific program that will compliment existing programs. Jurisdictional public education efforts have been very successful in attracting the attention of local citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Azle Drought Mitigation Action #2** | Develop a contingency plan to identify potential impacts of drought 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. Impacts identified in this plan will be included in updates to the Hazard Mitigation Action Plan. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • Water Suppliers<br>• City funds |

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|---|---|
| **Responsible Agency** | • Azle Fire Department/Emergency Management<br>• Fort Worth – Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will identify drought impacts in Azle thus providing specific information for builders of new structures to incorporate drought mitigation into the structures. |
| **Effect on Existing Buildings** | This action will identify drought impacts in Azle thus providing specific information for owners of existing structures to incorporate drought mitigation into the structures. |
| **Cost Effectiveness** | Cost Effective – This planning effort will have a low cost with the potential for significant benefits for the entire community. |
| **Discussion:** This planning effort will focus attention on the effects of drought on Azle. Specific drought effects will be identified and efforts can be made to mitigate those effects. | |

**EXPANSIVE SOILS**

Low Vulnerability - Expansive soils have caused damage to some structures in limited areas of Azle. However, damage has been limited to very small areas and there are no reports of significant damage to commercial structures or infrastructure.

Location – Expansive soils are found in small areas in Azle. We could not locate a map of expansive soils in Azle.

Extent – The extent of expansive soils in Azle is believed to be Very Low (0% - 20%) to Low (21% - 50%).

Previous Occurrences – We could find no empirical data on previous occurrences of damage from expansive soils, but it is believed that expansive soils have caused problems since the first buildings were constructed in this area.

Probability of Future Events – Due to the variability of soil types and construction quality, it is very difficult to predict future occurrences of problems with expansive soils. However, a study published in the fall 2003 issue of *Environmental Geology* cited in the September 19, 2003 *Dallas Business Journal* indicates that many new developments in the DFW Metroplex are being built on soil that is more unstable than soils built on prior to 1990. This could lead to a higher incidence of expansive soil related damage in the future.

Impact – The impact of expansive soils ranges from cosmetic cracks in walls to substantial foundation and structural damage that can result in the need to demolish the building. Infrastructure such as pipelines can be damaged causing increased maintenance

and repairs, damaged beyond repair requiring replacement, damaged to the point of failure.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Azle Expansive Soils Mitigation Action #1** | Improve construction techniques to mitigate expansive soils through building code enhancements. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined (Minimal – Staff Time Only) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building permit fees |
| **Potential Matching Funding Sources** | • City funds<br>• Building permit fees |
| **Responsible Agency** | • Azle Utilities Manager<br>• Azle Fire/Emergency Management |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will make new buildings more resistant to damage from expansive soils. |
| **Effect on Existing Buildings** | This action will require modifications to existing buildings to be more resistant to damage from expansive soils. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will improve construction quality and reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Azle Expansive Soils Mitigation Action #2** | Educate construction contractors, home owners, and business owners about mitigation techniques. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $2,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building Permit Fees |
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | • Azle Utilities Manager<br>• Azle Fire/Emergency Management |

| | |
|---|---|
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will provide builders of new construction with expansive soil mitigation techniques that will reduce damage. |
| **Effect on Existing Buildings** | This action will provide owners of existing buildings with expansive soil mitigation techniques that will reduce damage. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will provide construction contractors and home/business owners with techniques designed to reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**EXTREME HEAT**

High Vulnerability - Summer heat and humidity can occur anytime from May through October. Community health services actively work with at risk populations to prevent heat related deaths and injuries. The elderly, very young people and people with poor health are most at risk from summer heat. People who work outside or in un-air-conditioned buildings are also at high risk to the direct effects of summer heat. Summer heat can also lead to electrical service outages if equipment fails or demand exceeds available supply. Most public safety and special facilities are equipped with emergency generators.

Location - Throughout the City.

Extent - Summer temperatures can reach as high as 113 degrees. Azle is also subject to high humidity.

Previous Occurrences - This is an annual occurrence. The summer of 1980 was a record year with 69 consecutive days of temperatures of 100 degrees or more. We were unable to find a reliable record of deaths or injuries related to heat.

Probability of Future Events - Hot summer temperatures are certain to continue to occur in Azle.

Impact - Summer heat can cause widespread electrical outages resulting in dangerous conditions, especially for at-risk populations. Occasionally "cooling centers" are opened at community centers to provide a safe place for citizens to seek refuge from the heat. Extreme heat can have economic impacts if construction work is curtailed or outdoor special events are cancelled.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Azle Extreme Heat Mitigation Action #1** | Determine feasibility of expanding monitoring of populations at risk from extreme heat |

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|---|---|
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined. Staff time |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Other State or Federal Public Health Grants |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Azle Fire/Emergency Management<br>• Tarrant County Public Health (Support) |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | None - This action is intended to expand monitoring of people only. |
| **Effect on Existing Buildings** | None - This action is intended to expand monitoring of people only. |
| **Cost Effectiveness** | Pending, but believed to be Cost Effective |
| **Discussion:** This action would determine the feasibility of expanding monitoring of populations at risk from extreme heat. Existing at risk population monitoring programs will be reviewed to ensure all known populations at risk from extreme heat are included. Any newly discovered at risk populations will be evaluated for inclusion in existing monitoring programs. Tarrant County Public Health provides public health services throughout the county. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Azle Extreme Heat Mitigation Action #2** | Increase public education programs on the dangers of excessive heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness |
| **Priority** | Medium |
| **Estimated Cost** | $2,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program |
| **Potential Matching Funding Sources** | • City Funds<br>• Other State or Federal Public Health Grants |
| **Responsible Agency** | • Azle Fire/Emergency Management<br>• Tarrant County Public Health (Support) |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Effect on Existing Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits. |

**Discussion:** Public education on severe weather in Azle has traditionally focused on severe thunderstorms and associated hazards (tornadoes, lighting, flooding, high winds). This action would expand public education to include hazards from extreme heat.

**FLOOD**

High Vulnerability – Azle is located on Eagle Mountain Lake and thus receives drainage from a wide area as creeks drain a wide area into the lake. Homes, businesses, and a hospital are located along creeks. Water supply and sewer lines are vulnerable to flood damage along Ash Creek and Walnut Creek. Along Walnut Creek there are 12 inch and 8 inch water main crossings and a 4 Inch sewer line crossing. On Ash Creek there are 16 and 8 Inch water main crossings as well as 15 inch, 6 inch, and 4 Inch sewer line crossings. 10 inch and 8 Inch sewer lines are routed along Ash Creek and are subject to damage from flooding.

Location - Throughout the City along creeks and drainage structures as well as flooding of lakefront property on Eagle Mountain Lake. Ash Creek and Walnut Creek through the center of the City are prone to flash flooding. Ash Creek upstream of Texas Highway 199 is a problem area due to inadequate capacity of the drainage structure under the highway. The Mountainview addition along Lakecrest Parkway has also proven to be flood prone.

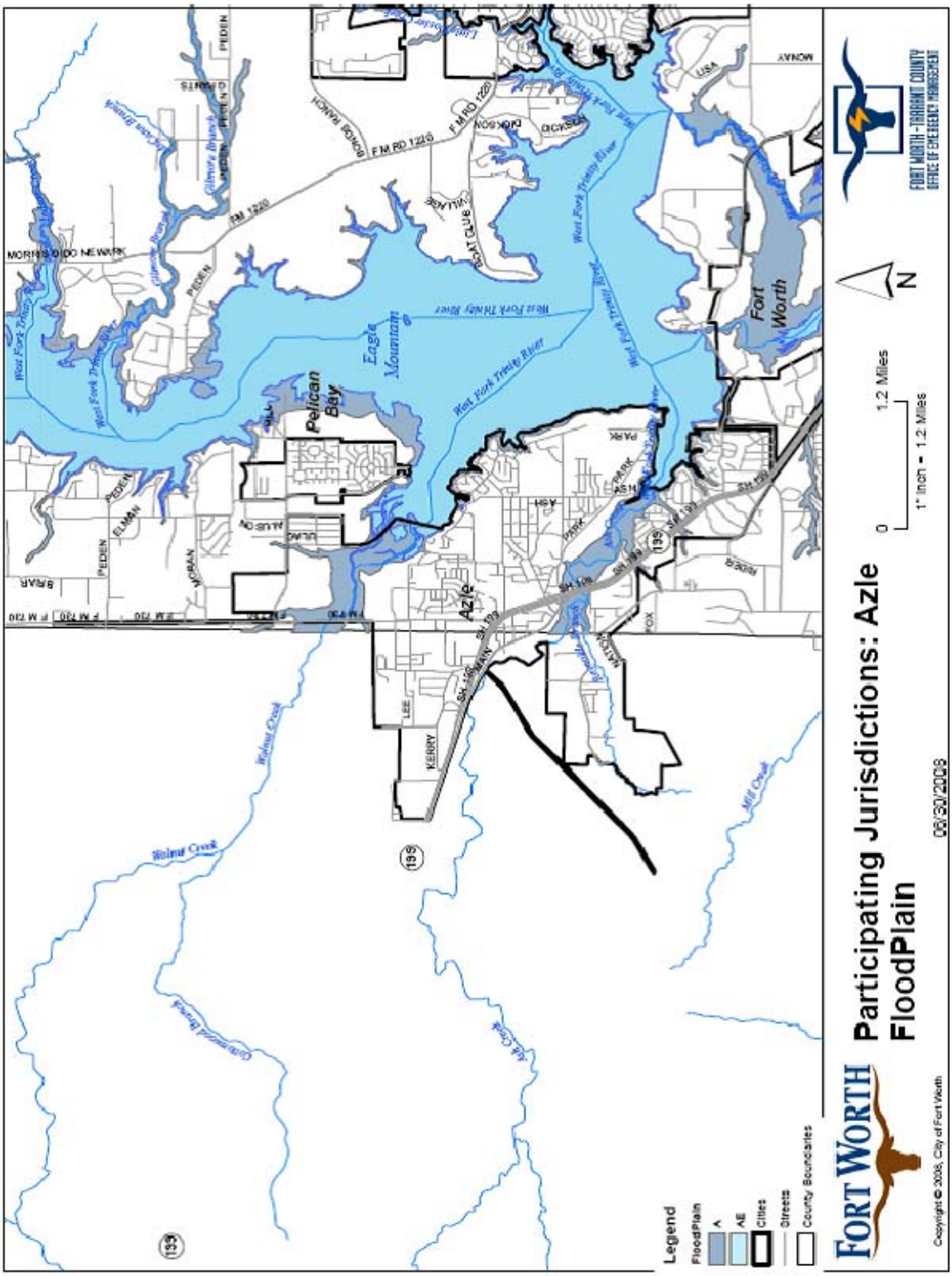
Extent - Flash floods are the most common type of flooding in Azle. Areas adjacent to Eagle Mountain Lake have flooded to a depth of 4 feet in 1957.

Previous Occurrences - Minor flooding occurs frequently, especially during the spring and early summer. In June of 2004 significant flooding occurred on both Ash Creek and Walnut Creek. State highways over both creeks were closed due to flooding. Homes, businesses, a hospital, and utilities were affected by the flooding. This included closing off traffic on Highway 199 east of Stewart Street and West of Jackson Trail. FM 730 closed due to flooding at Calhoun Bend and north into the Town of Boyd. Estimated cost for City forces was $160,000.00. In 2004 and 2007 flooding on Ash Creek exposed a sewer line that parallels the creek near Texas Highway 199.

Probability of Future Events – Based on previous experience Azle is certain to suffer flash flood events every year. National Weather Service records indicate an average of 11 flash flood events per year in county-wide. Continued development in Azle, upstream, and throughout the County and the resulting increase in impervious cover will increase the likelihood and severity of flooding.

Impact – Flood impacts in Azle are significant. Structures and utilities have proven vulnerable and can be affected by future events. Flash floods kill more people than any other hazard associated with thunderstorms. Property damage from flash flooding is seldom covered by insurance, which makes it very difficult for citizens to recover from the flood. Due to the very rapid rate of development and growth we are experiencing problems with determining actual building footprints within flood plains and will be using planimetric GIS data from the NCTCOG to resolve this issue when it becomes

available. At that time we will be able to accurately identify the number and types of buildings vulnerable to flooding; as well as access other data associated with those locations such as appraised value, census data, and owner information.


Participating Jurisdictions: Azle
FloodPlain
06/30/2008
FORT WORTH
FORT WORTH - TARRANT COUNTY
OFFICE OF EMERGENCY MANAGEMENT
Legend
FloodPlain
A
AE
Cities
Streets
County Boundaries
Copyright © 2008, City of Fort Worth
0
1.2 Miles
1" Inch = 1.2 Miles
N
Pelican Bay
Eagle Mountain
Fort Worth
Azle
West Fork Trinity River
Walnut Creek
Mill Creek
MORRIS DIDO NEWARK
PEDEN
ELMAN
MORAN
ALLISON
BRIAR
LEE
KERRY
PARK
ASH
SH 199
SH 199
SH 199
SH 199
FM 1220
F M RD 1220
BONDS RANCH
DICKSON
VILLAGE
BOAT CLUB
LISA
MONAY
199

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Azle Flood Mitigation Project #1** | Participate in development of Tarrant County specific "Flood Preparedness" brochure. |
| **Hazard Addressed** | Flooding |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of Flood events.<br>1. c. Develop effective flood mitigation public education materials. |
| **Priority** | High |
| **Estimated Cost** | Staff time only |
| **Potential Funding Sources** | Hazard Mitigation Grant Program<br>Private Foundations<br>Private Sector Donations |
| **Potential Matching Funding Sources** | City Budget<br>Private Foundation Grants |
| **Responsible Agency** | • Azle Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 6 Months |

Develop Tarrant County specific "Flood Preparedness" brochure. Once developed, the brochure will be distributed County-Wide. Historically flood prone areas will be targeted for door-to-door distribution and neighborhood meetings to present the brochure and solicit input for *Fort Worth Hazard Mitigation Action Plan* revisions.

The brochure will include:

- Description of Tarrant County flood hazards
- "Case Studies" of previous flood events in Tarrant County
- Preparedness and "self-help" mitigation information
- Benefits of participation in NFIP
- Advantages of flood insurance
- Risks of not having flood insurance
- Warnings that typical homeowner's insurance does not cover rising water
- Solicitation of input for the *Fort Worth Hazard Mitigation Action Plan*

**Cost Benefit Review:**
This project will provide valuable information to the public in a relatively short time and with relatively low costs. It will also have the added benefit of increasing public awareness of mitigation. The estimated cost could easily be offset by reduced losses to the public in a single small flood event.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Azle Flood Mitigation Project #2** | Protect utilities along Ash Creek by armoring the creek bank. |
| **Hazard Addressed** | Flooding |

| | |
|---|---|
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of Flood events. |
| **Priority** | High |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | Hazard Mitigation Grant Program<br>City Budget |
| **Potential Matching Funding Sources** | City Budget<br>Utility Funds |
| **Responsible Agency** | Azle Public Works |
| **Estimated Completion Time Frame** | 24 Months |
| Sewer and water pipelines have been exposed by previous flood events. Armoring the creek bank will help protect the pipelines from future flood events. | |
| **Cost Benefit Review:**<br>A detailed cost benefit review has not been conducted for this project. Armoring the creek bank will provide increased protection and cost much less than relocating the pipelines. There will be on-going maintenance expenses associated with the armoring.<br><br>The project would be a cost effective means to provide some protection for the pipelines until it is determined whether relocating the pipelines away from the creek is feasible. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Azle Flood Mitigation Project #3** | Protect utilities along Ash Creek by relocating water and sewer lines away from the creek to the extent possible. |
| **Hazard Addressed** | Flooding |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of Flood events. |
| **Priority** | High |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | Hazard Mitigation Grant Program<br>City Budget |
| **Potential Matching Funding Sources** | City Budget<br>Utility Funds |
| **Responsible Agency** | Azle Public Works |
| **Estimated Completion Time Frame** | Unknown |
| **Discussion:**<br>Sewer and water pipelines have been exposed by previous flood events. Relocating the pipelines away from the creek bank will permanently mitigate the hazard from flooding.<br><br>In addition to securing funds; other issues with this project will include determining new pipeline routes and obtaining property and/or right-of-way. | |

**Cost Benefit Review:**
A detailed cost benefit review has not been conducted for this project. This project will provide a permanent solution to protecting the pipelines from flood events. However, a detailed study will be required to determine feasibility of the project. Issues to be considered in detail include gravity flow for sewage, the potential need for a lift station, and the potential for future growth in the area.

The project will have significant costs for engineering, property/right-of-way acquisition, and construction. If it is feasible, the project would be cost effective since it will provide permanent protection for the pipelines.

**HAILSTORM**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of large hail occur in Azle several times per year. Tarrant County averages eleven significant thunderstorm events (large hail, high winds) per year according to National Weather Service records. Most structures in Azle can resist the effects of all but the most severe hailstorms. There are several mobile and manufactured home parks in Azle that are more vulnerable to hailstorms than site built structures. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to hailstorms. Vehicles have proven to be vulnerable to hailstorms with widespread severe vehicle damage reported in 1980 and 1995.

Location - Throughout the City.

Extent - Azle is subject to the hazards of severe thunderstorms, including large hail. Hail stones up to the size of grapefruit (H9 on the Combined NOAA/TORRO Hailstorm Intensity Scales) have been reported in Tarrant County.

Previous Occurrences – Azle has experienced large hail events, but none that have been as significant as the 1980 and 1995 hailstorms that struck Fort Worth.

Probability of Future Events - Thunderstorms with hail are certain to continue to occur in Azle. County-wide, hail falls on about two or three days per year, ordinarily with only slight and scattered damage (*National Weather Service*).

Impact – The impact form hailstorms can be significant in extreme events such as the hailstorms of 1980 and 1995 in Fort Worth. Thousands of homes and vehicles can be damaged in a single storm with millions of dollars in damages. Vehicles are especially impacted by large hails with windshields being the vulnerable part. A recurring problem following hailstorms is broken windshields in vehicles belonging to populations who do not have vehicle insurance and cannot afford the replacements costs, resulting in the owners having difficulty traveling to work, medical appointments, etc.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Azle Hailstorm Mitigation Action #1** | Develop public education campaign to encourage "hail resistant" roofing in new construction and roof replacements. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $2,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• Building /Permit Fees<br>• City Funds |
| **Responsible Agency** | • Azle Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will potentially decrease the damage caused by most hailstorms in new buildings. |
| **Effect on Existing Buildings** | This action will potentially decrease the damage caused by most hailstorms in existing buildings. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing hailstorm damage. One long term benefit will be reduced property insurance as claims related to hail damage are reduced. |
| **Discussion**: Public education has proven to be a low cost effective means to achieve changes public behavior. Encouraging hail resistant roofing can benefit citizens through reduced damage, business through reduced damage to their buildings and reduced claims against insurance companies, and government through reduced request for assistance. This campaign can be developed in conjunction with the Tarrant County effort. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Azle Hailstorm Mitigation Action #2** | Evaluate City buildings to determine feasibility of installing hail resistant roofing and window coverings with a focus on critical infrastructure. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• City Funds |

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| **Responsible Agency** | • Azle Utilities Manager<br>• Azle Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on new City buildings. |
| **Effect on Existing Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on existing City buildings. |
| **Cost Effectiveness** | Cost Effective – Although currently undetermined, this project is believed to be cost effective. |
| **Discussion:** Installing hail resistant roofing and window coverings on City buildings could prevent or limit damage to City buildings thus avoiding costs to the City as well as preventing or limiting loss of use of damaged facilities. | |

**HIGH WINDS**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of high winds are a hazard in Azle. Tarrant County averages ten reported significant thunderstorm events (large hail, high winds) county-wide per year. In addition, strong weather fronts can sometimes be accompanied by high winds which occasionally cause damage. Most structures in Azle can resist the effects of all but the most severe high wind events. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to high winds. There are several mobile home and manufactured home parks in Azle which are more vulnerable to the effects of high winds.

Location - Throughout the City.

Extent - Severe thunderstorms with high winds with speeds in excess of 90 mph have been reported in Azle.

Previous Occurrences – We could find no records of high wind damage in unincorporated Azle. There are reports of electrical service loss due to high winds blowing down tree limbs onto power lines.

Probability of Future Events – Based on previous experience, Azle can expect to experience several significant thunderstorm events with high winds per year.

Impact – Records on high wind events are difficult to separate from severe thunderstorm records. High winds in Azle typically cause little damage to commercial buildings. More often high winds cause damage to roofs, trees, and signs.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Azle High Winds Mitigation Action #1** | Enact building codes to reduce damages from high winds. |

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| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined – Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Azle City Attorney<br>• Azle Utility Manager |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will potentially identify a means to reduce high wind damage on new buildings. |
| **Effect on Existing Buildings** | This action will potentially identify a means to reduce high wind damage on new buildings. |
| **Cost Effectiveness** | Cost Effective – Although costs are undetermined, this action is believed to be cost effective since the action will require staff time only. |
| **Discussion:** Enhanced building codes will reduce damages from high wind events. Devices such as "hurricane clips" can make structures significantly more storm resistant. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Azle High Winds Mitigation Action #2** | Educate builders and residents about mitigating wind damage. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | $10,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |
| **Responsible Agency** | • Azle Utility Manager<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on new buildings. |
| **Effect on Existing Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on existing buildings. |

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| **Cost Effectiveness** | Cost Effective – The low cost of developing and providing high wind mitigation compared with savings to the community make this action cost effective. |
| **Discussion:** Public education has proven to be a low cost and effective means to achieve changes public behavior. High winds have not been a focus of severe weather preparedness. | |

**LANDSLIDES**

No Vulnerability - Although there is some relatively steep terrain in portions of unincorporated Tarrant County, the relief is associated with rocky outcrops and not susceptible to landslides. Other than infrequent slumping along highways at overpasses, there is no history of landslides in unincorporated Tarrant County. Based on the lack of vulnerability, landslides will receive no further consideration in this plan for unincorporated Tarrant County. However, landslide hazards will be reviewed during the annual review of this plan and we will continue looking for areas with landslide potential during hazard surveys.

**LEVEE FAILURE**

No Vulnerability – There are no levees or areas that would be affected by levee failure in unincorporated Tarrant County. Based on the lack of vulnerability, levee failure will receive no further consideration in this plan for unincorporated Tarrant County.

**LIGHTNING**

Moderate Vulnerability – Lightning is one of the most common hazards in Azle. Thunderstorms (and by definition, lightning) occur an average of 30 – 50 days per year (*Oklahoma Climatological Survey*). Lightning is the second most common cause of weather-related deaths in Texas (*National Weather Service*). Lightning information is available only on a county-wide basis.

Location – Throughout the City.

Extent – We could find no references to the average number of strikes per storm in Azle. However, lightning is by definition associated with thunderstorms.

Previous Occurrences – Lightning strike in February 2002 hit a sewer pump station causing damage to 4 25 HP pumps and control panel resulting in sewer overflow resulting in $50,000 in damages. A lightning strike in November 2006 hit the City of Azle radio tower causing damage to 911 system, phone system, radios, and radio console with an estimated repair cost of $75,000.

Probability of Future Events – Based on past experience Azle will experience 30 – 50 thunderstorm days each year. Some days will have more than one thunderstorm during a given thunderstorm day.

Impact – Although lightning is the second most common cause of storm related deaths in Texas, lightning deaths remain relatively rare. Lightning does cause property damage several times per year (we could not find statistical data to validate this observation).

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Azle Lightning Mitigation Action #1** | Provide lightning mitigation materials with building permit packets. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program |
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit fees |
| **Responsible Agency** | • Azle Utility Manager |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will provide materials that will reduce the vulnerability of new buildings to lightning. |
| **Effect on Existing Buildings** | This action will provide materials that will reduce the vulnerability of existing buildings that are being remodeled to lightning. |
| **Cost Effectiveness** | Cost Effective – The low cost of this project would be offset by eliminating just one lightning caused building loss. |
| **Discussion:** Lightning mitigation materials will be included in all building permit packets distributed to builders or citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Azle Lightning Mitigation Action #2** | Ensure all City critical infrastructure has adequate lightning mitigation in place and upgrade protection as necessary. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | $20,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Azle Utility Manager<br>• Azle Fire/Emergency Management |
| **Estimated Completion Time Frame** | One Year |

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| **Effect on New Buildings** | This action will ensure new buildings that house critical infrastructure have adequate lightning mitigation. |
| **Effect on Existing Buildings** | This action will ensure existing critical infrastructure has adequate lightning mitigation. |
| **Cost Effectiveness** | Cost Effective – The destructive and sometimes capricious nature of lighting warrant the expense of this action compared with the benefits of avoiding damage to critical infrastructure. |
| **Discussion:** Review and confirmation of the adequacy of lightning protection systems in City buildings housing critical infrastructure is worthwhile considering the number of thunderstorms experienced in Azle. | |

**SEVERE THUNDERSTORM**

High Vulnerability - Severe thunderstorms are the most common hazard in Tarrant County. Most structures in Tarrant County can resist the effects of all but the most severe thunderstorms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to thunderstorms. There are a number of mobile and manufactured home parks in Azle that are vulnerable to the effects of severe thunderstorms.

Location - Throughout the City

Extent - Azle is subject to the hazards of severe thunderstorms of all magnitudes.

Previous Occurrences – Azle has experienced the effects of a number of severe thunderstorms. The 2004 storm was the most significant storm in recent history.

Probability of Future Events – Severe thunderstorms will occur in Azle several times per year.

Impact – A single severe thunderstorm can cause damage from hail, high winds, lightning, and/or tornadoes to thousands of structures.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Azle Mitigation Project #1** | Conduct technical assessment to determine the feasibility of structurally hardening the Azle Fire Station located at 613 Southeast Parkway against severe weather. |
| **Hazard Addressed** | Tornado/Severe Thunderstorm |
| **Mitigation Goal/Objective** | 2. Reduce loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | High |
| **Estimated Cost** | $50,000 |

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| **Potential Funding Sources** | • Hazard Mitigation Grant Program |
| **Potential Matching Funding Sources** | • Private Foundation Grants<br>• Other State or Federal Grants<br>• City General Fund |
| **Responsible Agency** | • Azle Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | None - This project will determine the feasibility of structurally hardening the existing Azle Fire Station against severe weather. |
| **Effect on Existing Buildings** | This project will determine the feasibility of structurally hardening the Azle Fire Station against severe weather. |
| **Cost Effectiveness** | Cost Effective - This project will provide the basis for a realistic cost benefit analysis of the feasibility of hardening the Azle Fire Station against severe weather events. The relatively low cost of this project compared with the potential benefits of protecting a city's emergency response equipment against the jurisdiction's most likely hazard event result in a favorable cost benefit review. |

**Discussion:**
This project will provide for determining the feasibility of hardening the City's only Fire Station against severe weather. This project will contribute to protecting the City's emergency response equipment so that it will be available to assist the citizens of Azle in responding to and recovering from severe weather or other events. Final project details will be developed in accordance with grant requirements at the time the project is funded.

The cost estimate is a conservative "best guess" based on a structural analysis of the existing fire station. That analysis would require:

- Structural analysis of the building by a Structural Engineer
- Analysis of electrical systems
- Analysis of HVAC systems
- Review of building codes
- Design of structural changes to existing building

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Azle Severe Thunderstorm Mitigation Action #2** | Encourage builders to install storm resistant construction such as "hurricane clips". |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | High |
| **Estimated Cost** | $2,000 |

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| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |
| **Responsible Agency** | • Azle Utility Manager<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will encourage storm resistant construction in new buildings. |
| **Effect on Existing Buildings** | This action will encourage storm resistant construction in existing buildings as they are remodeled. |
| **Cost Effectiveness** | Cost Effective – The low cost of this action will be offset by a reduction in damage from severe thunderstorms. |
| **Discussion:** Effective education on storm resistant construction can reduce damage from severe thunderstorms. Insurance companies may be willing to fund or provide educational materials and/or provide discounts to persons who install storm resistant devices. | |

**SEVERE WINTER STORM**

Moderate Vulnerability - Since 2000 the national Weather Service has reported 14 Winter Storm/Ice events. Winter storms in Azle usually consist of short-lived icing events (ice on the roads for a few hours) that primarily affect traffic and cause numerous motor vehicle accidents. Occasionally an ice storm will cause widespread power outages for as long as several days. ONCOR Electric Delivery and Tri-County Electric Service have aggressive tree trimming programs. Most structures in Azle can resist the effects of all but the most severe winter storms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to winter storms. Electrical service outages are usually the most serious threat in this area. Most public safety and special facilities are equipped with generators.

Location - Throughout the City

Extent - Severe ice storms have resulted in accumulations in excess of two inches. Most storms leave only a light coating or glaze of ice.

Previous Occurrences – Severe Winter Storms are typically regional events. Azle's location in northwest Tarrant County makes it slightly more likely to experience winter weather than other parts of the County. Azle has averaged two winter storms per year since 2000. Most winter storms resulting only minor inconveniences and a few motor vehicle accidents.

In 1978 up to an inch of ice coated area trees and roadways causing $14 million in damages region-wide and making travel almost impossible for two days.

In 1996 a winter storm dropped two to four inches of a mixture of sleet, freezing rain, and snow in Azle over Thanksgiving weekend causing many motor vehicle accidents and some electrical service outages.

In 2003 a winter storm dropped one inch of sleet across Azle resulting in numerous motor vehicle accidents and closing schools for two days.

Probability of Future Events - Azle can expect to experience two winter storms per year with a severe winter storm once each ten years.

Impact - Winter storms can cause widespread electrical and telephone service outages, make travel dangerous or impossible, and damage structures. Deaths and injuries due to vehicle accidents and slips/falls are common during ice storms. Occasional deaths and injuries from carbon monoxide poisoning due to improper heating have occurred. Economic losses due to lost production can be significant. Damage from frozen pipes can lead to significant expenses for homeowners.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Azle Severe Winter Storm Mitigation Action #1** | Increase public education concerning winter storm preparedness and mitigation. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | Medium |
| **Estimated Cost** | $2,000 |
| **Potential Funding Sources** | • City Funds<br>• Hazard Mitigation Grant Program |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Azle Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into new buildings. |
| **Effect on Existing Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost is effective when compared to benefits provided to citizens. |
| **Discussion:** Winter weather preparedness has not been emphasized in Azle as much as severe thunderstorms. This action will provide preparedness information to citizens during the fall. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Azle Severe Winter Storm Mitigation Action #2** | Purchase additional street sanding capacity |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program |
| **Potential Matching Funding Sources** | • County Funds |
| **Responsible Agency** | Azle Parks and Streets Superintendent |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will have no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Sanding streets is essential to allow emergency vehicles to respond during severe winter events. |
| **Discussion:** Sanding equipment can be mounted on existing equipment to provide sanding capabilities. During severe winter weather events streets around hospitals, fire stations and other critical facilities are sanded along with major intersections and roadways. Additional sanding capacity would allow for quicker sanding of these areas and for more repeat sanding during prolonged winter weather events. This will improve public safety by facilitating emergency response as well as reducing motor vehicle accidents. | |

**STREAM BANK EROSION**

Moderate Vulnerability – Water supply and sewer lines are vulnerable to flood damage along Ash Creek and Walnut Creek. Along Walnut Creek there are 12 inch and 8 inch water main crossings and a 4 Inch sewer line crossing. On Ash Creek there are 16 and 8 Inch water main crossings as well as 15 inch, 6 inch, and 4 Inch sewer line crossings. 10 inch and 8 Inch sewer lines are routed along Ash Creek and are subject to damage from flooding. Further analysis using GIS and field verification can specifically identify vulnerable structures.

Location – Along Ash Creek and Walnut Creek through central Azle and then southeast in Eagle Mountain Lake.

Extent – Stream bank erosion has caused utility lines to become exposed and has damaged roadway drainage structures.

Previous Occurrences – Sewer and water lines were exposed during flooding in 2004 and 2007.

Probability of Future Events – It is likely that flooding will expose and possibly damage utility lines in the next five years.

Impact – Damage or rupture of the sewer and water lines could cause health/sanitation hazards, loss of service to citizens, and significant environmental damage.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Azle Stream Bank Erosion Mitigation Action #1** | Relocate sewer line along Ash Creek. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events.<br>a. Remove structures from flood prone areas. |
| **Priority** | High |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Azle Utility Manager |
| **Estimated Completion Time Frame** | 3 years |
| **Effect on New Buildings** | This action will not affect new buildings. |
| **Effect on Existing Buildings** | This action may affect existing buildings if significant construction is required. |
| **Cost Effectiveness** | Cost Effective – Although the final project cost is undetermined, it is believed the action will be cost effective. |
| **Discussion:** This project is in the design phase. Relocating the sewer line will eliminate a hazard that has nearly occurred during floods in 2004 and 2007. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Azle Stream Bank Erosion Mitigation Action #2** | Determine and implement erosion control techniques along Ash Creek. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Azle Parks and Streets Superintendent |
| **Estimated Completion Time Frame** | 3 years |
| **Effect on New Buildings** | This action will not have an effect on new buildings. |
| **Effect on Existing Buildings** | This action will protect existing buildings along Ash Creek. |

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| **Cost Effectiveness** | Cost Effective – Although the final project cost is undetermined, it is believed the action will be cost effective. |
| **Discussion:** This action will review erosion control techniques and implement the most effective technique for controlling erosion along Ash Creek. | |

**TORNADO**

High Vulnerability – All structures in Azle are vulnerable to tornadoes. Very few structures can withstand the effects of an F5 tornado. However, the March 28, 2000 F3 tornado that struck Fort Worth provided good evidence that well built structures can protect people who take appropriate shelter inside those buildings. There are a number of mobile and manufactured home parks in Azle that are more vulnerable to tornadoes than site constructed buildings.

Location - Tornadoes can occur anywhere in Azle.

Extent - Azle is subject to tornadoes of all magnitudes, including F5 tornadoes.

Previous Occurrences – We found no reports of tornados causing damage in Azle.

Probability of Future Events - Tarrant County has averaged one reported tornado per year and can expect that average to continue. Increasing population and the spread of development into formally agricultural or undeveloped land increases the likelihood of a tornado causing casualties or property damage each year. It is likely that Azle will experience damage from a tornado at some point.

Impact - Tornadoes can cause deaths, injuries and property damage/destruction. Special facilities such as hospitals, fire stations, and utilities can be damaged or destroyed. Citizens who live in neighborhoods struck by tornadoes can experience disruption of their life styles and traditions. Areas struck by tornadoes can experience increased demand for mental health services as people deal with grief and stress.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Azle Tornado Mitigation Project #1** | Assist citizens with funding for building tornado safe rooms or in-ground shelters. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction |
| **Priority** | High |
| **Estimated Cost** | $100,000 (25 Safe Rooms at $4,000 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Community Development Block Grant Funds |
| **Potential Matching Funding Sources** | Home/Building Owner |

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| **Responsible Agency** | • Azle Fire/Emergency Management<br>• Fort Worth – Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This project will encourage new buildings to be constructed with tornado safe rooms as part of the construction process. The safe room will enhance the overall storm resistance of the building. |
| **Effect on Existing Buildings** | This project will encourage homeowners to construct/install tornado safe rooms in their existing homes. A safe room will enhance the overall storm resistance of the building. |
| **Cost Effectiveness** | Cost Effective - Safe rooms and in-ground shelters have been proven to reduce deaths and injuries during tornadoes and severe thunderstorms. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of safe rooms and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

**Discussion:**
This project will reimburse costs associated with tornado safe room or in-ground shelter installation in new or existing homes. Safe rooms provide increased protection for citizens during severe thunderstorms and tornados. Safe rooms have been proven to save lives and reduce injuries from severe weather events. FEMA publication 320 (*Taking Shelter from the Storm, Building a Safe Room Inside Your House*) provides the standards for safe rooms. As stated on the FEMA website: Although a *"residence may be built "to code," that does not mean it can withstand winds from extreme events such as tornadoes and major hurricanes. The purpose of a safe room or a wind shelter is to provide a space where you and your family can seek refuge that provides a high level of protection. To protect its occupants, a safe room must be built to withstand high winds and flying debris, even if the rest of the residence is severely damaged or destroyed."*

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to home owners will be for no more than $3,000 or 75% of cost, whichever is less
- Eligibility will be limited to individuals who own their home at the time of application
- The safe room or in-ground shelter must be constructed/installed in the primary residence of the applicant
- Each eligible homeowner can only receive one reimbursement, regardless of the number of shelters he/she may purchase/install
- In-ground shelters must meet requirements established in the National Performance Criteria for Tornado Shelters dated May 28, 1999.
- Safe Rooms must meet the requirements of FEMA Publication 320
- Safe Rooms and shelters must meet all applicable city and/or county codes
- Previously owned or used shelters will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Azle Tornado Mitigation Project #2** | Assist citizens with funding for purchase of Weather Alert Radios |
| **Mitigation Goal/Objective** | 4. Increase the effectiveness of warning systems in Azle.<br>4. a. Increase the number of homes and businesses with Weather Alert Radios. |
| **Priority** | High |
| **Estimated Cost** | $10,000 (250 Weather Alert Radios at $40 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Private Sector Donations |
| **Potential Matching Funding Sources** | Citizen/Business Owner |
| **Responsible Agency** | • Azle Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |

| | |
|---|---|
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings except for providing additional warning time of severe weather events thus allowing citizens more time to secure their home or business against approaching severe weather. |
| **Cost Effectiveness** | Cost Effective – Weather Alert Radios are a proven means to alert and warn citizens about severe weather and civil emergencies. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of Weather Alert Radios and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

***NOTE**: We are aware that Weather Alert Radios are on the "2007 Ineligible Planning Activities" list. It is our opinion that Weather Alert Radios should be considered eligible due to their very high benefit and very low cost.*

This project will reimburse 75% of the cost for citizens to purchase Weather Alert Radios, with the citizen responsible for the remaining 25%. Weather Alert Radios provide the best means for citizens to receive emergency alerts when they are indoors. Severe weather is the primary hazard in our area. Early alert and warning has proven to be a significant factor in saving lives during severe weather events.

In addition, the Weather Alert Radios can be activated for civil emergencies such as hazardous materials incidents. Effective warning saves lives, especially during severe weather events. Weather alert radios provide a proven means of indoor warning to citizens any time of the day or night and compose the vital indoor portion of our emergency warning system.

Warning systems have been shown to have value beyond the initial warning. Persons receiving warning relay the information to family and friends to ensure they are aware of the hazard. The secondary and tertiary warning can greatly amplify the effectiveness of the warning system.

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to citizens will be for no more than $30 or 75% of cost of the radio, whichever is less
- Eligibility will be limited to residents of Azle
- The citizen must sign an agreement to keep the radio operational
- Each eligible homeowner can only receive one reimbursement, regardless of the number of radios purchased
- Previously purchased radios will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**WILDFIRE**

Moderate Vulnerability - The rural-urban interface in Azle has resulted in several recent wildfires. Areas along Ash Creek and around Eagle Mountain Lake have homes surrounded by thick brush and large trees. Access to fight the wildfires can be very difficult due to the thick growth.

Location - The areas of most concern are along Ash Creek, Walnut Creek, and around Eagle Mountain Lake. These areas have areas of rural-urban interface. Access to fight wildfires is often difficult due to thick trees and undergrowth, semi-swampy terrain, and lack of roads.

Extent - The effects of wildfire are deaths, injuries, loss of structures, loss of wild lands, and loss of wildlife habitat.

Previous Occurrences - Wildfires in Azle are typically associated with droughts. A number of wildfires occurred during the droughts from 1996 - 1998, 2000, and from 2005

- 2006. In 2007 wildfires occurred along Ash Creek near newly developed and developing areas.

Probability of Future Events - Wildfires are likely to occur annually and increase in frequency and severity as the population continues to increase and formally rural areas are developed.

Vulnerability - Homes are most vulnerable to wildfires. The tendency to locate homes on tree covered lots and lack of fire breaks (such as parking lots around businesses) can enable fires to spread more easily to homes. Special facilities tend to be less vulnerable due to construction type (brick or metal).

Impact - Wildfires can result in the need for rapid evacuations, casualties, loss of homes and businesses, and loss of wildlife habitat and recreational areas.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Azle Wildfire Mitigation Action #1** | Increase public education on how to reduce the risks from wildfires (construction, landscaping, etc.) |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | High |
| **Estimated Cost** | $10,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Azle Fire/Emergency Management |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will reduce the effects of wildfire on new buildings through increased use of wildfire mitigation measures. |
| **Effect on Existing Buildings** | This action will reduce the effects of wildfire on existing buildings through increased use of wildfire mitigation measures. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing the effects of wildfire. |
| **Discussion:** Wildfire mitigation measures are not widely known in Azle. This action will increase that knowledge and reduce casualties and damages from wildfires. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Azle Wildfire Mitigation Action #2** | Enact building permit process that encourages wildfire resistant construction. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program |
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | • Azle Utility Manager<br>• Azle Fire/Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will reduce the vulnerability of new structure to wildfire. |
| **Effect on Existing Buildings** | This action will reduce the vulnerability of existing buildings to wildfire if they are remodeled to the extent a building permit is required. |
| **Cost Effectiveness** | Cost Effective – This action will integrate wildfire mitigation into the building process at minimal cost. |
| **Discussion:** Integrating mitigation into building permitting provides a process to reduce vulnerability with few negative impacts. | |

**Other Projects Identified for Further Consideration**

- Work with Texas Department of Transportation to increase capacity of Ash Creek drainage structure under Texas Highway 199.
- Conduct City wide drainage study.

**Texas Standards That Exceed 44 CFR Requirements: Local Capability Assessments**

MAP 1

Projects funded under the following programs. Address the type of project that was funded. If you did not receive money from one of the below grants programs, then state that.

1.1: Hazard Mitigation Grant Program - None
1.2: Pre-Disaster Mitigation Grant Program - None
1.3: Project Impact - None
1.4: Hurricane-Property Protection Mitigation - None
1.5: Flood Mitigation Assistance - None
1.6: 406 Mitigation (through the Public Assistance Program) - None

MAP 2

Current Building Codes. Include the following information:

2.1: Date and type of code: 2003 International Building Code/2002 national Electrical Code
2.2: How is it being enforced? Plans submitted for review. Projects inspected on site.

MAP 3

Current Fire Codes. Include the following information:

3.1: Date and type of code: 2003 International Building Code

3.2: How is it being enforced?

- Plans are submitted for review
- Projects inspected on site
- Annual Fire Inspection

MAP 4

4.1: Any other codes, sub-division regulations, etc., that are in effect in your jurisdiction? No

4.2: How are they being enforced?

MAP 5

Floodplain Management. Include the following information:

5.1: Ordinance/Order Date: Ordinance #1985-358, Adopted 1985

5.2: Do you have a Floodplain Administrator? Yes

5.3: Is the person a Certified Floodplain Manager (CFM)? Yes

5.4: Date of current floodplain maps. August 23, 2000

5.5: Any codes, regulations, etc. that prohibit development in the floodway and/or floodplain: Ordinance 1985-358

MAP 6

Findings/results of Building Code Effectiveness Grading Report (BCEGS). Include date of report and score. Not applicable

MAP 7

Identify other plans that your jurisdiction has or have been done in your jurisdiction.

7.1: Capital Improvement Plans: None

7.2: Comprehensive Plans: Adopted in 2005

7.3: Storm Water Management Plans: Ordinance # 2000-773 Adopted in 2000

7.4: Master Drainage Plans: None

7.5: Corps of Engineers: None

7.6: Flood Mitigation Plan: None

7.7: Any other plans, studies, etc. that may have been done in your jurisdiction.

Ash Creek Drainage Study Phase 1 and Phase 2, March 2004 by the Lopez Garcia Group - Drainage Study of Ash Creek channel within the City of Azle, including estimated costs to control drainage.

# City of Blue Mound

Jurisdiction Profile

Blue Mound has an area of 0.5 square miles and a NCTCOG 2007 population estimate of 2,400.

Blue Mound is located on Texas Farm Road 156 eight miles north of Fort Worth in north central Tarrant County. In 1920 John Kennedy, an immigrant from Scotland, established Globe Laboratories, Incorporated, to produce serum to immunize cattle against black leg. In 1933 he purchased several hundred acres near the intersection of Blue Mound and Watauga roads in order to expand his serum business and to begin a new operation, the Globe Aircraft Company. Over the next decade a settlement grew up around the Kennedy businesses and was called Blue Mound because of its proximity to the hill of the same name. During the 1950s Bell Helicopter used the Kennedy facility to develop its new helicopters. In 1960, however, Bell left the facility, and the Kennedy building has remained vacant ever since. Blue Mound, however, survived and incorporated in 1960. The population steadily increased thereafter, surpassing 2,000 in the mid-1970s. During the 1980s the town became a bedroom community for residents employed in Fort Worth or at Dallas-Fort Worth International Airport. In 2000 the population was 2,388 with an estimated current population of 2,400.

| 1990 | 2000 | 2006 | 2007 |
|---|---|---|---|
| 2,133 | 2,388 | 2,400 | 2,400 |
| 2007 Population Density (persons per square mile): 4,630.89 | | | |

City Point-Of-Contact

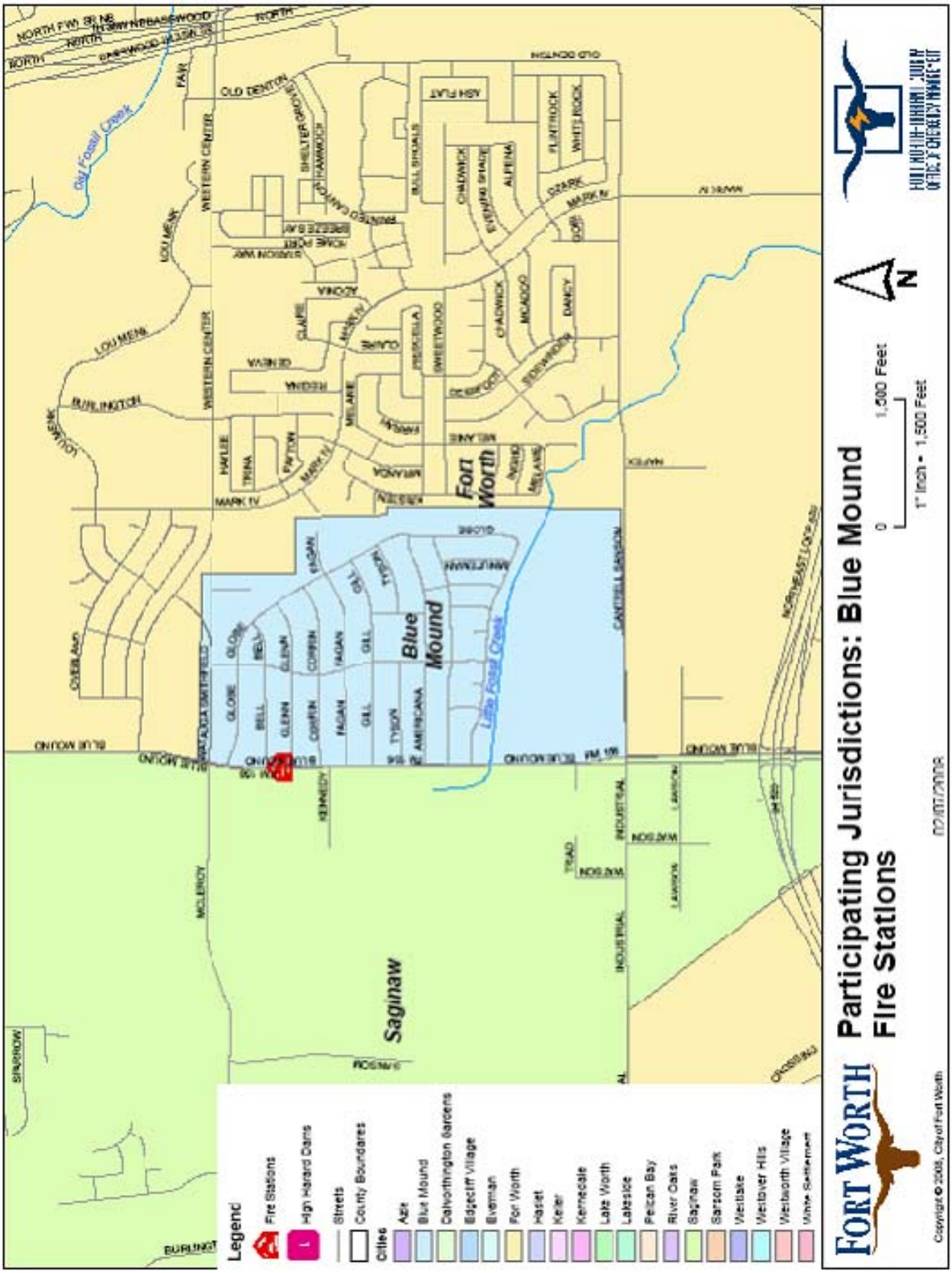
Fire Chief/Emergency Management Coordinator Shawn Fannan

Land Use & Development Trends

Blue Mound is essentially land-locked and built out. Some business and retail development may occur along Texas FM 156.

Jurisdiction Unique Hazards

Hazards specific to Blue Mound are discussed below.


Participating Jurisdictions: Blue Mound
Fire Stations
FORT WORTH
Legend
Fire Stations
High Hazard Dams
Streets
County Boundaries
Cities
Azle
Blue Mound
Dalworthington Gardens
Edgecliff Village
Everman
Fort Worth
Haslet
Keller
Kennedale
Lake Worth
Lakeside
Pelican Bay
River Oaks
Saginaw
Sansom Park
Westlake
Westover Hills
Westworth Village
White Settlement
Saginaw
Blue Mound
Fort Worth
Little Fossil Creek
Old Fossil Creek
0
1,500 Feet
1" Inch = 1,500 Feet
N
Copyright © 2008, City of Fort Worth

**DAM FAILURE**

No Vulnerability – There are no high hazard dams located in Blue Mound and none that would affect Blue Mound if they failed. Based on the lack of vulnerability, dam failure will receive no further consideration in this plan for Blue Mound.

**DROUGHT**

Moderate Vulnerability – The water supply in Blue Mound comes from surface water and is thus subject to drought. Blue Mound purchases water from the Tarrant Regional Water District (TRWD). TRWD water supply comes from three reservoirs on the West Fork of the Trinity River in northwest Tarrant County and from two reservoirs located well southeast of Tarrant County. These diverse supply locations help mitigate the effects of a local drought. An additional reservoir location well northeast of Tarrant County is being pursued. There has been some preliminary discussion of constructing a pipeline to carry water from southern Oklahoma. TRWD is installing pipelines to interconnect area water supply lakes with water treatment plants in order to provide maximum flexibility in water supply and treatment.

Location – Drought can affect all of Blue Mound.

Current Extent – As of February 2008 all of Tarrant County, including Blue Mound, was at DO – Abnormally Dry on the Palmer Drought Severity Index.

Previous Occurrences – National Climatic Data Center records indicate that in the past ten years there have been three periods of drought in Blue Mound; 1996 - 1998, 2000, and 2005 - 2006.

Probability of Future Events – Droughts are certain to occur again in Blue Mound. Significant droughts significantly affecting water supply and resulting in mandatory restrictions traditionally occur on a twenty year cycle. Based on the previously cited National Climatic Data Center recent records, we can anticipate that drought conditions will occur approximately every three years.

Impact – Drought can lead to loss of water for basic needs such as drinking and fire-fighting. Droughts are associated with increased wildfire and damage from expansive soils. More common impacts are damage to landscaping and reduced recreation due to low lake levels.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Blue Mound Drought Mitigation Action #1** | Participate in the design and implementation of the Tarrant County specific water conservation public education efforts to compliment existing programs. |
| **Mitigation Goal/Objective** | 3. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |

| | |
|---|---|
| **Estimated Cost** | $1,000 for materials for distribution in Blue Mound. |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • Water Customers<br>• City funds |
| **Responsible Agency** | • Blue Mound Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One year |
| **Effect on New Buildings** | This action will publicize water conservation efforts that can be incorporated into new construction. |
| **Effect on Existing Buildings** | This action will publicize water conservation efforts that can be incorporated into existing construction. |
| **Cost Effectiveness** | Cost Effective – Public education programs can provide significant results for relatively low costs. |
| **Discussion:** Most cities in the area have existing water conservation programs designed to educate the public and businesses on ways to conserve water. This action will develop a Tarrant County specific program that will compliment existing programs. Jurisdictional public education efforts have been very successful in attracting the attention of local citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Blue Mound Drought Mitigation Action #2** | Develop a contingency plan to identify potential impacts of drought 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. Impacts identified in this plan will be included in updates to the Hazard Mitigation Action Plan. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • Water Suppliers<br>• City funds |
| **Responsible Agency** | • Blue Mound Fire/Emergency Management<br>• Fort Worth – Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One Year |

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|---|---|
| **Effect on New Buildings** | This action will identify drought impacts in Blue Mound thus providing specific information for builders of new structures to incorporate drought mitigation into the structures. |
| **Effect on Existing Buildings** | This action will identify drought impacts in Blue Mound thus providing specific information for owners of existing structures to incorporate drought mitigation into the structures. |
| **Cost Effectiveness** | Cost Effective – This planning effort will have a low cost with the potential for significant benefits for the entire community. |
| **Discussion:** This planning effort will focus attention on the effects of drought on Blue Mound. Specific drought effects will be identified and efforts can be made to mitigate those effects. | |

**EXPANSIVE SOILS**

Low Vulnerability - Expansive soils have caused damage to some structures in limited areas of Blue Mound. However, damage has been limited to very small areas and there are no reports of significant damage to commercial structures or infrastructure.

Location – Expansive soils are found in small areas in Blue Mound. We could not locate a map of expansive soils in Blue Mound.

Extent – The extent of expansive soils in Blue Mound is believed to be Very Low (0% - 20%) to Low (21% - 50%).

Previous Occurrences – We could find no empirical data on previous occurrences of damage from expansive soils, but it is believed that expansive soils have caused problems since the first buildings were constructed in this area.

Probability of Future Events – Due to the variability of soil types and construction quality, it is very difficult to predict future occurrences of problems with expansive soils. However, a study published in the fall 2003 issue of *Environmental Geology* cited in the September 19, 2003 *Dallas Business Journal* indicates that many new developments in the DFW Metroplex are being built on soil that is more unstable than soils built on prior to 1990. This could lead to a higher incidence of expansive soil related damage in the future.

Impact – The impact of expansive soils ranges from cosmetic cracks in walls to substantial foundation and structural damage that can result in the need to demolish the building. Infrastructure such as pipelines can be damaged causing increased maintenance and repairs, damaged beyond repair requiring replacement, damaged to the point of failure.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Blue Mound Expansive Soils Mitigation Action #1** | Improve construction techniques to mitigate expansive soils through building code enhancements. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined (Minimal – Staff Time Only) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building permit fees |
| **Potential Matching Funding Sources** | • City funds<br>• Building permit fees |
| **Responsible Agency** | • City Engineer<br>• Blue Mound Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will make new buildings more resistant to damage from expansive soils. |
| **Effect on Existing Buildings** | This action will require modifications to existing buildings to be more resistant to damage from expansive soils. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will improve construction quality and reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Blue Mound Expansive Soils Mitigation Action #2** | Educate construction contractors, home owners, and business owners about mitigation techniques. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $2,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building Permit Fees |
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | • City Engineer<br>• Blue Mound Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One Year |

| | |
|---|---|
| **Effect on New Buildings** | This action will provide builders of new construction with expansive soil mitigation techniques that will reduce damage. |
| **Effect on Existing Buildings** | This action will provide owners of existing buildings with expansive soil mitigation techniques that will reduce damage. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will provide construction contractors and home/business owners with techniques designed to reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**EXTREME HEAT**

High Vulnerability - Summer heat and humidity can occur anytime from May through October. Community health services actively work with at risk populations to prevent heat related deaths and injuries. The elderly, very young people and people with poor health are most at risk from summer heat. People who work outside or in un-air-conditioned buildings are also at high risk to the direct effects of summer heat. Summer heat can also lead to electrical service outages if equipment fails or demand exceeds available supply. Most public safety and special facilities are equipped with emergency generators.

Location - Throughout the City.

Extent - Summer temperatures can reach as high as 113 degrees. Blue Mound is also subject to high humidity.

Previous Occurrences - This is an annual occurrence. The summer of 1980 was a record year with 69 consecutive days of temperatures of 100 degrees or more. We were unable to find a reliable record of deaths or injuries related to heat.

Probability of Future Events - Hot summer temperatures are certain to continue to occur in Blue Mound.

Impact - Summer heat can cause widespread electrical outages resulting in dangerous conditions, especially for at-risk populations. Occasionally "cooling centers" are opened at community centers to provide a safe place for citizens to seek refuge from the heat. Extreme heat can have economic impacts if construction work is curtailed or outdoor special events are cancelled.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Blue Mound Extreme Heat Mitigation Action #1** | Determine feasibility of expanding monitoring of populations at risk from extreme heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |

| | |
|---|---|
| **Priority** | Medium |
| **Estimated Cost** | Undetermined. Staff time |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Other State or Federal Public Health Grants |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Blue Mound Fire/Emergency Management<br>• Tarrant County Public Health (Support)<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | None - This action is intended to expand monitoring of people only. |
| **Effect on Existing Buildings** | None - This action is intended to expand monitoring of people only. |
| **Cost Effectiveness** | Pending, but believed to be Cost Effective |
| **Discussion:** This action would determine the feasibility of expanding monitoring of populations at risk from extreme heat. Existing at risk population monitoring programs will be reviewed to ensure all known populations at risk from extreme heat are included. Any newly discovered at risk populations will be evaluated for inclusion in existing monitoring programs. Tarrant County Public Health provides public health services throughout the county. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Blue Mound Extreme Heat Mitigation Action #2** | Increase public education programs on the dangers of excessive heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness |
| **Priority** | Medium |
| **Estimated Cost** | $2,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program |
| **Potential Matching Funding Sources** | • City Funds<br>• Other State or Federal Public Health Grants |
| **Responsible Agency** | • Blue Mound Fire/Emergency Management<br>• Tarrant County Public Health (Support)<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Effect on Existing Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits. |

**Discussion:** Public education on severe weather in Azle has traditionally focused on severe thunderstorms and associated hazards (tornadoes, lighting, flooding, high winds). This action would expand public education to include hazards from extreme heat.

**FLOOD**

Low Vulnerability – Blue Mound is bordered on the south by Little Fossil Creek. Although there is no history of Little Fossil Creek causing damage in Blue Mound, upstream development may lead to flooding issues in the future. Street flooding during heavy rains can cause damage to vehicles.

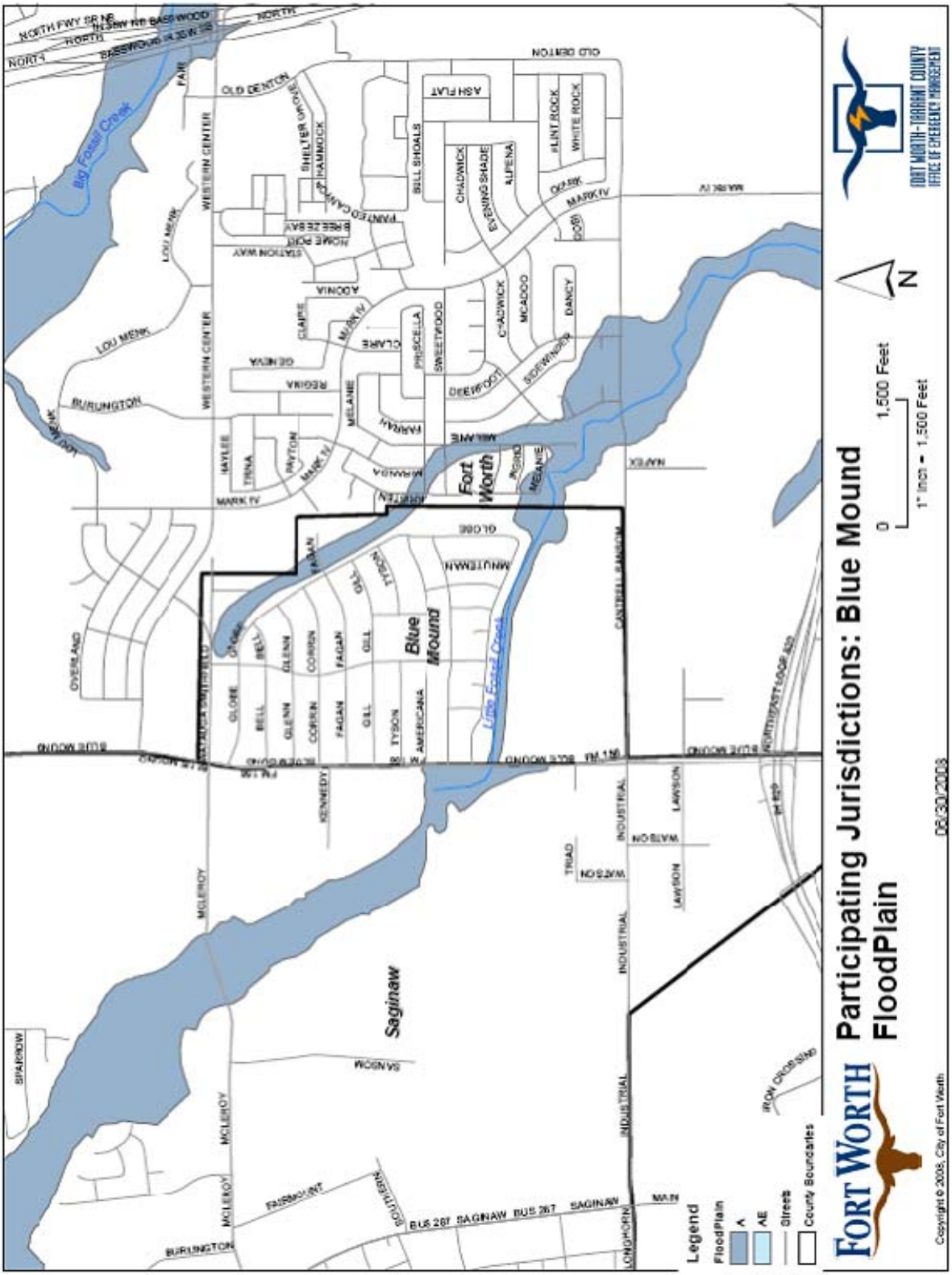
Location – Little Fossil Creek flows along the southern border of Blue Mound.

Extent - Flash flooding is the only type of flooding that can affect Blue Mound. Flash floods in tend to occur and recede very quickly. Water may rise a foot or so and then recede quickly.

Previous Occurrences – There is no history of significant flooding in Blue Mound. Some minor street flooding does occur during heavy rains.

Probability of Future Events – Based on previous experience Blue Mound will likely experience street flooding two or three times per year. Continued development throughout the County and the resulting increase in impervious cover will increase the likelihood and severity of flooding.

Impact - Flash floods kill more people than any other hazard associated with thunderstorms. Property damage from flash flooding is seldom covered by insurance, which makes it very difficult for citizens to recover from the flood. Due to the very rapid rate of development and growth in Tarrant County we are experiencing problems with determining actual building footprints within flood plains and will be using planimetric GIS data from the NCTCOG to resolve this issue when it becomes available. At that time we will be able to accurately identify the number and types of buildings vulnerable to flooding; as well as access other data associated with those locations such as appraised value, census data, and owner information.


Participating Jurisdictions: Blue Mound
FloodPlain
FORT WORTH
FORT WORTH-TARRANT COUNTY
OFFICE OF EMERGENCY MANAGEMENT
Fort Worth
Blue Mound
Saginaw
Big Fossil Creek
Little Fossil Creek
Legend
FloodPlain
A
AE
Streets
County Boundaries
1,500 Feet
1" inch = 1,500 Feet
N
06/30/2008
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**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Blue Mound Flood Mitigation Project #1** | Participate in the development of the Tarrant County specific "Flood Preparedness" brochure. |
| **Hazard Addressed** | Flooding |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of Flood events.<br>1. c. Develop effective flood mitigation public education materials. |
| **Priority** | High |
| **Estimated Cost** | Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Private Foundation Grants |
| **Responsible Agency** | • Blue Mound Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This action will provide flood mitigation techniques for owners of new buildings. |
| **Effect on Existing Buildings** | This action will provide flood mitigation techniques for owners of existing buildings. |
| **Cost Effectiveness** | Cost Effective - This project will provide valuable information to the public in a relatively short time and with relatively low costs. It will also have the added benefit of increasing public awareness of mitigation. The estimated cost could easily be offset by reduced losses to the public in a single small flood event. |

**Discussion**: Develop Tarrant County specific "Flood Preparedness" brochure. Once developed, the brochure will be distributed County-Wide. Historically flood prone areas will be targeted for door-to-door distribution and neighborhood meetings to present the brochure and solicit input for *Fort Worth Hazard Mitigation Action Plan* revisions.

The brochure will include:

- Description of Tarrant County flood hazards
- "Case Studies" of previous flood events in Tarrant County
- Preparedness and "self-help" mitigation information
- Benefits of city participation in NFIP
- Advantages of flood insurance
- Risks of not having flood insurance
- Warnings that typical homeowner's insurance does not cover rising water
- Solicitation of input for the *Fort Worth Hazard Mitigation Action Plan*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Blue Mound Flood Mitigation Action #2** | Conduct study and implement recommendations to prevent future flooding along Little Fossil Creek. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined pending engineering analysis |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • City Engineer<br>• Blue Mound Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will prevent new buildings from being built in future hazard areas and protect other new buildings from flooding. |
| **Effect on Existing Buildings** | This action will protect existing buildings from future flood events. |
| **Cost Effectiveness** | Cost Effective – This action will mitigate flood hazard to life and property. |
| **Discussion:** This action will identify actions to be taken to prevent flooding from becoming a significant hazard in Blue Mound. | |

**HAILSTORM**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of large hail are a hazard event in Blue Mound. Tarrant County averages eleven significant thunderstorm events (large hail, high winds) per year according to National Weather Service records. Most structures in Blue Mound can resist the effects of all but the most severe hailstorms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to hailstorms.

Location - Throughout the City

Extent - Blue Mound is subject to the hazards of severe thunderstorms, including large hail. Hail stones up to the size of grapefruit (H9 on the Combined NOAA/TORRO Hailstorm Intensity Scales) have been reported in Tarrant County.

Previous Occurrences – There is no record of hail causing significant damage in Blue Mound.

Probability of Future Events - Thunderstorms with hail are certain to continue to occur in Blue Mound. Hail falls on about two or three days per year, ordinarily with only slight and scattered damage (*National Weather Service*).

Impact – Thousands of homes and vehicles can be damaged in a single storm with millions of dollars in damages. Vehicles are especially impacted by large hails with windshields being the vulnerable part. A recurring problem following hailstorms is broken windshields in vehicles belonging to populations who do not have vehicle insurance and cannot afford the replacements costs, resulting in the owners having difficulty traveling to work, medical appointments, etc.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Blue Mound Hailstorm Mitigation Action #1** | Develop public education campaign to encourage "hail resistant" roofing in new construction and roof replacements. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• Building /Permit Fees<br>• City Funds |
| **Responsible Agency** | • Blue Mound Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will potentially decrease the damage caused by most hailstorms in new buildings. |
| **Effect on Existing Buildings** | This action will potentially decrease the damage caused by most hailstorms in existing buildings. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing hailstorm damage. One long term benefit will be reduced property insurance as claims related to hail damage are reduced. |
| **Discussion**: Public education has proven to be a low cost effective means to achieve changes public behavior. Encouraging hail resistant roofing can benefit citizens through reduced damage, business through reduced damage to their buildings and reduced claims against insurance companies, and government through reduced request for assistance. This campaign can be developed in conjunction with the Tarrant County effort. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Blue Mound Hailstorm Mitigation Action #2** | Evaluate City buildings to determine feasibility of installing hail resistant roofing and window coverings with a focus on critical infrastructure. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• City Funds |
| **Responsible Agency** | • Blue Mound City Engineer<br>• Blue Mound Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on new City buildings. |
| **Effect on Existing Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on existing City buildings. |
| **Cost Effectiveness** | Cost Effective – Although currently undetermined, this project is believed to be cost effective. |
| **Discussion:** Installing hail resistant roofing and window coverings on any City buildings could prevent or limit damage to City buildings thus avoiding costs to the City as well as preventing or limiting loss of use of damaged facilities. | |

**HIGH WINDS**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of high winds are a hazard in Blue Mound. Tarrant County averages ten reported significant thunderstorm events (large hail, high winds) per year. In addition, strong weather fronts can sometimes be accompanied by high winds which occasionally cause damage. Most structures in Blue Mound can resist the effects of all but the most severe high wind events. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to high winds.

Location - Throughout the City.

Extent - Severe thunderstorms with high winds with speeds in excess of 90 mph have been reported in Blue Mound.

Previous Occurrences – We could find no records of high wind damage in Blue Mound.

Probability of Future Events – Based on previous experience Blue Mound can expect to experience an average of ten significant thunderstorm events with high winds per year.

Impact – Records on high wind events are difficult to separate from severe thunderstorm records. High winds in Tarrant County typically cause little damage to commercial buildings. More often high winds cause damage to roofs, trees, and signs.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Blue Mound High Winds Mitigation Action #1** | Enact building codes to reduce damages from high winds. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined – Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • City Engineer<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will potentially identify a means to reduce high wind damage on new buildings. |
| **Effect on Existing Buildings** | This action will potentially identify a means to reduce high wind damage on new buildings. |
| **Cost Effectiveness** | Cost Effective – Although costs are undetermined, this action is believed to be cost effective since the action will require staff time only. |
| **Discussion:** Enhanced building codes will reduce damages from high wind events. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Blue Mound High Winds Mitigation Action #2** | Educate builders and residents about mitigating wind damage. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |

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| **Responsible Agency** | • City Engineer<br>• Blue Mound Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on new buildings. |
| **Effect on Existing Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost of developing and providing high wind mitigation compared with savings to the community make this action cost effective. |
| **Discussion:** Public education has proven to be a low cost and effective means to achieve changes public behavior. High winds have not been a focus of severe weather preparedness. | |

**LANDSLIDES**

No Vulnerability - There is no topography in Blue Mound that would be capable of a landslide. Based that would on the lack of vulnerability; landslides will receive no further consideration in this plan for Blue Mound. However, landslide hazards will be reviewed during the annual review of this plan and we will continue looking for areas with landslide potential during hazard surveys.

**LEVEE FAILURE**

No Vulnerability – There are no levees or areas that would be affected by levee failure in Blue Mound. Based on the lack of vulnerability, levee failure will receive no further consideration in this plan for Blue Mound.

**LIGHTNING**

Moderate Vulnerability – Lightning is one of the most common hazards in Blue Mound. Thunderstorms (and by definition, lightning) occur an average of 30 – 50 days per year (*Oklahoma Climatological Survey*). Lightning is the second most common cause of weather-related deaths in Texas (*National Weather Service*). Lightning information is available only for Tarrant County on a county-wide basis.

Location – Throughout the City.

Extent – We could find no references to the average number of strikes per storm in Tarrant County. However, lightning is by definition associated with thunderstorms.

Previous Occurrences – Tarrant County experiences 30 – 50 thunderstorm days per year. From 1995 – 2004 one person was killed and five were injured by lightning in Tarrant County (*National Weather Service*). Throughout Texas 34 people were killed by lightning, there were 184 injuries, and an estimated 23 million dollars in damages due to lightning from 1995 - 2004 (*National Weather Service*).

Probability of Future Events – Based on past experience Tarrant County will experience 30 – 50 thunderstorm days each year. Some days will have more than one thunderstorm during a given thunderstorm day.

Impact – Although lightning is the second most common cause of storm related deaths in Texas, lightning deaths remain relatively rare. Lightning does cause property damage several times per year (we could not find statistical data to validate this observation).

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Blue Mound Lightning Mitigation Action #1** | Provide lightning mitigation materials with building permit packets. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • City Engineer<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will provide materials that will reduce the vulnerability of new buildings to lightning. |
| **Effect on Existing Buildings** | This action will provide materials that will reduce the vulnerability of existing buildings that are being remodeled to lightning. |
| **Cost Effectiveness** | Cost Effective – The low cost of this project would be offset by eliminating just one lightning caused building loss. |
| **Discussion:** Lightning mitigation materials will be included in all building permit packets distributed to builders or citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Blue Mound Lightning Mitigation Action #2** | Ensure all City critical infrastructure has adequate lightning mitigation in place and upgrade protection as necessary. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program |

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| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • City Engineer<br>• Blue Mound Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will ensure new buildings that house critical infrastructure have adequate lightning mitigation. |
| **Effect on Existing Buildings** | This action will ensure existing critical infrastructure has adequate lightning mitigation. |
| **Cost Effectiveness** | Cost Effective – The destructive and sometimes capricious nature of lighting warrant the expense of this action compared with the benefits of avoiding damage to critical infrastructure. |
| **Discussion:** Review and confirmation of the adequacy of lightning protection systems in City buildings housing critical infrastructure is worthwhile considering the number of thunderstorms experienced in Blue Mound. | |

**SEVERE THUNDERSTORM**

High Vulnerability - Severe thunderstorms are the most common hazard in Blue Mound. From 1950 through August 2007 Tarrant County averaged eleven reported severe thunderstorm events county-wide per year. Most structures in Blue Mound can resist the effects of all but the most severe thunderstorms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to thunderstorms.

Location - Throughout the City

Extent - Blue Mound is subject to the hazards of severe thunderstorms of all magnitudes.

Previous Occurrences – A severe thunderstorm in 2004 caused some tree and roof damage as well as electrical service outages.

Probability of Future Events – Severe thunderstorms will occur in Tarrant County an average of eleven times per year.

Impact – A single severe thunderstorm can cause damage from hail, high winds, lightning, and/or tornadoes to thousands of structures.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Blue Mound Severe Thunderstorm Mitigation Project #1** | Conduct technical assessment to determine the feasibility of structurally hardening the Blue Mound Fire Station located at 301 South Blue Mound Road against severe weather. |
| **Hazard Addressed** | Tornado/Severe Thunderstorm |

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| **Mitigation Goal/Objective** | 2. Reduce loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | High |
| **Estimated Cost** | $50,000 |
| **Potential Funding Sources** | Hazard Mitigation Grant Program |
| **Potential Matching Funding Sources** | • Private Foundation Grants<br>• Other State or Federal Grants<br>• City General Fund |
| **Responsible Agency** | • Blue Mound Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This project will determine the feasibility of structurally hardening the Blue Mound Fire Station against severe weather. |
| **Effect on Existing Buildings** | This project will determine the feasibility of structurally hardening the Blue Mound Fire Station against severe weather. |
| **Cost Effectiveness** | Cost Effective - This project will provide the basis for a realistic cost benefit analysis of the feasibility of hardening the Blue Mound Fire Station against severe weather events. The relatively low cost of this project compared with the potential benefits of protecting a city's emergency response equipment against the jurisdiction's most likely hazard event result in a favorable cost benefit review. |

**Discussion:**
This project will provide for determining the feasibility of hardening the city's only fire station against severe weather. This project will contribute to protecting emergency response equipment so that it will be available to assist the citizens of Blue Mound in responding to and recovering from severe weather or other events. Final project details will be developed in accordance with grant requirements at the time the project is funded.

The cost estimate is a conservative "best guess" based on a structural analysis of the existing fire station. That analysis would require:

- Structural analysis of the building by a Structural Engineer
- Analysis of electrical systems
- Analysis of HVAC systems
- Review of building codes

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Blue Mound Severe Thunderstorm Mitigation Action #2** | Encourage builders to install storm resistant construction such as "hurricane clips". |

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| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | High |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |
| **Responsible Agency** | • City Engineer<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will encourage storm resistant construction in new buildings. |
| **Effect on Existing Buildings** | This action will encourage storm resistant construction in existing buildings as they are remodeled. |
| **Cost Effectiveness** | Cost Effective – The low cost of this action will be offset by a reduction in damage from severe thunderstorms. |
| **Discussion:** Effective education on storm resistant construction can reduce damage from severe thunderstorms. Insurance companies may be willing to fund or provide educational materials and/or provide discounts to persons who install storm resistant devices. | |

**SEVERE WINTER STORMS**

Moderate Vulnerability - Since 2000 the National Weather Service has reported 14 Winter Storm/Ice events in Tarrant County. Winter storms in Blue Mound usually consist of short-lived icing events (ice on the roads for a few hours) that primarily affect traffic and cause numerous motor vehicle accidents. Occasionally an ice storm will cause widespread power outages for as long as several days. ONCOR Electric Delivery has an aggressive tree trimming program. Most structures in Blue Mound can resist the effects of all but the most severe winter storms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to winter storms. Electrical service outages are usually the most serious threat in this area. Most public safety and special facilities are equipped with generators.

Location - Throughout the City

Extent - Severe ice storms have resulted in accumulations in excess of two inches. Most storms leave only a light coating or glaze of ice.

Previous Occurrences – Severe Winter Storms are typically regional events. Blue Mound has averaged two winter storms per year since 2000. Most winter storms resulting only minor inconveniences and a few motor vehicle accidents.

In 1978 up to an inch of ice coated area trees and roadways causing $14 million in damages region-wide and making travel almost impossible for two days.

In 1996 a winter storm dropped two to four inches of a mixture of sleet, freezing rain, and snow in Blue Mound over Thanksgiving weekend causing many motor vehicle accidents and some electrical service outages.

In 2003 a winter storm dropped one inch of sleet across Blue Mound resulting in numerous motor vehicle accidents and closing schools for two days.

Probability of Future Events - Blue Mound can expect to experience two winter storms per year with a severe winter storm once each ten years.

Impact - Winter storms can cause widespread electrical and telephone service outages, make travel dangerous or impossible, and damage structures. Deaths and injuries due to vehicle accidents and slips/falls are common during ice storms. Occasional deaths and injuries from carbon monoxide poisoning due to improper heating have occurred. Economic losses due to lost production can be significant. Damage from frozen pipes can lead to significant expenses for homeowners.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Blue Mound Severe Winter Storm Mitigation Action #1** | Increase public education concerning winter storm preparedness and mitigation. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | Medium |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Blue Mound Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into new buildings. |
| **Effect on Existing Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost is effective when compared to benefits provided to citizens. |

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| **Discussion:** Winter weather preparedness has not been emphasized in Blue Mound as much as severe thunderstorms. This action will provide preparedness information to citizens during the fall. |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Blue Mound Severe Winter Storm Mitigation Action #2** | Purchase additional street sanding capacity |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Blue Mound Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will have no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Sanding streets is essential to allow emergency vehicles to respond during severe winter events. |
| **Discussion:** Sanding equipment can be mounted on existing equipment to provide sanding capabilities. During severe winter weather events streets around hospitals, fire stations and other critical facilities are sanded along with major intersections and roadways. Additional sanding capacity would allow for quicker sanding of these areas and for more repeat sanding during prolonged winter weather events. This will improve public safety by facilitating emergency response as well as reducing motor vehicle accidents. | |

**STREAM BANK EROSION**

No Vulnerability - The predominantly low rolling topography of Blue Mound prevents stream bank erosion from causing a hazard. No vulnerability to stream bank erosion has been identified in Blue Mound. Further analysis using GIS and field verification will continue to search for vulnerable structures or facilities.

**TORNADO**

High Vulnerability – All structures in Blue Mound are vulnerable to tornadoes. Very few structures can withstand the effects of an F5 tornado. However, the March 28, 2000 F3 tornado that struck Fort Worth provided good evidence that well built structures can protect people who take appropriate shelter inside those buildings.

Location - Tornadoes can occur anywhere in Blue Mound.

Extent - Blue Mound is subject to tornadoes of all magnitudes, including F5 tornadoes.

Previous Occurrences – We found no reports of tornados causing damage in Blue Mound. However, Tarrant County has an average of one tornado reported per year county-wide (Source: National Climatic Data Center). In 2007 there were eight tornadoes reported by storm spotters county-wide. Four of those tornados caused damage, all within incorporated areas. Since 2000 tornadoes have caused damage in Arlington, Benbrook, Euless, Everman, Fort Worth, Grand Prairie, Haltom City, Mansfield, North Richland Hills, and River Oaks.

Probability of Future Events - Tarrant County has averaged one reported tornado per year and can expect that average to continue. Blue Mound, based on its relatively small size, will likely experience tornados very infrequently.

Impact - Tornadoes can cause deaths, injuries and property damage/destruction. Special facilities such as hospitals, fire stations, and utilities can be damaged or destroyed. Citizens who live in neighborhoods struck by tornadoes can experience disruption of their life styles and traditions. Areas struck by tornadoes can experience increased demand for mental health services as people deal with grief and stress.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Blue Mound Tornado Mitigation Project #1** | Assist citizens with funding for building tornado safe rooms or in-ground shelters. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction |
| **Priority** | High |
| **Estimated Cost** | $60,000 (15 Safe Rooms at $4,000 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Community Development Block Grant Funds |
| **Potential Matching Funding Sources** | Home/Building Owner |
| **Responsible Agency** | • Blue Mound Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This project will encourage new buildings to be constructed with tornado safe rooms as part of the construction process. The safe room will enhance the overall storm resistance of the building. |
| **Effect on Existing Buildings** | This project will encourage homeowners to construct/install tornado safe rooms in their existing homes. A safe room will enhance the overall storm resistance of the building. |

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| **Cost Effectiveness** | Cost Effective - Safe rooms and in-ground shelters have been proven to reduce deaths and injuries during tornadoes and severe thunderstorms. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of safe rooms and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

**Discussion:**

This project will reimburse costs associated with tornado safe room or in-ground shelter installation in new or existing homes. Safe rooms provide increased protection for citizens during severe thunderstorms and tornados. Safe rooms have been proven to save lives and reduce injuries from severe weather events. FEMA publication 320 (*Taking Shelter from the Storm, Building a Safe Room Inside Your House*) provides the standards for safe rooms. As stated on the FEMA website: Although a "*residence may be built "to code," that does not mean it can withstand winds from extreme events such as tornadoes and major hurricanes. The purpose of a safe room or a wind shelter is to provide a space where you and your family can seek refuge that provides a high level of protection. To protect its occupants, a safe room must be built to withstand high winds and flying debris, even if the rest of the residence is severely damaged or destroyed."*

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to home owners will be for no more than $3,000 or 75% of cost, whichever is less
- Eligibility will be limited to individuals who own their home at the time of application
- The safe room or in-ground shelter must be constructed/installed in the primary residence of the applicant
- Each eligible homeowner can only receive one reimbursement, regardless of the number of shelters he/she may purchase/install
- In-ground shelters must meet requirements established in the National Performance Criteria for Tornado Shelters dated May 28, 1999.
- Safe Rooms must meet the requirements of FEMA Publication 320
- Safe Rooms and shelters must meet all applicable city and/or county codes
- Previously owned or used shelters will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Blue Mound Tornado Mitigation Project #2** | Assist citizens with funding for purchase of Weather Alert Radios |

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| **Mitigation Goal/Objective** | 4. Increase the effectiveness of warning systems in Tarrant County.<br>4. a. Increase the number of homes and businesses with Weather Alert Radios. |
| **Priority** | High |
| **Estimated Cost** | $4,000 (100 Weather Alert Radios at $40 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Private Sector Donations<br>• City Funds |
| **Potential Matching Funding Sources** | Citizen/Business Owner |
| **Responsible Agency** | • Blue Mound Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings except for providing additional warning time of severe weather events thus allowing citizens more time to secure their home or business against approaching severe weather. |
| **Cost Effectiveness** | Cost Effective – Weather Alert Radios are a proven means to alert and warn citizens about severe weather and civil emergencies. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of Weather Alert Radios and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

***NOTE**: We are aware that Weather Alert Radios are on the "2007 Ineligible Planning Activities" list. It is our opinion that Weather Alert Radios should be considered eligible due to their very high benefit and very low cost.*

This project will reimburse 75% of the cost for citizens to purchase Weather Alert Radios, with the citizen responsible for the remaining 25%. Weather Alert Radios provide the best means for citizens to receive emergency alerts when they are indoors. Severe weather is the primary hazard in our area. Early alert and warning has proven to be a significant factor in saving lives during severe weather events.

In addition, the Weather Alert Radios can be activated for civil emergencies such as hazardous materials incidents. Effective warning saves lives, especially during severe weather events. Weather alert radios provide a proven means of indoor warning to citizens any time of the day or night and compose the vital indoor portion of our emergency warning system.

Warning systems have been shown to have value beyond the initial warning. Persons receiving warning relay the information to family and friends to ensure they are aware of the hazard. The secondary and tertiary warning can greatly amplify the effectiveness of the warning system.

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to citizens will be for no more than $30 or 75% of cost of the radio, whichever is less
- Eligibility will be limited to residents of Blue Mound
- The citizen must sign an agreement to keep the radio operational
- Each eligible homeowner can only receive one reimbursement, regardless of the number of radios purchased
- Previously purchased radios will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**WILDFIRE**

Low Vulnerability – Blue Mound has a very small rural-urban interface consisting of a few homes near a park.

Location – The rural-urban interface in Blue Mound is on the northwest corner of the City.

Extent - The effects of wildfire are deaths, injuries, loss of structures, loss of wildlands, and loss of wildlife habitat.

Previous Occurrences – There have no reports of wildfires in Blue Mound.

Probability of Future Events - Wildland fires are unlikely, but may occur during droughts or high wind events associated with weather fronts.

Vulnerability - Homes are most vulnerable to wildfires. The tendency to locate homes on tree covered lots and lack of fire breaks (such as parking lots around businesses) can enable fires to spread more easily to homes. Special facilities tend to be less vulnerable due to construction type (brick or metal).

Impact - Wildfires can result in the need for rapid evacuations, casualties, loss of homes and businesses, and loss of wildlife habitat and recreational areas.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Blue Mound Wildfire Mitigation Action #1** | Increase public education on how to reduce the risks from wildfires (construction, landscaping, etc.) |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | High |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Blue Mound Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will reduce the effects of wildfire on new buildings through increased use of wildfire mitigation measures. |
| **Effect on Existing Buildings** | This action will reduce the effects of wildfire on existing buildings through increased use of wildfire mitigation measures. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing the effects of wildfire. |
| **Discussion:** Wildfire mitigation measures are not widely known in urban areas such as Blue Mound. This action will increase that knowledge and reduce casualties and damages from wildfires. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Blue Mound Wildfire Mitigation Action #s** | Enact building permit process that encourages wildfire resistant construction. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program |

| | |
|---|---|
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | • City Engineer<br>• Blue Mound Fire/Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will reduce the vulnerability of new structure to wildfire. |
| **Effect on Existing Buildings** | This action will reduce the vulnerability of existing buildings to wildfire if they are remodeled to the extent a building permit is required. |
| **Cost Effectiveness** | Cost Effective – This action will integrate wildfire mitigation into the building process at minimal cost. |
| **Discussion:** Integrating mitigation into building permitting provides a process to reduce vulnerability with few negative impacts. | |

**Existing Hazard Mitigation Efforts**
The City of Blue Mound has a siren for outdoor warning of citizens.

**Other Projects Identified for Further Consideration**
Blue Mound is downstream from an area undergoing substantial development (primarily in Fort Worth and Saginaw). The County-Wide Drainage study identified in the Tarrant County section of this plan will be very useful for Blue Mound.

**Texas Standards That Exceed 44 CFR Requirements: Local Capability Assessments**
MAP 1
Projects funded under the following programs. Address the type of project that was funded. If you did not receive money from one of the below grants programs, then state that.
1.1: Hazard Mitigation Grant Program - None
1.2: Pre-Disaster Mitigation Grant Program - None
1.3: Project Impact - None
1.4: Hurricane-Property Protection Mitigation - None
1.5: Flood Mitigation Assistance - None
1.6: 406 Mitigation (through the Public Assistance Program) - None

MAP 2
Current Building Codes. Include the following information:
2.1: Date and type of code: 2003 International Building Code/2002 national Electrical Code
2.2: How is it being enforced? Plans submitted for review. Projects inspected on site.

MAP 3
Current Fire Codes. Include the following information:

3.1: Date and type of code: 2003 International Building Code
3.2: How is it being enforced?

- Plans are submitted for review
- Projects inspected on site
- Annual Fire Inspection

MAP 4

4.1: Any other codes, sub-division regulations, etc., that are in effect in your jurisdiction? No
4.2: How are they being enforced?

MAP 5

Floodplain Management. Include the following information:
5.1: Ordinance/Order Date: None
5.2: Do you have a Floodplain Administrator? No
5.3: Is the person a Certified Floodplain Manager (CFM)? No
5.4: Date of current floodplain maps. August 23, 2000
5.5: Any codes, regulations, etc. that prohibit development in the floodway and/or floodplain: Not Applicable

MAP 6

Findings/results of Building Code Effectiveness Grading Report (BCEGS). Include date of report and score. Not applicable

MAP 7

Identify other plans that your jurisdiction has or have been done in your jurisdiction.
7.1: Capital Improvement Plans: None
7.2: Comprehensive Plans: None
7.3: Storm Water Management Plans: None
7.4: Master Drainage Plans: None
7.5: Corps of Engineers: None
7.6: Flood Mitigation Plan: None
7.7: Any other plans, studies, etc. that may have been done in your jurisdiction: None

# City of Dalworthington Gardens

Jurisdiction Profile
Dalworthington Gardens has an area of 1.8 square miles and a NCTCOG 2007 population estimate of 2,300.

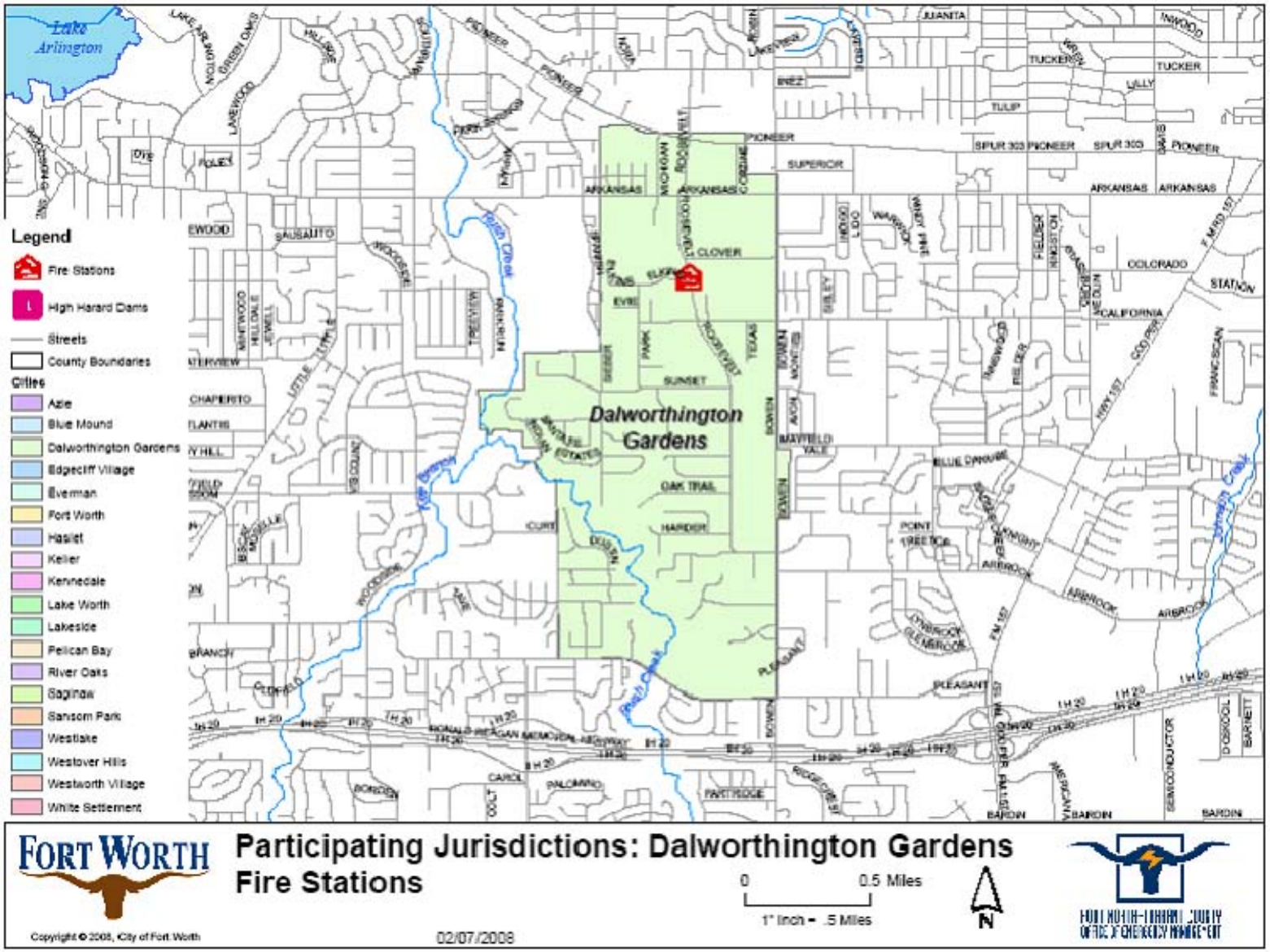
Dalworthington Gardens, one of the most unusual communities in Texas, is located in east central Tarrant County between Interstate 30 to the north and Interstate 20 to the south, about twelve miles southeast of Fort Worth. Dalworthington Gardens is completely surrounded by the City of Arlington. The land area in Dalworthington Gardens is 1.8 square miles. The community was established as a subsistence homestead project during the Great Depression under the authority of the National Industrial Recovery Act. The homestead program was administered by the Department of the Interior. Its original purpose was to help families attain a better standard of living through a combination of part-time industrial employment and subsistence agriculture. The idea was to locate homestead projects near large industrial centers where city workers could live, grow gardens, and raise farm animals to supplement their regular food supplies. Dalworthington Gardens was one of five such projects located in Texas and the only one still in existence today.

| 1990 | 2000 | 2006 | 2007 |
|---|---|---|---|
| 1,758 | 2,186 | 2,300 | 2,300 |
| 2007 Population Density (persons per square mile): 1,246.63 | | | |

City Point-Of-Contact
Captain Bob Fisher

Land Use and Development Trends
Dalworthington Gardens is primarily residential. It is landlocked, but is growing as undeveloped areas are developed.

Jurisdiction Unique Hazards
Hazards specific to Dalworthington Gardens are discussed below.


Lake Arlington
Dalworthington Gardens
Legend
Fire Stations
High Hazard Dams
Streets
County Boundaries
Cities
Azle
Blue Mound
Dalworthington Gardens
Edgecliff Village
Everman
Fort Worth
Haslet
Keller
Kennedale
Lake Worth
Lakeside
Pelican Bay
River Oaks
Saginaw
Sansom Park
Westlake
Westover Hills
Westworth Village
White Settlement
FORT WORTH
Participating Jurisdictions: Dalworthington Gardens
Fire Stations
0
0.5 Miles
1" Inch = .5 Miles
N
Copyright © 2008, City of Fort Worth
02/07/2008

**DAM FAILURE**

No Vulnerability – There are no high hazard dams located in Dalworthington Gardens and none that would affect Dalworthington Gardens if they failed. Based on the lack of vulnerability, dam failure will receive no further consideration in this plan for Dalworthington Gardens.

**DROUGHT**

Moderate Vulnerability – Dalworthington Gardens water supply is surface water purchased water from the City of Fort Worth which in turn purchases raw water from the Tarrant Regional Water District (TRWD). TRWD water supply comes from three reservoirs on the West Fork of the Trinity River in northwest Tarrant County and from two reservoirs located well southeast of Tarrant County. These diverse supply locations help mitigate the effects of a local drought. An additional reservoir location well northeast of Tarrant County is being pursued. There has been some preliminary discussion of constructing a pipeline to carry water from southern Oklahoma.

TRWD is installing pipelines to interconnect area water supply lakes with water treatment plants in order to provide maximum flexibility in water supply and treatment.

Location – Drought can affect all of Dalworthington Gardens.

Current Extent – As of February 2008, Dalworthington Gardens was at DO – Abnormally Dry on the Palmer Drought Severity Index.

Previous Occurrences – National Climatic Data Center records indicate that in the past ten years there have been three periods of drought in Dalworthington Gardens, 1996 - 1998, 2000, and 2005 - 2006.

Probability of Future Events – Droughts are certain to occur again in Dalworthington Gardens. Significant droughts significantly affecting water supply and resulting in mandatory restrictions traditionally occur on a twenty year cycle. Based on the previously cited National Climatic Data Center recent records, we can anticipate that drought conditions will occur approximately every three years.

Impact – Drought can lead to loss of water for basic needs such as drinking and fire-fighting. Droughts are associated with increased wildfire and damage from expansive soils. More common impacts are damage to landscaping and reduced recreation due to low lake levels.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Dalworthington Gardens Drought Mitigation Action #1** | Design and implement Dalworthington Gardens specific water conservation public education efforts to compliment existing programs. |

| | |
|---|---|
| **Mitigation Goal/Objective** | 4. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • City Funds<br>• Water Suppliers |
| **Responsible Agency** | • Dalworthington Gardens Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One year |
| **Effect on New Buildings** | This action will publicize water conservation efforts that can be incorporated into new construction. |
| **Effect on Existing Buildings** | This action will publicize water conservation efforts that can be incorporated into existing construction. |
| **Cost Effectiveness** | Cost Effective – Public education programs can provide significant results for relatively low costs. |
| **Discussion:** Most cities in the area have existing water conservation programs designed to educate the public and businesses on ways to conserve water. This action will develop a Dalworthington Gardens specific program that will compliment existing programs. Jurisdictional public education efforts have been very successful in attracting the attention of local citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Dalworthington Gardens Drought Mitigation Action #2** | 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. Impacts identified in this plan will be included in updates to the Hazard Mitigation Action Plan. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • City Funds<br>• Water Suppliers |

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|---|---|
| **Responsible Agency** | • Dalworthington Gardens Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will identify drought impacts in Dalworthington Gardens thus providing specific information for builders of new structures to incorporate drought mitigation into the structures. |
| **Effect on Existing Buildings** | This action will identify drought impacts in Dalworthington Gardens thus providing specific information for owners of existing structures to incorporate drought mitigation into the structures. |
| **Cost Effectiveness** | Cost Effective – This planning effort will have a low cost with the potential for significant benefits for the entire community. |
| **Discussion:** This planning effort will focus attention on the effects of drought on the community. Specific drought effects will be identified and efforts can be made to mitigate those effects. | |

**EXPANSIVE SOILS**

Low Vulnerability - Expansive soils have caused damage to some structures in some portions of Dalworthington Gardens. However, damage has been limited to relatively small geographic areas and there are no reports of significant damage to commercial structures or infrastructure.

Location – Expansive soils are found in various areas of Dalworthington Gardens. We could not locate a map of expansive soils in Dalworthington Gardens.

Extent – The extent of expansive soils in Dalworthington Gardens is believed to be Very Low (0% - 20%) to Low (21% - 50%).

Previous Occurrences – We could find no empirical data on previous occurrences of damage from expansive soils, but it is believed that expansive soils have caused problems since the first buildings were constructed in this area.

Probability of Future Events – Due to the variability of soil types and construction quality, it is very difficult to predict future occurrences of problems with expansive soils. However, a study published in the fall 2003 issue of *Environmental Geology* cited in the September 19, 2003 *Dallas Business Journal* indicates that many new developments in the Metroplex are being built on soil that is more unstable than soils built on prior to 1990. This could lead to a higher incidence of expansive soil related damage in the future.

Impact – The impact of expansive soils ranges from cosmetic cracks in walls to substantial foundation and structural damage that can result in the need to demolish the building. Infrastructure such as pipelines can be damaged causing increased maintenance

and repairs, damaged beyond repair requiring replacement, damaged to the point of failure.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Dalworthington Gardens Expansive Soils Mitigation Action #1** | Improve construction techniques through building code enhancements. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined (Minimal – Staff Time Only) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building permit fees |
| **Potential Matching Funding Sources** | • City Funds<br>• Building permit fees |
| **Responsible Agency** | • Dalworthington Gardens Public Works<br>• Dalworthington Gardens Emergency Management |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will make new buildings more resistant to damage from expansive soils. |
| **Effect on Existing Buildings** | This action will require modifications to existing buildings to be more resistant to damage from expansive soils. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will improve construction quality and reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Dalworthington Gardens Expansive Soils Mitigation Action #2** | Educate construction contractors, home owners, and business owners about mitigation techniques. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building Permit Fees |
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | • Dalworthington Gardens Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |

| | |
|---|---|
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will provide builders of new construction with expansive soil mitigation techniques that will reduce damage. |
| **Effect on Existing Buildings** | This action will provide owners of existing buildings with expansive soil mitigation techniques that will reduce damage. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will provide construction contractors and home/business owners with techniques designed to reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**EXTREME HEAT**

High Vulnerability - Summer heat and humidity can occur anytime from May through October. Community health services actively work with at risk populations to prevent heat related deaths and injuries. The elderly, very young people and people with poor health are most at risk from summer heat. People who work outside or in un-air-conditioned buildings are also at high risk to the direct effects of summer heat. Summer heat can also lead to electrical service outages if equipment fails or demand exceeds available supply. Most public safety and special facilities are equipped with emergency generators.

Location - Throughout the City

Extent - Summer temperatures can reach as high as 113 degrees. Dalworthington Gardens is also subject to high humidity.

Previous Occurrences - This is an annual occurrence. The summer of 1980 was a record year with 69 consecutive days of temperatures of 100 degrees or more. We were unable to find a reliable record of deaths or injuries related to heat.

Probability of Future Events - Hot summer temperatures are certain to continue to occur in Dalworthington Gardens.

Impact - Summer heat can cause widespread electrical outages resulting in dangerous conditions, especially for at-risk populations. Occasionally "cooling centers" are opened at community centers to provide a safe place for citizens to seek refuge from the heat. Extreme heat can have economic impacts if construction work is curtailed or outdoor special events are cancelled.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Dalworthington Gardens Extreme Heat Mitigation Action #1** | Determine feasibility of expanding monitoring of populations at risk from extreme heat |

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| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined. Staff time and GIS resources |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Other State or Federal Public Health Grants |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Tarrant County Public Health<br>• Dalworthington Gardens Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | None - This action is intended to expand monitoring of people only. |
| **Effect on Existing Buildings** | None - This action is intended to expand monitoring of people only. |
| **Cost Effectiveness** | Pending, but believed to be Cost Effective |
| **Discussion:** This action would determine the feasibility of expanding monitoring of populations at risk from extreme heat. Existing at risk population monitoring programs will be reviewed to ensure all known populations at risk from extreme heat are included. Any newly discovered at risk populations will be evaluated for inclusion in existing monitoring programs. Tarrant County Public Health provides public health services throughout the County. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Dalworthington Gardens Extreme Heat Mitigation Action #2** | Increase public education programs on the dangers of excessive heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br><br>2. c. Enhance public education concerning severe weather preparedness |
| **Priority** | Medium |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program |
| **Potential Matching Funding Sources** | • City Funds<br>• Other State or Federal Public Health Grants |
| **Responsible Agency** | • Tarrant County Public Health<br>• Dalworthington Gardens Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Effect on Existing Buildings** | None - This action is intended to expand public education on extreme heat. |

| | |
|---|---|
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits. |
| **Discussion:** Public education on severe weather in Dalworthington Gardens has traditionally focused on severe thunderstorms and associated hazards (tornadoes, lighting, flooding, high winds). This action would expand public education to include hazards from extreme heat. | |

**FLOOD**

High Vulnerability - The topography of Dalworthington Gardens combined with the frequency of severe thunderstorms results in frequent flash flood events. Several homes and a few businesses are located close enough to Rush Creek to be vulnerable to flash floods.

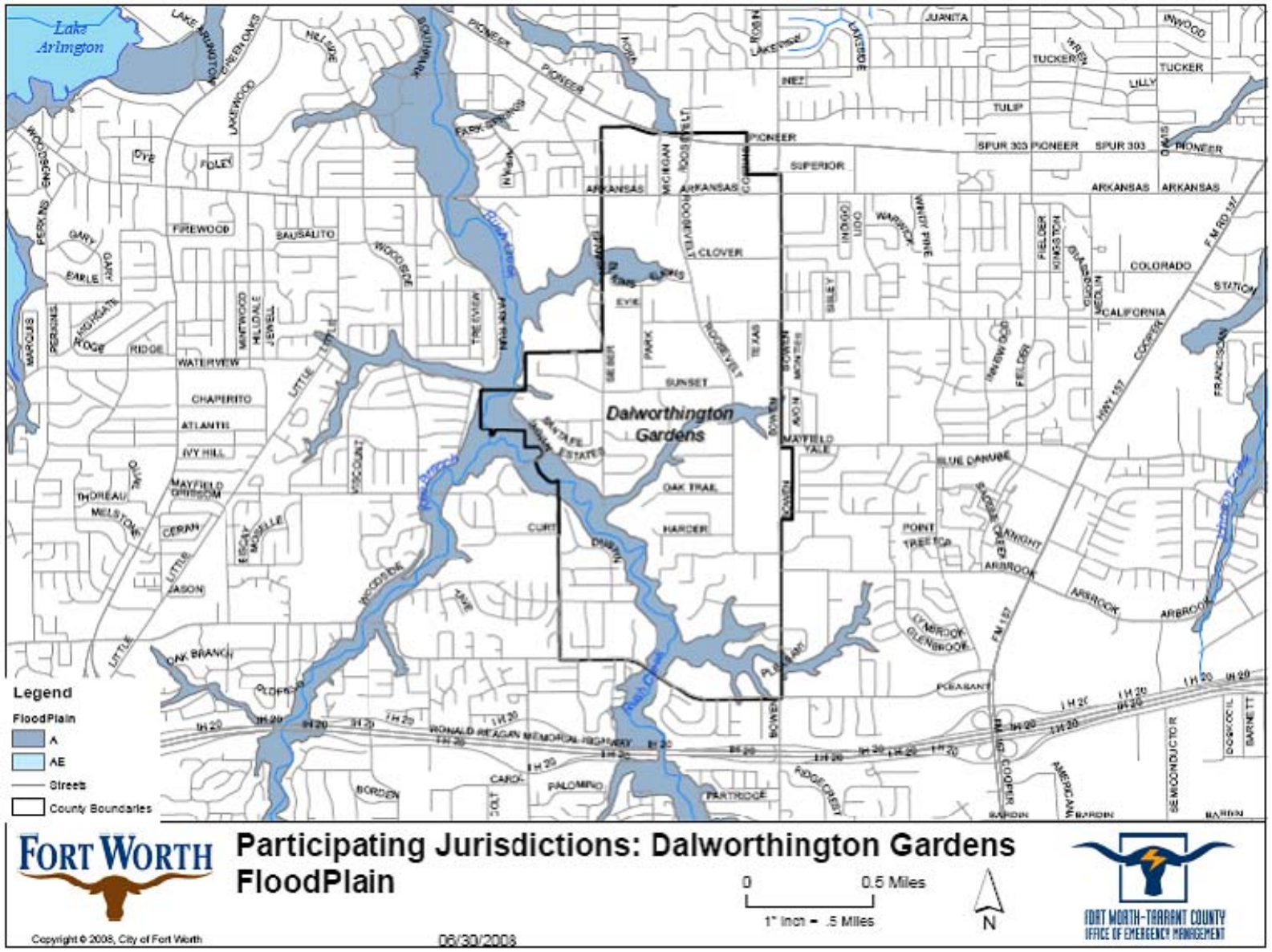
Location - Throughout the City, especially along Rush Creek in the southwest part of the City.

Extent - Flash floods are the most common type of flooding in Dalworthington Gardens, which tend to occur and recede very quickly.

Previous Occurrences - Minor flooding occurs frequently, especially during the spring and early summer. Significant flash flooding was reported along Rush Creek in 1998.

Probability of Future Events – Based on previous experience Dalworthington Gardens is certain to suffer flash flood events every year. National Weather Service records indicate an average of 11 flash flood events per year in Tarrant County. Continued development throughout the County and the resulting increase in impervious cover will increase the likelihood and severity of flooding.

Impact - Flash floods kill more people than any other hazard associated with thunderstorms. Property damage from flash flooding is seldom covered by insurance, which makes it very difficult for citizens to recover from the flood. Due to the very rapid rate of development and growth throughout Tarrant County we are experiencing problems with determining actual building footprints within flood plains and will be using planimetric GIS data from the NCTCOG to resolve this issue when it becomes available. At that time we will be able to accurately identify the number and types of buildings vulnerable to flooding; as well as access other data associated with those locations such as appraised value, census data, and owner information.


Lake Arlington
Dalworthington Gardens
Legend
FloodPlain
A
AE
Streets
County Boundaries
FORT WORTH
Participating Jurisdictions: Dalworthington Gardens
FloodPlain
0
0.5 Miles
1" Inch = .5 Miles
N
FORT WORTH-TARRANT COUNTY
OFFICE OF EMERGENCY MANAGEMENT
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06/30/2008

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Dalworthington Gardens Flood Mitigation Project #1** | Participate in the development of the Tarrant County specific "Flood Preparedness" brochure. |
| **Hazard Addressed** | Flooding |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of Flood events.<br>1. c. Develop effective flood mitigation public education materials. |
| **Priority** | High |
| **Estimated Cost** | Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Private Foundation Grants |
| **Responsible Agency** | • Dalworthington Gardens Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This action will provide flood mitigation techniques for owners of new buildings. |
| **Effect on Existing Buildings** | This action will provide flood mitigation techniques for owners of existing buildings. |
| **Cost Effectiveness** | Cost Effective - This project will provide valuable information to the public in a relatively short time and with relatively low costs. It will also have the added benefit of increasing public awareness of mitigation. The estimated cost could easily be offset by reduced losses to the public in a single small flood event. |

**Discussion**: Develop Tarrant County specific "Flood Preparedness" brochure. Once developed, the brochure will be distributed County-Wide. Historically flood prone areas will be targeted for door-to-door distribution and neighborhood meetings to present the brochure and solicit input for *Fort Worth Hazard Mitigation Action Plan* revisions.

The brochure will include:

- Description of Tarrant County flood hazards
- "Case Studies" of previous flood events in Tarrant County
- Preparedness and "self-help" mitigation information
- Benefits of city participation in NFIP
- Advantages of flood insurance
- Risks of not having flood insurance
- Warnings that typical homeowner's insurance does not cover rising water
- Solicit input for the *Fort Worth Hazard Mitigation Action Plan*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Dalworthington Gardens Flood Mitigation Action #2** | Develop program to encourage residents and business owners to purchase flood insurance. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |
| **Priority** | Medium |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City funds |
| **Potential Matching Funding Sources** | • City funds |
| **Responsible Agency** | • Dalworthington Gardens Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will have little or no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have little or no effect on existing buildings. |
| **Cost Effectiveness** | Cost Effective – This low cost action will help citizens mitigate potential losses due flood events. |
| **Discussion:** This action will develop a Dalworthington Gardens specific program to encourage citizens to purchase flood insurance to mitigate losses due to flood events. | |

**HAILSTORM**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of large hail are a hazard event in Dalworthington Gardens. Tarrant County averages eleven significant thunderstorm events (large hail, high winds) per year according to National Weather Service records. Most structures in Dalworthington Gardens can resist the effects of all but the most severe hailstorms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to hailstorms. Vehicles have proven to be vulnerable to hailstorms with widespread severe vehicle damage reported in 1980 and 1995.

Location - Throughout the Dalworthington Gardens.

Extent - Dalworthington Gardens is subject to the hazards of severe thunderstorms, including large hail. Hail stones up to the size of grapefruit (H9 on the Combined NOAA/TORRO Hailstorm Intensity Scales) have been reported in Tarrant County.

Previous Occurrences – Hailstorms in 1980, 1995, and 2007 caused property damage in Dalworthington Gardens.

Probability of Future Events - Thunderstorms with hail are certain to continue to occur in Dalworthington Gardens. Hail falls on about two or three days per year, ordinarily with only slight and scattered damage (*National Weather Service*).

Impact – The impact from hailstorms can be significant in extreme events such as the hailstorms of 1980 and 1995. Thousands of homes and vehicles can be damaged in a single storm with millions of dollars in damages. Vehicles are especially impacted by large hails with windshields being the vulnerable part. A recurring problem following hailstorms is broken windshields in vehicles belonging to populations who do not have vehicle insurance and cannot afford the replacements costs, resulting in the owners having difficulty traveling to work, medical appointments, etc.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Dalworthington Gardens Hailstorm Mitigation Action #1** | Develop a public education campaign to encourage "hail resistant" roofing in new construction and roof replacements. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• Building/Permit Fees<br>• City Funds |
| **Responsible Agency** | • Dalworthington Gardens Emergency Management<br>• Dalworthington Gardens Building Official<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will potentially decrease the damage caused by most hailstorms to new buildings. |
| **Effect on Existing Buildings** | This action will potentially decrease the damage caused by most hailstorms to existing buildings. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing hailstorm damage. One long term benefit will be reduced property insurance as claims related to hail damage are reduced. |
| **Discussion**: Public education has proven to be a low cost effective means to achieve changes public behavior. Encouraging hail resistant roofing can benefit citizens through reduced damage, business through reduced damage to their buildings and reduced claims against insurance companies, and government through reduced request for assistance. This campaign can be developed in conjunction with the Tarrant County effort. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Dalworthington Gardens Hailstorm Mitigation Action #2** | Evaluate City buildings to determine feasibility of installing hail resistant roofing and window coverings with a focus on critical infrastructure. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• County Funds |
| **Responsible Agency** | • Dalworthington Gardens Emergency Management<br>• Dalworthington Gardens Building Official |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on new City buildings. |
| **Effect on Existing Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on existing City buildings. |
| **Cost Effectiveness** | Cost Effective – Although currently undetermined, this project is believed to be cost effective. |
| **Discussion:** Installing hail resistant roofing and window coverings on City buildings could prevent or limit damage to City buildings thus avoiding costs to the City as well as preventing or limiting loss of use of damaged facilities. | |

**HIGH WINDS**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of high winds are a hazard in Dalworthington Gardens. Tarrant County averages ten reported significant thunderstorm events (large hail, high winds) per year. In addition, strong weather fronts can sometimes be accompanied by high winds which occasionally cause damage. Most structures in Dalworthington Gardens can resist the effects of all but the most severe high wind events. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to high winds.

Location - Throughout the City.

Extent - Severe thunderstorms with high winds with speeds in excess of 90 mph have been reported in Dalworthington Gardens.

Previous Occurrences – We could find no records of high wind damage in Dalworthington Gardens.

Probability of Future Events – Based on previous experience Dalworthington Gardens can expect to experience an average of ten significant thunderstorm events with high winds per year.

Impact – Records on high wind events are difficult to separate from severe thunderstorm records. High winds in Dalworthington Gardens typically cause little damage to commercial buildings. More often high winds cause damage to roofs, trees, and signs.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Dalworthington Gardens High Winds Mitigation Action #1** | Enact enhanced building codes to reduce damages from high winds. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined – Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Dalworthington Gardens Building Official<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will potentially identify a means to reduce high wind damage on new buildings. |
| **Effect on Existing Buildings** | This action will potentially identify a means to reduce high wind damage on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Although costs are undetermined, this action is believed to be cost effective since the action will require staff time only. |
| **Discussion:** Counties in Texas are restricted from many of the powers associated with cities, such as building codes. If the legal authority exists, enhanced building codes will reduce damages from high wind events. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Dalworthington Gardens High Winds Mitigation Action #2** | Educate builders and residents about mitigating wind damage. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | $1,000 |

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| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • County Funds<br>• Insurance Companies |
| **Responsible Agency** | • Dalworthington Gardens Building Official<br>• Dalworthington Gardens Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on new buildings. |
| **Effect on Existing Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost of developing and providing high wind mitigation compared with savings to the community make this action cost effective. |
| **Discussion:** Public education has proven to be a low cost and effective means to achieve changes public behavior. High winds have not been a focus of severe weather preparedness. | |

**LANDSLIDES**

No Vulnerability – There are no areas in Dalworthington Gardens subject to landslides. Based on the lack of vulnerability, landslides will receive no further consideration in this plan for Dalworthington Gardens. However, landslide hazards will be reviewed during the annual review of this plan.

**LEVEE FAILURE**

No Vulnerability – There are no levees or areas that would be affected by levee failure in Dalworthington Gardens. Based on the lack of vulnerability, levee failure will receive no further consideration in this plan for Dalworthington Gardens.

**LIGHTNING**

Moderate Vulnerability – Lightning is one of the most common hazards in Dalworthington Gardens. Thunderstorms (and by definition, lightning) occur an average of 30 – 50 days per year (*Oklahoma Climatological Survey*). Lightning is the second most common cause of weather-related deaths in Texas (*National Weather Service*). Lightning information is available only for Tarrant County on a county-wide basis.

Location – Throughout Dalworthington Gardens.

Extent – We could find no references to the average number of strikes per storm in Dalworthington Gardens. However, lightning is by definition associated with thunderstorms.

Previous Occurrences – Tarrant County experiences 30 – 50 thunderstorm days per year. From 1995 – 2004 one person was killed and five were injured by lightning in Tarrant

County (*National Weather Service*). Throughout Texas 34 people were killed by lightning, there were 184 injuries, and an estimated 23 million dollars in damages due to lightning from 1995 - 2004 (*National Weather Service*).

Probability of Future Events – Based on past experience Dalworthington Gardens will experience 30 – 50 thunderstorm days each year. Some days will have more than one thunderstorm during a given thunderstorm day.

Impact – Although lightning is the second most common cause of storm related deaths in Texas, lightning deaths remain relatively rare. Lightning does cause property damage several times per year (we could not find statistical data to validate this observation).

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Dalworthington Gardens Lightning Mitigation Action #1** | Provide lightning mitigation materials with building permit packets. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Dalworthington Gardens Building Official<br>• Dalworthington Gardens Emergency Management |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will provide materials that will reduce the vulnerability of new buildings to lightning. |
| **Effect on Existing Buildings** | This action will provide materials that will reduce the vulnerability of existing buildings that are being remodeled to lightning. |
| **Cost Effectiveness** | Cost Effective – The low cost of this project would be offset by eliminating just one lightning caused building loss. |
| **Discussion:** Lightning mitigation materials will be included in all building permit packets distributed to builders or citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Dalworthington Gardens Lightning Mitigation Action #2** | Ensure all City critical infrastructure has adequate lightning mitigation in place and upgrade protection as necessary. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |

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| **Estimated Cost** | $20,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program |
| **Potential Matching Funding Sources** | • County Funds |
| **Responsible Agency** | • Dalworthington Gardens Public Works<br>• Dalworthington Gardens Emergency Management |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will ensure new buildings that house critical infrastructure have adequate lightning mitigation. |
| **Effect on Existing Buildings** | This action will ensure existing critical infrastructure has adequate lightning mitigation. |
| **Cost Effectiveness** | Cost Effective – The destructive and sometimes capricious nature of lighting warrant the expense of this action compared with the benefits of avoiding damage to critical infrastructure. |
| **Discussion:** Review and confirmation of the adequacy of lightning protection systems in City buildings housing critical infrastructure is worthwhile considering the number of thunderstorms experienced in Dalworthington Gardens. | |

**SEVERE THUNDERSTORM**

High Vulnerability - Severe thunderstorms are the most common hazard in Dalworthington Gardens. From 1950 through August 2007 Tarrant County averaged eleven reported severe thunderstorm events county-wide per year. Most structures in Dalworthington Gardens can resist the effects of all but the most severe thunderstorms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to thunderstorms.

Location - Throughout Dalworthington Gardens.

Extent - Dalworthington Gardens is subject to the hazards of severe thunderstorms of all magnitudes.

Previous Occurrences - Records are available only on a county-wide basis. A severe thunderstorm in 2007 spawned a small tornado that caused some property damage.

Probability of Future Events – Severe thunderstorms will occur in Dalworthington Gardens an average of eleven times per year.

Impact – A single severe thunderstorm can cause damage from hail, high winds, lightning, and/or tornadoes to thousands of structures.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*
**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Dalworthington Gardens Severe Thunderstorm Mitigation Project #1** | Conduct technical assessment to determine the feasibility of structurally hardening the Dalworthington Gardens Fire Station located at 2600 Roosevelt Drive against severe weather. |
| **Hazard Addressed** | Tornado/Severe Thunderstorm |
| **Mitigation Goal/Objective** | 2. Reduce or eliminate loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction |
| **Priority** | High |
| **Estimated Cost** | $50,000 |
| **Potential Funding Sources** | Hazard Mitigation Grant Program |
| **Potential Matching Funding Sources** | • Private Foundation Grants<br>• Other State or Federal Grants<br>• City General Fund |
| **Responsible Agency** | • Dalworthington Gardens Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This project will determine the feasibility of structurally hardening the Dalworthington Gardens Fire Station against severe weather.<br><br>Note: Please see discussion section regarding the possibility of a new fire station in Dalworthington Gardens. |
| **Effect on Existing Buildings** | This project will determine the feasibility of structurally hardening the existing Dalworthington Gardens Fire Station against severe weather. |
| **Cost Effectiveness** | This project will provide the basis for a realistic cost benefit analysis of the feasibility of hardening the Dalworthington Gardens Fire Station against severe weather events. The relatively low cost of this project compared with the potential benefits of protecting a city's emergency response equipment against the jurisdiction's most likely hazard event result in a favorable cost benefit review. |

**Discussion:**
If federally funded, this project will provide for determining the feasibility of hardening the Dalworthington Gardens Fire Station against severe weather. Severe weather is the hazard most likely to impact Dalworthington Gardens. Dalworthington Gardens has only one fire station. This project will contribute to protecting the City's emergency response equipment so that it will be available to assist the citizens of Dalworthington Gardens in responding to and recovering from severe weather or other events.

The cost estimate is a conservative "best guess" based on a structural analysis of the existing fire station. That analysis would require:

- Structural analysis of the building by a Structural Engineer
- Analysis of electrical systems
- Analysis of HVAC systems
- Review of building codes
- Design of structural changes to existing building

Dalworthington Gardens may build a new fire station in the near future in order to house new fire apparatus. If a decision is made to build a new fire station, this project would fund design elements related to hardening the structure against severe weather. Design costs for hardening a new station against severe weather would likely be less than retro-fitting the existing fire station.

**NOTE:** *Final project details will be developed in accordance with grant requirements at the time the project is funded.*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Dalworthington Gardens Severe Thunderstorm Mitigation Action #2** | Encourage builders to install storm resistant construction such as "hurricane clips". |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | High |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |
| **Responsible Agency** | • Dalworthington Gardens Building Official<br>• Dalworthington Gardens Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will encourage storm resistant construction in new buildings. |

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| **Effect on Existing Buildings** | This action will encourage storm resistant construction in existing buildings as they are remodeled. |
| **Cost Effectiveness** | Cost Effective – The low cost of this action will be offset by a reduction in damage from severe thunderstorms. |
| **Discussion:** Effective education on storm resistant construction can reduce damage from severe thunderstorms. Insurance companies may be willing to fund or provide educational materials and/or provide discounts to persons who install storm resistant devices. | |

**SEVERE WINTER STORMS**

Moderate Vulnerability - Since 2000 the National Weather Service has reported 14 Winter Storm/Ice events. Winter storms in Dalworthington Gardens usually consist of short-lived icing events (ice on the roads for a few hours) that primarily affect traffic and cause numerous motor vehicle accidents. Occasionally an ice storm will cause widespread power outages for as long as several days. ONCOR Electric Delivery has an aggressive tree trimming program. Most structures in Dalworthington Gardens can resist the effects of all but the most severe winter storms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to winter storms. Electrical service outages are usually the most serious threat in this area. Most public safety and special facilities are equipped with generators.

Location - Throughout Dalworthington Gardens.

Extent - Severe ice storms have resulted in accumulations in excess of two inches. Most storms leave only a light coating or glaze of ice.

Previous Occurrences – Severe Winter Storms are typically regional events. Dalworthington Gardens has averaged two winter storms per year since 2000. Most winter storms resulting only minor inconveniences and a few motor vehicle accidents.

In 1978 up to an inch of ice coated area trees and roadways causing $14 million in damages region-wide and making travel almost impossible for two days.

In 1996 a winter storm dropped two to four inches of a mixture of sleet, freezing rain, and snow in Dalworthington Gardens over Thanksgiving weekend causing many motor vehicle accidents and some electrical service outages.

In 2003 a winter storm dropped one inch of sleet across Dalworthington Gardens resulting in numerous motor vehicle accidents and closing schools for two days.

Probability of Future Events - Dalworthington Gardens can expect to experience two winter storms per year with a severe winter storm once each ten years.

Impact - Winter storms can cause widespread electrical and telephone service outages, make travel dangerous or impossible, and damage structures. Deaths and injuries due to vehicle accidents and slips/falls are common during ice storms. Occasional deaths and injuries from carbon monoxide poisoning due to improper heating have occurred. Economic losses due to lost production can be significant. Damage from frozen pipes can lead to significant expenses for homeowners.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Dalworthington Gardens Severe Winter Storm Mitigation Action #1** | Increase public education concerning winter storm preparedness and mitigation. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | Medium |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Dalworthington Gardens Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into new buildings. |
| **Effect on Existing Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost is effective when compared to benefits provided to citizens. |
| **Discussion:** Winter weather preparedness has not been emphasized in Dalworthington Gardens as much as severe thunderstorms. This action will provide preparedness information to citizens during the fall. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Dalworthington Gardens Severe Winter Storm Mitigation Action #2** | Purchase additional street sanding capacity. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |

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| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Dalworthington Gardens Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will have no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Sanding streets is essential to allow emergency vehicles to respond during severe winter events. |
| **Discussion:** Sanding equipment can be mounted on existing equipment to provide sanding capabilities. During severe winter weather events streets around hospitals, fire stations and other critical facilities are sanded along with major intersections and roadways. Additional sanding capacity would allow for quicker sanding of these areas and for more repeat sanding during prolonged winter weather events. This will improve public safety by facilitating emergency response as well as reducing motor vehicle accidents. | |

**STREAM BANK EROSION**

Moderate Vulnerability - Flash floods along Rush Creek can cause stream bank erosion.

Location - Along Rush Creek through the western and southwestern portions of the City.

Extent - Stream bank erosion along Rush could cause severe damage to homes and roadways.

Previous Occurrences - Some minor flooding associated erosion occurs annually, especially during the spring and early summer.

Probability of Future Events - Dalworthington Gardens is certain to experience stream bank erosion in the future. Continued development and the resulting impervious cover will increase the likelihood and severity of flooding and associated erosion. It is likely that flooding will cause some damage in the next five years.

Vulnerability - Some homes, businesses, and roadways are vulnerable to stream bank erosion. Most buildings are a safe distance from the current path of the creek. Further analysis using GIS and field verification can specifically identify vulnerable structures.

Impact - Extreme stream bank erosion could destroy homes, businesses, and/or roadways. Dalworthington Gardens is a small city and any loss of business would have a noticeable impact. Roadway damage can restrict access for home/business owners and cause minor to major inconveniences to for drivers.

Impact – Damage or rupture of the sewer and water lines could cause health/sanitation hazards, loss of service to citizens, and significant environmental damage.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Dalworthington Gardens Stream Bank Erosion Mitigation Action #1** | Conduct study to reduce flood impacts of Rush Creek and implement findings. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |
| **Priority** | Medium |
| **Estimated Cost** | $100,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Dalworthington Gardens Emergency Management |
| **Estimated Completion Time Frame** | 3 years |
| **Effect on New Buildings** | This action will not affect new buildings |
| **Effect on Existing Buildings** | This action may affect existing buildings if significant construction is required. |
| **Cost Effectiveness** | Cost Effective – The action will reduce the adverse effects of flooding. |
| **Discussion:** A hydrologic study and resulting mitigation actions will provide a plan to manage development along Rush Creek. This study should be made in coordination with the City of Arlington which surrounds Dalworthington Gardens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Dalworthington Gardens Stream Bank Erosion Mitigation Action #2** | Determine and implement erosion control techniques along Rush Creek. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Dalworthington Gardens Public Works |
| **Estimated Completion Time Frame** | 3 years |
| **Effect on New Buildings** | This action will not have an effect on new buildings. |
| **Effect on Existing Buildings** | This action will protect existing buildings along Rush Creek. |
| **Cost Effectiveness** | Cost Effective – Although the final project cost is undetermined, it is believed the action will be cost effective. |
| **Discussion:** This action will review erosion control techniques and implement the most effective technique for controlling erosion along Rush Creek. | |

**TORNADO**

<u>High Vulnerability</u> – All structures in Dalworthington Gardens are vulnerable to tornadoes. Very few structures can withstand the effects of an F5 tornado. However, the

March 28, 2000 F3 tornado that struck Fort Worth provided good evidence that well built structures can protect people who take appropriate shelter inside those buildings.

Location - Tornadoes can occur anywhere in Dalworthington Gardens.

Extent - Dalworthington Gardens is subject to tornadoes of all magnitudes, including F5 tornadoes.

Previous Occurrences – On April 4, 2007 a tornado caused major damage to four homes in Dalworthington Gardens.

Probability of Future Events – Tarrant County has averaged one reported tornado per year and can expect that average to continue. Dalworthington Gardens, based on its relatively small size, will likely experience tornados very infrequently.

Impact - Tornadoes can cause deaths, injuries and property damage/destruction. Special facilities such as hospitals, fire stations, and utilities can be damaged or destroyed. Citizens who live in neighborhoods struck by tornadoes can experience disruption of their life styles and traditions. Areas struck by tornadoes can experience increased demand for mental health services as people deal with grief and stress.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Dalworthington Gardens Tornado Mitigation Project #1** | Assist citizens with funding for building tornado safe rooms or in-ground shelters. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction |
| **Priority** | High |
| **Estimated Cost** | $80,000 (20 Safe Rooms at $4,000 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Community Development Block Grant Funds |
| **Potential Matching Funding Sources** | Home/Building Owner |
| **Responsible Agency** | Dalworthington Gardens Emergency Management |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This project will encourage new buildings to be constructed with tornado safe rooms as part of the construction process. The safe room will enhance the overall storm resistance of the building. |
| **Effect on Existing Buildings** | This project will encourage homeowners to construct/install tornado safe rooms in their existing homes. A safe room will enhance the overall storm resistance of the building. |

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| **Cost Effectiveness** | Cost Effective - Safe rooms and in-ground shelters have been proven to reduce deaths and injuries during tornadoes and severe thunderstorms. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of safe rooms and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

**Discussion:**

This project will reimburse costs associated with tornado safe room or in-ground shelter installation in new or existing homes. Safe rooms provide increased protection for citizens during severe thunderstorms and tornados. Safe rooms have been proven to save lives and reduce injuries from severe weather events. FEMA publication 320 (*Taking Shelter from the Storm, Building a Safe Room Inside Your House*) provides the standards for safe rooms. As stated on the FEMA website: Although a "*residence may be built "to code," that does not mean it can withstand winds from extreme events such as tornadoes and major hurricanes. The purpose of a safe room or a wind shelter is to provide a space where you and your family can seek refuge that provides a high level of protection. To protect its occupants, a safe room must be built to withstand high winds and flying debris, even if the rest of the residence is severely damaged or destroyed."*

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to home owners will be for no more than $3,000 or 75% of cost, whichever is less
- Eligibility will be limited to individuals who own their home at the time of application
- The safe room or in-ground shelter must be constructed/installed in the primary residence of the applicant
- Each eligible homeowner can only receive one reimbursement, regardless of the number of shelters he/she may purchase/install
- In-ground shelters must meet requirements established in the National Performance Criteria for Tornado Shelters dated May 28, 1999.
- Safe Rooms must meet the requirements of FEMA Publication 320
- Safe Rooms and shelters must meet all applicable city and/or county codes
- Previously owned or used shelters will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Dalworthington Gardens Tornado Mitigation Project #2** | Assist citizens with funding for purchase of Weather Alert Radios |

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| **Mitigation Goal/Objective** | 4. Increase the effectiveness of warning systems in Tarrant County.<br>4. a. Increase the number of homes and businesses with Weather Alert Radios. |
| **Priority** | High |
| **Estimated Cost** | $4,000 (100 Weather Alert Radios at $40 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Private Sector Donations<br>• City Funds |
| **Potential Matching Funding Sources** | Citizen/Business Owner |
| **Responsible Agency** | Dalworthington Gardens Emergency Management |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings except for providing additional warning time of severe weather events thus allowing citizens more time to secure their home or business against approaching severe weather. |
| **Cost Effectiveness** | Cost Effective – Weather Alert Radios are a proven means to alert and warn citizens about severe weather and civil emergencies. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of Weather Alert Radios and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

***NOTE**: We are aware that Weather Alert Radios are on the "2007 Ineligible Planning Activities" list. It is our opinion that Weather Alert Radios should be considered eligible due to their very high benefit and very low cost.*

This project will reimburse 75% of the cost for citizens to purchase Weather Alert Radios, with the citizen responsible for the remaining 25%. Weather Alert Radios provide the best means for citizens to receive emergency alerts when they are indoors. Severe weather is the primary hazard in our area. Early alert and warning has proven to be a significant factor in saving lives during severe weather events.

In addition, the Weather Alert Radios can be activated for civil emergencies such as hazardous materials incidents. Effective warning saves lives, especially during severe weather events. Weather alert radios provide a proven means of indoor warning to citizens any time of the day or night and compose the vital indoor portion of our emergency warning system.

Warning systems have been shown to have value beyond the initial warning. Persons receiving warning relay the information to family and friends to ensure they are aware of the hazard. The secondary and tertiary warning can greatly amplify the effectiveness of the warning system.

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to citizens will be for no more than $30 or 75% of cost of the radio, whichever is less
- Eligibility will be limited to residents of Dalworthington Gardens
- The citizen must sign an agreement to keep the radio operational
- Each eligible homeowner can only receive one reimbursement, regardless of the number of radios purchased
- Previously purchased radios will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**WILDFIRE**

Low Vulnerability - Dalworthington Gardens has a small area of rural-urban interface (primarily park land along Rush Creek) and low vulnerability to wildfire.

Location – In the southwestern portions of the City.

Extent - The effects of wildfire are deaths, injuries, loss of structures, loss of wildlands, and loss of wildlife habitat.

Previous Occurrences – There are no reports of wildfire in Dalworthington Gardens.

Probability of Future Events – This is difficult to predict based on the lack of previous occurrences, but wildfire is possible in Dalworthington Gardens.

Vulnerability - Homes are most vulnerable to wildfires. The tendency to locate homes on tree covered lots and lack of fire breaks (such as parking lots around businesses) can enable fires to spread more easily to homes. Special facilities tend to be less vulnerable due to construction type (brick or metal).

Impact - Wildland fires can result in the need for rapid evacuations, casualties, loss of homes and businesses, and loss of wildlife habitat and recreational areas.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Dalworthington Gardens Wildfire Mitigation Action #1** | Increase public education on how to reduce the risks from wildfires (construction, landscaping, etc.) |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | High |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Dalworthington Gardens Emergency Management |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will reduce the effects of wildfire on new buildings through increased use of wildfire mitigation measures. |
| **Effect on Existing Buildings** | This action will reduce the effects of wildfire on existing buildings through increased use of wildfire mitigation measures. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing the effects of wildfire. |
| **Discussion:** Wildfire mitigation measures are not widely known in urban areas such as Dalworthington Gardens. This action will increase that knowledge and reduce casualties and damages from wildfires. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Dalworthington Gardens Wildfire Mitigation Action #2** | Enact building permit process that encourages wildfire resistant construction. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |

| | |
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| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | Dalworthington Gardens Building Official |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will reduce the vulnerability of new structure to wildfire. |
| **Effect on Existing Buildings** | This action will reduce the vulnerability of existing buildings to wildfire if they are remodeled to the extent a building permit is required. |
| **Cost Effectiveness** | Cost Effective – This action will integrate wildfire mitigation into the building process at minimal cost. |
| **Discussion:** Integrating mitigation into building permitting provides a process to reduce vulnerability with few negative impacts. | |

**Texas Standards That Exceed 44 CFR Requirements: Local Capability Assessments**

MAP 1

Projects funded under the following programs. Address the type of project that was funded. If you did not receive money from one of the below grants programs, then state that.

1.1: Hazard Mitigation Grant Program - None
1.2: Pre-Disaster Mitigation Grant Program - None
1.3: Project Impact - None
1.4: Hurricane-Property Protection Mitigation - None
1.5: Flood Mitigation Assistance - None
1.6: 406 Mitigation (through the Public Assistance Program) - None

MAP 2

Current Building Codes. Include the following information:
2.1: Date and type of code: 2000 International Building Code
2.2: How is it being enforced? Plans submitted for review. Projects inspected on site.

MAP 3

Current Fire Codes. Include the following information:
3.1: Date and type of code: 2000 International Building Code
3.2: How is it being enforced?

- Plans are submitted for review
- Projects inspected on site
- Annual Fire Inspection

MAP 4

4.1: Any other codes, sub-division regulations, etc., that are in effect in your jurisdiction? No
4.2: How are they being enforced?

MAP 5

Floodplain Management. Include the following information:

5.1: Ordinance/Order Date: Ordinance 05-17, Adopted October 20, 2005

5.2: Do you have a Floodplain Administrator? Yes

5.3: Is the person a Certified Floodplain Manager (CFM)? Yes

5.4: Date of current floodplain maps. August 23, 2000

5.5: Any codes, regulations, etc. that prohibit development in the floodway and/or floodplain: Ordinance 05-17

MAP 6

Findings/results of Building Code Effectiveness Grading Report (BCEGS). Include date of report and score. Not applicable

MAP 7

Identify other plans that your jurisdiction has or have been done in your jurisdiction.

7.1: Capital Improvement Plans: None

7.2: Comprehensive Plans: Adopted August 21, 1989, Revised March 17, 2005

7.3: Storm Water Management Plans: None

7.4: Master Drainage Plans: None

7.5: Corps of Engineers: None

7.6: Flood Mitigation Plan: None

7.7: Any other plans, studies, etc. that may have been done in your jurisdiction: None

# City of Edgecliff Village

Jurisdiction Profile
Edgecliff Village has an area of 1.1 square miles and a NCTCOG 2004 population estimate of 2,550.

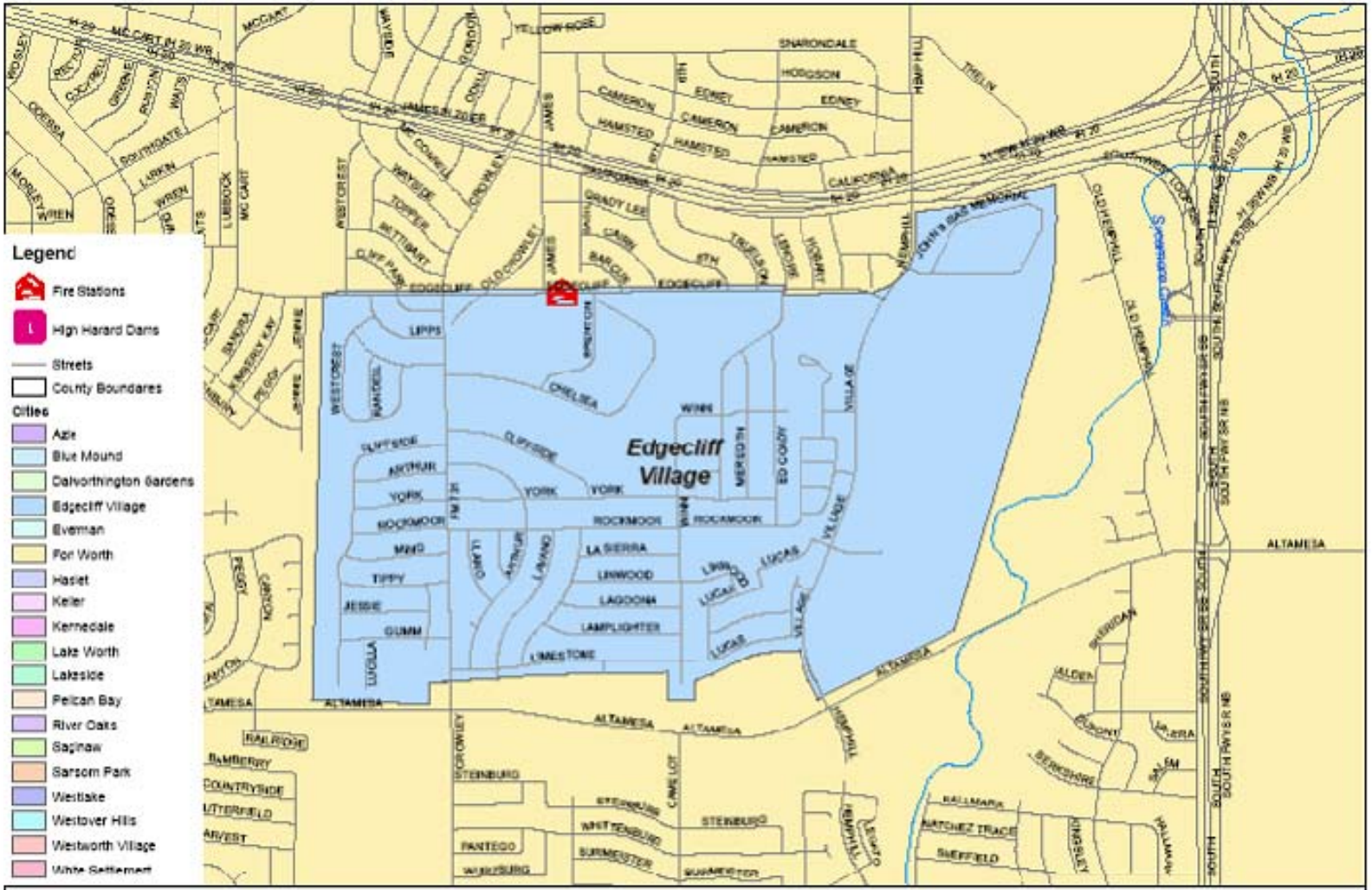
Edgecliff is an incorporated residential community on Farm Road 731 just south of the city limits of Fort Worth in south central Tarrant County. The establishment nearby of Carswell Air Force Base in the 1940s and the manufacturing plants of defense contractor General Dynamics in the 1950s boosted the community's development. The population remained low until the 1950s, when it increased to 500; in the late 1980s it was reported at more than 3,000. In 1990 the population was 2,715. In 2000 the population was 2,555.

| 1990 | 2000 | 2006 | 2007 |
|---|---|---|---|
| 2,715 | 2,550 | 2,550 | 2,550 |
| 2007 Population Density (persons per square mile): 2,106.70 | | | |

City Point-Of-Contact
Fire Chief/Emergency Management Coordinator Rex Loveday

Land Use and Development Trends
Edgecliff Village is a predominantly residential city. A large parcel of land on the eastern edge of the City that was owned by a single family has sold and will likely be developed into a residential community.

Jurisdiction Unique Hazards
Hazards specific to Edgecliff Village are discussed below.


Legend
Fire Stations
High Hazard Dams
Streets
County Boundaries
Cities
Azle
Blue Mound
Dalworthington Gardens
Edgecliff Village
Everman
Fort Worth
Haslet
Keller
Kennedale
Lake Worth
Lakeside
Pelican Bay
River Oaks
Saginaw
Sansom Park
Westlake
Westover Hills
Westworth Village
White Settlement
Edgecliff Village
ALTAMESA
FORT WORTH
Participating Jurisdictions: Edgecliff Village
Fire Stations
0
1,500 Feet
1" Inch = 1,500 Feet
N
Copyright © 2008, City of Fort Worth
02/07/2008

**DAM FAILURE**

No Vulnerability – There are no high hazard dams located in Edgecliff Village and none that would affect Edgecliff Village if they failed. Based on the lack of vulnerability, dam failure will receive no further consideration in this plan for Edgecliff Village.

**DROUGHT**

Moderate Vulnerability - The water supply in Edgecliff Village comes from surface water and is thus subject to drought. Edgecliff Village purchases water from the Tarrant Regional Water District (TRWD). TRWD water supply comes from three reservoirs on the West Fork of the Trinity River in northwest Tarrant County and from two reservoirs located well southeast of Tarrant County. These diverse supply locations help mitigate the effects of a local drought. An additional reservoir location well northeast of Tarrant County is being pursued. There has been some preliminary discussion of constructing a pipeline to carry water from southern Oklahoma. TRWD is installing pipelines to interconnect area water supply lakes with water treatment plants in order to provide maximum flexibility in water supply and treatment.

Location – Drought can affect all of Edgecliff Village.

Current Extent – As of February 2008, Edgecliff Village was at DO – Abnormally Dry on the Palmer Drought Severity Index.

Previous Occurrences – National Climatic Data Center records indicate that in the past ten years there have been three periods of drought in Edgecliff Village, 1996 - 1998, 2000, and 2005 - 2006.

Probability of Future Events – Droughts are certain to occur again in Edgecliff Village. Significant droughts significantly affecting water supply and resulting in mandatory restrictions traditionally occur on a twenty year cycle. Based on the previously cited National Climatic Data Center recent records, we can anticipate that drought conditions will occur approximately every three years.

Impact – Drought can lead to loss of water for basic needs such as drinking and fire-fighting. Droughts are associated with increased wildfire and damage from expansive soils. More common impacts are damage to landscaping and reduced recreation due to low lake levels.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Edgecliff Village Drought Mitigation Action #1** | Participate in the design and implementation of the Tarrant County specific water conservation public education efforts to compliment existing programs. |
| **Mitigation Goal/Objective** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |

| | |
|---|---|
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • City funds<br>• Water Suppliers |
| **Responsible Agency** | • Edgecliff Village Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One year |
| **Effect on New Buildings** | This action will publicize water conservation efforts that can be incorporated into new construction. |
| **Effect on Existing Buildings** | This action will publicize water conservation efforts that can be incorporated into existing construction. |
| **Cost Effectiveness** | Cost Effective – Public education programs can provide significant results for relatively low costs. |
| **Discussion:** Most cities in the area have existing water conservation programs designed to educate the public and businesses on ways to conserve water. This action will develop a Tarrant County specific program that will compliment existing programs. Jurisdictional public education efforts have been very successful in attracting the attention of local citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Edgecliff Village Drought Mitigation Action #2** | 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. Impacts identified in this plan will be included in updates to the Hazard Mitigation Action Plan. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • City Funds<br>• Water Suppliers |
| **Responsible Agency** | Edgecliff Village Fire/Emergency Management |
| **Estimated Completion Time Frame** | One Year |

| | |
|---|---|
| **Effect on New Buildings** | This action will identify drought impacts in Edgecliff Village thus providing specific information for builders of new structures to incorporate drought mitigation into the structures. |
| **Effect on Existing Buildings** | This action will identify drought impacts in Edgecliff Village thus providing specific information for owners of existing structures to incorporate drought mitigation into the structures. |
| **Cost Effectiveness** | Cost Effective – This planning effort will have a low cost with the potential for significant benefits for the entire community. |
| **Discussion:** This planning effort will focus attention on the effects of drought on the community. Specific drought effects will be identified and efforts can be made to mitigate those effects. | |

**EXPANSIVE SOILS**

Low Vulnerability - Expansive soils have caused damage to some structures in some portions of Edgecliff Village. However, damage has been limited to relatively small geographic areas and there are no reports of significant damage to commercial structures or infrastructure.

Location – Expansive soils are found in various areas of Edgecliff Village. We could not locate a map of expansive soils in Edgecliff.

Extent – The extent of expansive soils in Edgecliff Village is believed to be Very Low (0% - 20%) to Low (21% - 50%).

Previous Occurrences – We could find no empirical data on previous occurrences of damage from expansive soils, but it is believed that expansive soils have caused problems since the first buildings were constructed in this area.

Probability of Future Events – Due to the variability of soil types and construction quality, it is very difficult to predict future occurrences of problems with expansive soils. However, a study published in the fall 2003 issue of *Environmental Geology* cited in the September 19, 2003 *Dallas Business Journal* indicates that many new developments in the DFW Metroplex are being built on soil that is more unstable than soils built on prior to 1990. This could lead to a higher incidence of expansive soil related damage in the future.

Impact – The impact of expansive soils ranges from cosmetic cracks in walls to substantial foundation and structural damage that can result in the need to demolish the building. Infrastructure such as pipelines can be damaged causing increased maintenance and repairs, damaged beyond repair requiring replacement, damaged to the point of failure.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Edgecliff Village Expansive Soils Mitigation Action #1** | Improve construction techniques through building code enhancements. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined (Minimal – Staff Time Only) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building permit fees |
| **Potential Matching Funding Sources** | • City funds<br>• Building permit fees |
| **Responsible Agency** | Edgecliff Village Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will make new buildings more resistant to damage from expansive soils. |
| **Effect on Existing Buildings** | This action will require modifications to existing buildings to be more resistant to damage from expansive soils. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will improve construction quality and reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Edgecliff Village Expansive Soils Mitigation Action #2** | Educate construction contractors, home owners, and business owners about mitigation techniques. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $10,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building Permit Fees |
| **Potential Matching Funding Sources** | • City funds<br>• Building Permit Fees |
| **Responsible Agency** | • Edgecliff Village Public Works<br>• Edgecliff Village Fire/Emergency Management (Support) |
| **Estimated Completion Time Frame** | One Year |

| | |
|---|---|
| **Effect on New Buildings** | This action will provide builders of new construction with expansive soil mitigation techniques that will reduce damage. |
| **Effect on Existing Buildings** | This action will provide owners of existing buildings with expansive soil mitigation techniques that will reduce damage. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will provide construction contractors and home/business owners with techniques designed to reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**EXTREME HEAT**

High Vulnerability - Summer heat and humidity can occur anytime from May through October. Community health services actively work with at risk populations to prevent heat related deaths and injuries. The elderly, very young people and people with poor health are most at risk from summer heat. People who work outside or in un-air-conditioned buildings are also at high risk to the direct effects of summer heat. Summer heat can also lead to electrical service outages if equipment fails or demand exceeds available supply. Most public safety and special facilities are equipped with emergency generators.

Location - Throughout the City.

Extent - Summer temperatures can reach as high as 113 degrees. Edgecliff Village is also subject to high humidity.

Previous Occurrences - This is an annual occurrence. The summer of 1980 was a record year with 69 consecutive days of temperatures of 100 degrees or more. We were unable to find a reliable record of deaths or injuries related to heat.

Probability of Future Events - Hot summer temperatures are certain to continue to occur in Edgecliff Village.

Impact - Summer heat can cause widespread electrical outages resulting in dangerous conditions, especially for at-risk populations. Occasionally "cooling centers" are opened at community centers to provide a safe place for citizens to seek refuge from the heat. Extreme heat can have economic impacts if construction work is curtailed or outdoor special events are cancelled.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Edgecliff Village Extreme Heat Mitigation Action #1** | Determine feasibility of expanding monitoring of populations at risk from extreme heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |

| | |
|---|---|
| **Priority** | Medium |
| **Estimated Cost** | Undetermined. Staff time and GIS resources |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Other State or Federal Public Health Grants |
| **Potential Matching Funding Sources** | • City funds |
| **Responsible Agency** | • Tarrant County Public Health<br>• Edgecliff Village Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | None - This action is intended to expand monitoring of people only. |
| **Effect on Existing Buildings** | None - This action is intended to expand monitoring of people only. |
| **Cost Effectiveness** | Pending, but believed to be Cost Effective |
| **Discussion:** This action would determine the feasibility of expanding monitoring of populations at risk from extreme heat. Existing at risk population monitoring programs will be reviewed to ensure all known populations at risk from extreme heat are included. Any newly discovered at risk populations will be evaluated for inclusion in existing monitoring programs. Tarrant County Public Health provides public health services throughout the County. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Edgecliff Village Extreme Heat Mitigation Action #2** | Increase public education programs on the dangers of excessive heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br><br>2. c. Enhance public education concerning severe weather preparedness |
| **Priority** | Medium |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City funds<br>• Other State or Federal Public Health Grants |
| **Responsible Agency** | • Tarrant County Public Health<br>• Edgecliff Village Fire/Emergency Management |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Effect on Existing Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits. |

**Discussion:** Public education on severe weather in Edgecliff Village has traditionally focused on severe thunderstorms and associated hazards (tornadoes, lighting, flooding, high winds). This action would expand public education to include hazards from extreme heat.

**FLOOD**

High Vulnerability - The topography of Edgecliff Village combined with the frequency of severe thunderstorms results in flash flood events. Homes, business, and roadways along and crossing Sycamore Creek are vulnerable to flooding. There are no known special facilities in the flood prone area.

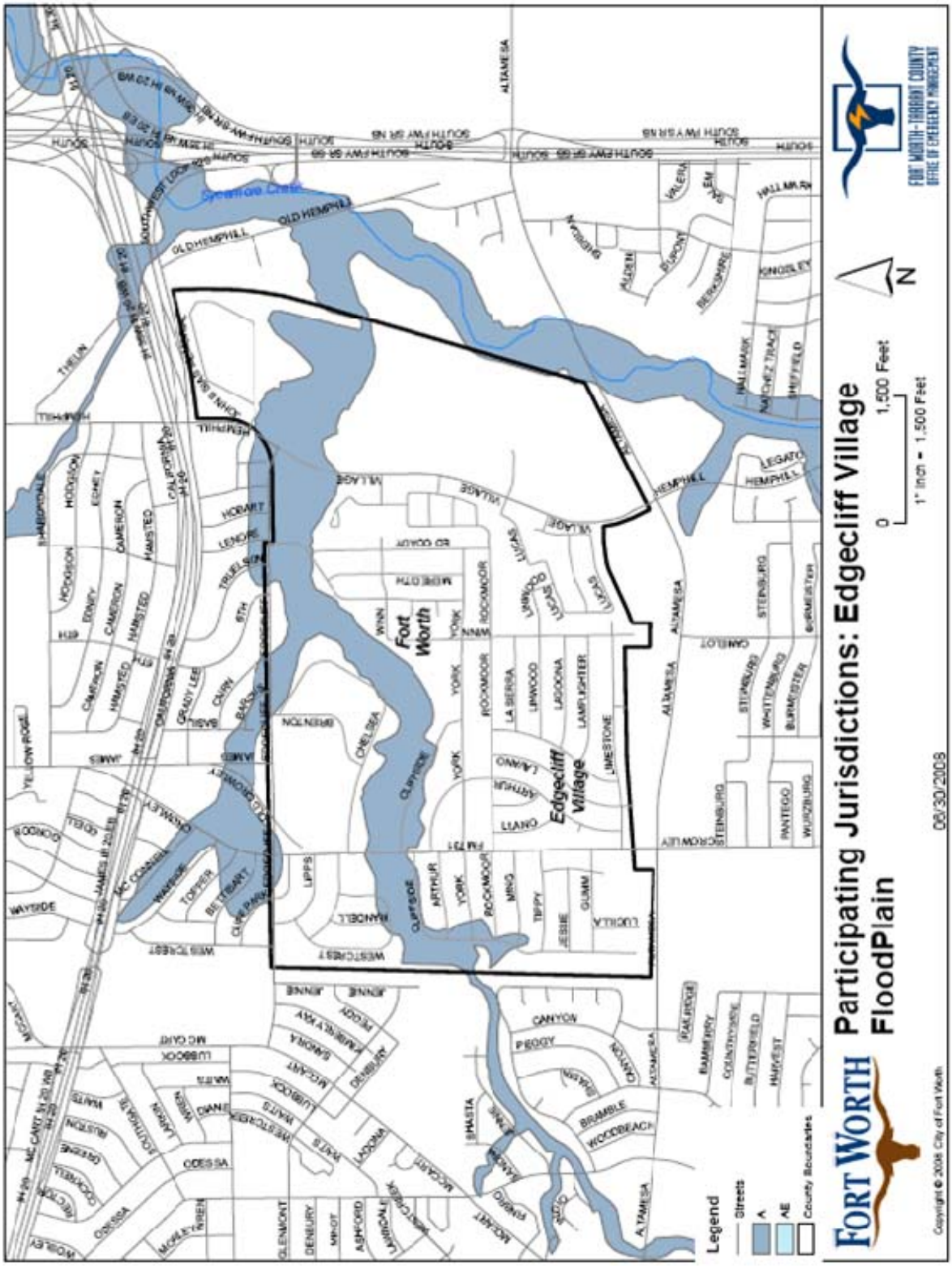
Location - Throughout the City, especially along Sycamore Creek and on Crowley Road.

Extent - Flash floods are the most common type of flooding in Edgecliff Village which tend to occur and recede very quickly.

Previous Occurrences - Sycamore Creek experiences minor floods periodically. On March 8, 1999 Sycamore Creek flooded causing damage to 12 homes along Sycamore Creek.

Probability of Future Events – Based on previous experience Edgecliff Village is certain to suffer flash flood events every year. National Weather Service records indicate an average of 11 flash flood events per year in Tarrant County. Continued development throughout the County and the resulting increase in impervious cover will increase the likelihood and severity of flooding.

Impact - Flash floods kill more people than any other hazard associated with thunderstorms. Property damage from flash flooding is seldom covered by insurance, which makes it very difficult for citizens to recover from the flood. Due to the very rapid rate of development and growth throughout Tarrant County we are experiencing problems with determining actual building footprints within flood plains and will be using planimetric GIS data from the NCTCOG to resolve this issue when it becomes available. At that time we will be able to accurately identify the number and types of buildings vulnerable to flooding; as well as access other data associated with those locations such as appraised value, census data, and owner information.


Participating Jurisdictions: Edgecliff Village
FloodPlain
FORT WORTH
FORT WORTH-TARRANT COUNTY
OFFICE OF EMERGENCY MANAGEMENT
N
0
1,500 Feet
1" inch = 1,500 Feet
06/30/2008
Legend
Streets
A
AE
County Boundaries
Fort Worth
Edgecliff Village
Sycamore Creek
Copyright © 2008 City of Fort Worth

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Edgecliff Village Flood Mitigation Project #1** | Participate in the development of the Tarrant County specific "Flood Preparedness" brochure. |
| **Hazard Addressed** | Flooding |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of Flood events.<br>1. c. Develop effective flood mitigation public education materials. |
| **Priority** | High |
| **Estimated Cost** | Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Private Foundation Grants |
| **Responsible Agency** | • Edgecliff Village Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This action will protect new buildings. |
| **Effect on Existing Buildings** | This action will provide flood mitigation techniques for owners of existing buildings. |
| **Cost Effectiveness** | Cost Effective - This project will provide valuable information to the public in a relatively short time and with relatively low costs. It will also have the added benefit of increasing public awareness of mitigation. The estimated cost could easily be offset by reduced losses to the public in a single small flood event. |

**Discussion**: Develop Tarrant County specific "Flood Preparedness" brochure. Once developed, the brochure will be distributed County-Wide. Historically flood prone areas will be targeted for door-to-door distribution and neighborhood meetings to present the brochure and solicit input for *Fort Worth Hazard Mitigation Action Plan* revisions.

The brochure will include:

- Description of Tarrant County flood hazards
- "Case Studies" of previous flood events in Tarrant County
- Preparedness and "self-help" mitigation information
- Benefits of city participation in NFIP
- Advantages of flood insurance
- Risks of not having flood insurance
- Warnings that typical homeowner's insurance does not cover rising water
- Solicit input for the *Fort Worth Hazard Mitigation Action Plan*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Edgecliff Village Flood Mitigation Action #2** | Conduct hydrologic study of Sycamore Creek to determine best means of mitigating flooding and implement findings of the study. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined pending engineering analysis |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Edgecliff Village Public Works<br>• Edgecliff Village Fire/Emergency Management |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will provide guidance for locating new buildings away from flood prone areas on Sycamore Creek. |
| **Effect on Existing Buildings** | This action will provide guidance for protection of existing buildings from flooding on Sycamore Creek. |
| **Cost Effectiveness** | Cost Effective – This project will provide guidance to reduce the hazard to life and property from flooding. |
| **Discussion:** This action will develop a study of flooding along Sycamore Creek and provide findings that can reduce the adverse effects of flooding on the creek. | |

**HAILSTORM**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of large hail are a hazard event in Edgecliff Village. Tarrant County averages eleven significant thunderstorm events (large hail, high winds) per year according to National Weather Service records. Most structures in Edgecliff Village can resist the effects of all but the most severe hailstorms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to hailstorms. Vehicles have proven to be vulnerable to hailstorms with widespread severe vehicle damage reported in 1980 and 1995.

Location - Throughout the City.

Extent - Edgecliff Village is subject to the hazards of severe thunderstorms, including large hail. Hail stones up to the size of grapefruit (H9 on the Combined NOAA/TORRO Hailstorm Intensity Scales) have been reported in Tarrant County.

Previous Occurrences – There are no reports of significant hailstorm events in Edgecliff Village other than the 1980 and 1995 county-wide events.

Probability of Future Events - Thunderstorms with hail are certain to continue to occur in Edgecliff Village. Hail falls on about two or three days per year, ordinarily with only slight and scattered damage (*National Weather Service*).

Impact – The impact from hailstorms can be significant in extreme events such as the hailstorms of 1980 and 1995. Thousands of homes and vehicles can be damaged in a single storm with millions of dollars in damages. Vehicles are especially impacted by large hails with windshields being the vulnerable part. A recurring problem following hailstorms is broken windshields in vehicles belonging to populations who do not have vehicle insurance and cannot afford the replacements costs, resulting in the owners having difficulty traveling to work, medical appointments, etc.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Edgecliff Village Hailstorm Mitigation Action #1** | Develop a public education campaign to encourage "hail resistant" roofing in new construction and roof replacements. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• Building/Permit Fees<br>• City funds |
| **Responsible Agency** | • Edgecliff Village Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will potentially decrease the damage caused by most hailstorms to new buildings. |
| **Effect on Existing Buildings** | This action will potentially decrease the damage caused by most hailstorms to existing buildings. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing hailstorm damage. One long term benefit will be reduced property insurance as claims related to hail damage are reduced. |
| **Discussion**: Public education has proven to be a low cost effective means to achieve changes public behavior. Encouraging hail resistant roofing can benefit citizens through reduced damage, business through reduced damage to their buildings and reduced claims against insurance companies, and government through reduced request for assistance. This campaign can be developed in conjunction with the Tarrant County effort. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Edgecliff Village Hailstorm Mitigation Action #2** | Evaluate City buildings to determine feasibility of installing hail resistant roofing and window coverings with a focus on critical infrastructure. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• City funds |
| **Responsible Agency** | Edgecliff Village Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on new City buildings. |
| **Effect on Existing Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on existing City buildings. |
| **Cost Effectiveness** | Cost Effective – Although currently undetermined, this project is believed to be cost effective. |
| **Discussion:** Installing hail resistant roofing and window coverings on City buildings could prevent or limit damage to City buildings thus avoiding costs to the City as well as preventing or limiting loss of use of damaged facilities. | |

**HIGH WINDS**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of high winds are a hazard in Edgecliff Village. Tarrant County averages ten reported significant thunderstorm events (large hail, high winds) per year. In addition, strong weather fronts can sometimes be accompanied by high winds which occasionally cause damage. Most structures in Edgecliff Village can resist the effects of all but the most severe high wind events. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to high winds.

Location - Throughout the City.

Extent - Severe thunderstorms with high winds with speeds in excess of 90 mph have been reported in Edgecliff Village.

Previous Occurrences – We could find no records of high wind damage in Edgecliff Village.

Probability of Future Events – Based on previous experience Edgecliff Village can expect to experience an average of ten significant thunderstorm events with high winds per year.

Impact – Records on high wind events are difficult to separate from severe thunderstorm records. High winds in Edgecliff Village typically cause little damage to commercial buildings. More often high winds cause damage to roofs, trees, and signs.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Edgecliff Village High Winds Mitigation Action #1** | Enact enhanced building codes to reduce damages from high winds. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined – Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City funds |
| **Responsible Agency** | • Edgecliff Village Public Works<br>• Edgecliff Village City Engineer<br>• Edgecliff Village Fire/Emergency Management |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will potentially identify a means to reduce high wind damage on new buildings. |
| **Effect on Existing Buildings** | This action will potentially identify a means to reduce high wind damage on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Although costs are undetermined, this action is believed to be cost effective since the action will require staff time only. |
| **Discussion:** Enhanced building codes will reduce damages from high wind events. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Edgecliff Village High Winds Mitigation Action #2** | Educate builders and residents about mitigating wind damage. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City funds<br>• Insurance Companies |
| **Responsible Agency** | Edgecliff Village Fire/Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |

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| **Effect on New Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on new buildings. |
| **Effect on Existing Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost of developing and providing high wind mitigation compared with savings to the community make this action cost effective. |
| **Discussion:** Public education has proven to be a low cost and effective means to achieve changes public behavior. High winds have not been a focus of severe weather preparedness. | |

**LANDSLIDES**

No Vulnerability – No areas in Edgecliff Village are subject to landslides. Based on the lack of vulnerability, landslides will receive no further consideration in this plan for Edgecliff Village. However, landslide hazards will be reviewed during the annual review of this plan and we will continue looking for areas with landslide potential during hazard surveys.

**LEVEE FAILURE**

No Vulnerability – There are no levees or areas that would be affected by levee failure in Edgecliff Village. Based on the lack of vulnerability, levee failure will receive no further consideration in this plan for Edgecliff Village.

**LIGHTNING**

Moderate Vulnerability – Lightning is one of the most common hazards in Edgecliff Village. Thunderstorms (and by definition, lightning) occur an average of 30 – 50 days per year (*Oklahoma Climatological Survey*). Lightning is the second most common cause of weather-related deaths in Texas (*National Weather Service*). Lightning information is available only for Tarrant County on a county-wide basis.

Location – Throughout the City.

Extent – We could find no references to the average number of strikes per storm in Edgecliff Village. However, lightning is by definition associated with thunderstorms.

Previous Occurrences – Tarrant County experiences 30 – 50 thunderstorm days per year. From 1995 – 2004 one person was killed and five were injured by lightning in Tarrant County (*National Weather Service*). Throughout Texas 34 people were killed by lightning, there were 184 injuries, and an estimated 23 million dollars in damages due to lightning from 1995 - 2004 (*National Weather Service*).

Probability of Future Events – Based on past experience Edgecliff Village will experience 30 – 50 thunderstorm days each year. Some days will have more than one thunderstorm during a given thunderstorm day.

Impact – Although lightning is the second most common cause of storm related deaths in Texas, lightning deaths remain relatively rare. Lightning does cause property damage several times per year (we could not find statistical data to validate this observation).

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Edgecliff Village Lightning Mitigation Action #1** | Provide lightning mitigation materials with building permit packets. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City funds |
| **Responsible Agency** | Edgecliff Village Public Works |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will provide materials that will reduce the vulnerability of new buildings to lightning. |
| **Effect on Existing Buildings** | This action will provide materials that will reduce the vulnerability of existing buildings that are being remodeled to lightning. |
| **Cost Effectiveness** | Cost Effective – The low cost of this project would be offset by eliminating just one lightning caused building loss. |
| **Discussion:** Lightning mitigation materials will be included in all building permit packets distributed to builders or citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Edgecliff Village Lightning Mitigation Action #2** | Ensure all City critical infrastructure has adequate lightning mitigation in place and upgrade protection as necessary. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | $20,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City funds |

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| **Responsible Agency** | • Edgecliff Village Public Works<br>• Edgecliff Village Fire/Emergency Management |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will ensure new City buildings that house critical infrastructure have adequate lightning mitigation. |
| **Effect on Existing Buildings** | This action will ensure existing critical infrastructure has adequate lightning mitigation. |
| **Cost Effectiveness** | Cost Effective – The destructive and sometimes capricious nature of lighting warrant the expense of this action compared with the benefits of avoiding damage to critical infrastructure. |
| **Discussion:** Review and confirmation of the adequacy of lightning protection systems in City buildings housing critical infrastructure is worthwhile considering the number of thunderstorms experienced in Edgecliff Village. | |

**SEVERE THUNDERSTORM**

High Vulnerability - Severe thunderstorms are the most common hazard in Edgecliff Village. From 1950 through August 2007 Tarrant County averaged eleven reported severe thunderstorm events county-wide per year. Most structures in Edgecliff Village can resist the effects of all but the most severe thunderstorms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to thunderstorms.

Location - Throughout the City.

Extent - Edgecliff Village is subject to the hazards of severe thunderstorms of all magnitudes.

Previous Occurrences - Records are available only on a county-wide basis.

Probability of Future Events – Severe thunderstorms will occur in Edgecliff Village an average of eleven times per year.

Impact – A single severe thunderstorm can cause damage from hail, high winds, lightning, and/or tornadoes to thousands of structures.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Edgecliff Village Severe Thunderstorm Mitigation Project #1** | Conduct technical assessment to determine the feasibility of structurally hardening the Edgecliff Village Fire Station located at 1605 Edgecliff Road against severe weather. |
| **Hazard Addressed** | Tornado/Severe Thunderstorm |

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| **Mitigation Goal/Objective** | 2. Reduce loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | High |
| **Estimated Cost** | $50,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • Private Foundation Grants<br>• Other State or Federal Grants<br>• City Funds |
| **Responsible Agency** | • Edgecliff Village City Engineer<br>• Edgecliff Village Fire Emergency Management |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This project will determine the feasibility of structurally hardening the Edgecliff Village Fire Station against severe weather. |
| **Effect on Existing Buildings** | This project will determine the feasibility of structurally hardening the Edgecliff Village Fire Station against severe weather. |
| **Cost Effectiveness** | Cost Effective - This project will provide the basis for a realistic cost benefit analysis of the feasibility of hardening the Edgecliff Village Fire Station against severe weather events. The relatively low cost of this project compared with the potential benefits of protecting a city's emergency response equipment against the jurisdiction's most likely hazard event result in a favorable cost benefit review. |

**Discussion:**
This project will provide for determining the feasibility of hardening the city's only fire station against severe weather. This project will contribute to protecting emergency response equipment so that it will be available to assist the citizens of Edgecliff Village in responding to and recovering from severe weather or other events. Final project details will be developed in accordance with grant requirements at the time the project is funded.

The cost estimate is a conservative "best guess" based on a structural analysis of the existing fire station. That analysis would require:

- Structural analysis of the building by a Structural Engineer
- Analysis of electrical systems
- Analysis of HVAC systems
- Review of building codes

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Edgecliff Village Severe Thunderstorm Mitigation Action #2** | Encourage builders to install storm resistant construction such as "hurricane clips". |

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| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | High |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City funds<br>• Insurance Companies |
| **Responsible Agency** | Edgecliff Village Public Works |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will encourage storm resistant construction in new buildings. |
| **Effect on Existing Buildings** | This action will encourage storm resistant construction in existing buildings as they are remodeled. |
| **Cost Effectiveness** | Cost Effective – The low cost of this action will be offset by a reduction in damage from severe thunderstorms. |
| **Discussion:** Effective education on storm resistant construction can reduce damage from severe thunderstorms. Insurance companies may be willing to fund or provide educational materials and/or provide discounts to persons who install storm resistant devices. | |

**SEVERE WINTER STORMS**

Moderate Vulnerability - Since 2000 the National Weather Service has reported 14 Winter Storm/Ice events. Winter storms in Edgecliff Village usually consist of short-lived icing events (ice on the roads for a few hours) that primarily affect traffic and cause numerous motor vehicle accidents. Occasionally an ice storm will cause widespread power outages for as long as several days. ONCOR Electric Delivery has an aggressive tree trimming program. Most structures in Edgecliff Village can resist the effects of all but the most severe winter storms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to winter storms. Electrical service outages are usually the most serious threat in this area. Most public safety and special facilities are equipped with generators.

Location - Throughout the City.

Extent - Severe ice storms have resulted in accumulations in excess of two inches. Most storms leave only a light coating or glaze of ice.

Previous Occurrences – Severe Winter Storms are typically regional events. Edgecliff Village has averaged two winter storms per year since 2000. Most winter storms resulting only minor inconveniences and a few motor vehicle accidents.

In 1978 up to an inch of ice coated area trees and roadways causing $14 million in damages region-wide and making travel almost impossible for two days.

In 1996 a winter storm dropped two to four inches of a mixture of sleet, freezing rain, and snow in Edgecliff Village over Thanksgiving weekend causing many motor vehicle accidents and some electrical service outages.

In 2003 a winter storm dropped one inch of sleet across Edgecliff Village resulting in numerous motor vehicle accidents and closing schools for two days.

Probability of Future Events - Edgecliff Village can expect to experience two winter storms per year with a severe winter storm once each ten years.

Impact - Winter storms can cause widespread electrical and telephone service outages, make travel dangerous or impossible, and damage structures. Deaths and injuries due to vehicle accidents and slips/falls are common during ice storms. Occasional deaths and injuries from carbon monoxide poisoning due to improper heating have occurred. Economic losses due to lost production can be significant. Damage from frozen pipes can lead to significant expenses for homeowners.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Edgecliff Village Severe Winter Storm Mitigation Action #1** | Increase public education concerning winter storm preparedness and mitigation. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | Medium |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City funds |
| **Responsible Agency** | Edgecliff Village Fire/Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into new buildings. |
| **Effect on Existing Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost is effective when compared to benefits provided to citizens. |
| **Discussion:** Winter weather preparedness has not been emphasized in Edgecliff Village as much as severe thunderstorms. This action will provide preparedness information to citizens during the fall. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Edgecliff Village Severe Winter Storm Mitigation Action #2** | Purchase additional street sanding capacity |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | City funds |
| **Responsible Agency** | Edgecliff Village Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will have no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Sanding streets is essential to allow emergency vehicles to respond during severe winter events. |
| **Discussion:** Sanding equipment can be mounted on existing equipment to provide sanding capabilities. During severe winter weather events streets around hospitals, fire stations and other critical facilities are sanded along with major intersections and roadways. Additional sanding capacity would allow for quicker sanding of these areas and for more repeat sanding during prolonged winter weather events. This will improve public safety by facilitating emergency response as well as reducing motor vehicle accidents. | |

**STREAM BANK EROSION**

Moderate Vulnerability - Flash floods along Sycamore Creek can cause stream bank erosion.

Location - Along Sycamore Creek through the northern portions of the City.

Extent - Stream bank erosion along Sycamore Creek could cause severe damage to homes and roadways.

Previous Occurrences - Some minor flooding associated erosion occurs annually, especially during the spring and early summer. On March 8, 1999 Sycamore Creek flooded causing some bank erosion near Crowley Road.

Probability of Future Events - Edgecliff Village is certain to experience stream bank erosion in the future. Continued development and the resulting impervious cover will increase the likelihood and severity of flooding and associated erosion. It is likely that flooding will cause some damage in the next five years.

Vulnerability - Some homes, businesses, and roadways are vulnerable to stream bank erosion. Most buildings are a safe distance from the current path of the creek. Further analysis using GIS and field verification can specifically identify vulnerable structures.

Impact - Extreme stream bank erosion could destroy homes, businesses, and/or roadways. Edgecliff Village is a small city and any loss of business would have a noticeable impact. Roadway damage can restrict access for home/business owners and cause minor to major inconveniences to for drivers.

Impact – Damage or rupture of the sewer and water lines could cause health/sanitation hazards, loss of service to citizens, and significant environmental damage.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Edgecliff Village Stream Bank Erosion Mitigation Action #1** | Conduct study to reduce erosion impacts of Sycamore Creek and implement findings. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |
| **Priority** | Medium |
| **Estimated Cost** | $50,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Edgecliff Village Emergency Management |
| **Estimated Completion Time Frame** | 3 years |
| **Effect on New Buildings** | This action will not affect new buildings |
| **Effect on Existing Buildings** | This action may affect existing buildings if significant construction is required. |
| **Cost Effectiveness** | Cost Effective – The action will reduce the adverse effects of flooding. |
| **Discussion:** A hydrologic study and resulting mitigation actions will provide a plan to manage development along Sycamore Creek. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Edgecliff Village Stream Bank Erosion Mitigation Action #2** | Determine and implement expedient erosion control techniques along Sycamore Creek. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Edgecliff Village Public Works |

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| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will not have an effect on new buildings. |
| **Effect on Existing Buildings** | This action will protect existing buildings along Sycamore Creek. |
| **Cost Effectiveness** | Cost Effective – Although the final project cost is undetermined, it is believed the action will be cost effective. |
| **Discussion:** This action will review erosion control techniques and implement the most effective technique for controlling erosion along Sycamore Creek. | |

**TORNADO**

High Vulnerability – All structures in Edgecliff Village are vulnerable to tornadoes. Very few structures can withstand the effects of an F5 tornado. However, the March 28, 2000 F3 tornado that struck Fort Worth provided good evidence that well built structures can protect people who take appropriate shelter inside those buildings.

Location - Tornadoes can occur anywhere in Edgecliff Village.

Extent - Edgecliff Village is subject to tornadoes of all magnitudes, including F5 tornadoes.

Previous Occurrences – We found no reports of tornados causing damage in Edgecliff Village. However, Tarrant County has an average of one tornado reported per year county-wide (Source: National Climatic Data Center). In 2007 there were eight tornadoes reported by storm spotters county-wide. Four of those tornados caused damage, all within incorporated areas.

Probability of Future Events - Tarrant County has averaged one reported tornado per year and can expect that average to continue. Edgecliff Village, based on its relatively small size, will likely experience tornados very infrequently.

Impact - Tornadoes can cause deaths, injuries and property damage/destruction. Special facilities such as hospitals, fire stations, and utilities can be damaged or destroyed. Citizens who live in neighborhoods struck by tornadoes can experience disruption of their life styles and traditions. Areas struck by tornadoes can experience increased demand for mental health services as people deal with grief and stress.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Edgecliff Village Tornado Mitigation Project #1** | Assist citizens with funding for building tornado safe rooms or in-ground shelters. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction |
| **Priority** | High |
| **Estimated Cost** | $100,000 (25 Safe Rooms at $4,000 each) |

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| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Community Development Block Grant Funds |
| **Potential Matching Funding Sources** | Home/Building Owner |
| **Responsible Agency** | • Edgecliff Village Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This project will encourage new buildings to be constructed with tornado safe rooms as part of the construction process. The safe room will enhance the overall storm resistance of the building. |
| **Effect on Existing Buildings** | This project will encourage homeowners to construct/install tornado safe rooms in their existing homes. A safe room will enhance the overall storm resistance of the building. |
| **Cost Effectiveness** | Cost Effective - Safe rooms and in-ground shelters have been proven to reduce deaths and injuries during tornadoes and severe thunderstorms. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of safe rooms and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

**Discussion:**
This project will reimburse costs associated with tornado safe room or in-ground shelter installation in new or existing homes. Safe rooms provide increased protection for citizens during severe thunderstorms and tornados. Safe rooms have been proven to save lives and reduce injuries from severe weather events. FEMA publication 320 (*Taking Shelter from the Storm, Building a Safe Room Inside Your House*) provides the standards for safe rooms. As stated on the FEMA website: Although a *"residence may be built "to code," that does not mean it can withstand winds from extreme events such as tornadoes and major hurricanes. The purpose of a safe room or a wind shelter is to provide a space where you and your family can seek refuge that provides a high level of protection. To protect its occupants, a safe room must be built to withstand high winds and flying debris, even if the rest of the residence is severely damaged or destroyed."*

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to home owners will be for no more than $3,000 or 75% of cost, whichever is less
- Eligibility will be limited to individuals who own their home at the time of application
- The safe room or in-ground shelter must be constructed/installed in the primary residence of the applicant
- Each eligible homeowner can only receive one reimbursement, regardless of the number of shelters he/she may purchase/install
- In-ground shelters must meet requirements established in the National Performance Criteria for Tornado Shelters dated May 28, 1999.
- Safe Rooms must meet the requirements of FEMA Publication 320
- Safe Rooms and shelters must meet all applicable city and/or county codes
- Previously owned or used shelters will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Edgecliff Village Tornado Mitigation Project #2** | Assist citizens with funding for purchase of Weather Alert Radios |
| **Mitigation Goal/Objective** | 4. Increase the effectiveness of warning systems in Tarrant County.<br>4. a. Increase the number of homes and businesses with Weather Alert Radios. |
| **Priority** | High |
| **Estimated Cost** | $10,000 (2,50 Weather Alert Radios at $40 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Private Sector Donations |
| **Potential Matching Funding Sources** | Citizen/Business Owner |
| **Responsible Agency** | • Edgecliff Village Fire Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |

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| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings except for providing additional warning time of severe weather events thus allowing citizens more time to secure their home or business against approaching severe weather. |
| **Cost Effectiveness** | Cost Effective – Weather Alert Radios are a proven means to alert and warn citizens about severe weather and civil emergencies. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of Weather Alert Radios and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

***NOTE**: We are aware that Weather Alert Radios are on the "2007 Ineligible Planning Activities" list. It is our opinion that Weather Alert Radios should be considered eligible due to their very high benefit and very low cost.*

This project will reimburse 75% of the cost for citizens to purchase Weather Alert Radios, with the citizen responsible for the remaining 25%. Weather Alert Radios provide the best means for citizens to receive emergency alerts when they are indoors. Severe weather is the primary hazard in our area. Early alert and warning has proven to be a significant factor in saving lives during severe weather events.

In addition, the Weather Alert Radios can be activated for civil emergencies such as hazardous materials incidents. Effective warning saves lives, especially during severe weather events. Weather alert radios provide a proven means of indoor warning to citizens any time of the day or night and compose the vital indoor portion of our emergency warning system.

Warning systems have been shown to have value beyond the initial warning. Persons receiving warning relay the information to family and friends to ensure they are aware of the hazard. The secondary and tertiary warning can greatly amplify the effectiveness of the warning system.

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to citizens will be for no more than $30 or 75% of cost of the radio, whichever is less
- Eligibility will be limited to residents of Edgecliff Village
- The citizen must sign an agreement to keep the radio operational
- Each eligible homeowner can only receive one reimbursement, regardless of the number of radios purchased
- Previously purchased radios will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**WILDFIRE**

Low Vulnerability - Edgecliff Village has a relatively small rural-urban interface along the southern edge of the City.

Location – Adjacent to undeveloped areas along the southern edge of the City.

Extent - The effects of wildfire are deaths, injuries, loss of structures, loss of wildlands, and loss of wildlife habitat.

Previous Occurrences – In December of 2005 a wildfire occurred on the southwest corner of the City causing no damage to structures.

Probability of Future Events - Wildfires are likely to occur annually and increase in frequency and severity as the population continues to increase and formally undeveloped areas are developed.

Vulnerability - Homes are most vulnerable to wildfires. The tendency to locate homes on tree covered lots and lack of fire breaks (such as parking lots around businesses) can enable fires to spread more easily to homes. Special facilities tend to be less vulnerable due to construction type (brick or metal).

Impact - Wildfires can result in the need for rapid evacuations, casualties, loss of homes and businesses, and loss of wildlife habitat and recreational areas.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Edgecliff Village Wildfire Mitigation Action #1** | Increase public education on how to reduce the risks from wildfires (construction, landscaping, etc.) |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | High |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Edgecliff Village Fire/Emergency Management |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will reduce the effects of wildfire on new buildings through increased use of wildfire mitigation measures. |
| **Effect on Existing Buildings** | This action will reduce the effects of wildfire on existing buildings through increased use of wildfire mitigation measures. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing the effects of wildfire. |
| **Discussion:** Wildfire mitigation measures are not widely known in urban areas such as Edgecliff Village. This action will increase that knowledge and reduce casualties and damages from wildfires. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Edgecliff Village Wildfire Mitigation Action #2** | Enact building permit process that encourages wildfire resistant construction. |

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| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City funds<br>• Building Permit Fees |
| **Responsible Agency** | • Edgecliff Village Public Works<br>• Edgecliff Village Fire/Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will reduce the vulnerability of new structure to wildfire. |
| **Effect on Existing Buildings** | This action will reduce the vulnerability of existing buildings to wildfire if they are remodeled to the extent a building permit is required. |
| **Cost Effectiveness** | Cost Effective – This action will integrate wildfire mitigation into the building process at minimal cost. |
| **Discussion:** Integrating mitigation into building permitting provides a process to reduce vulnerability with few negative impacts. | |

**Texas Standards That Exceed 44 CFR Requirements: Local Capability Assessments**

MAP 1

Projects funded under the following programs. Address the type of project that was funded. If you did not receive money from one of the below grants programs, then state that.

1.1: Hazard Mitigation Grant Program - None
1.2: Pre-Disaster Mitigation Grant Program - None
1.3: Project Impact - None
1.4: Hurricane-Property Protection Mitigation - None
1.5: Flood Mitigation Assistance - None
1.6: 406 Mitigation (through the Public Assistance Program) - None

MAP 2

Current Building Codes. Include the following information:
2.1: Date and type of code: 2000 International Building Code
2.2: How is it being enforced? Plans submitted for review. Projects inspected on site.

MAP 3

Current Fire Codes. Include the following information:
3.1: Date and type of code: 2000 International Building Code
3.2: How is it being enforced?

- Plans are submitted for review
- Projects inspected on site
- Annual Fire Inspection

MAP 4

4.1: Any other codes, sub-division regulations, etc., that are in effect in your jurisdiction? No

4.2: How are they being enforced?

MAP 5

Floodplain Management. Include the following information:

5.1: Ordinance/Order Date: None

5.2: Do you have a Floodplain Administrator? No

5.3: Is the person a Certified Floodplain Manager (CFM)? No

5.4: Date of current floodplain maps. August 23, 2000

5.5: Any codes, regulations, etc. that prohibit development in the floodway and/or floodplain: No

MAP 6

Findings/results of Building Code Effectiveness Grading Report (BCEGS). Include date of report and score. No report.

MAP 7

Identify other plans that your jurisdiction has or have been done in your jurisdiction.

7.1: Capital Improvement Plans: None

7.2: Comprehensive Plans: None

7.3: Storm Water Management Plans: None

7.4: Master Drainage Plans: None

7.5: Corps of Engineers: None

7.6: Flood Mitigation Plan: None

7.7: Any other plans, studies, etc. that may have been done in your jurisdiction: None

# City of Everman

Jurisdiction Profile
Everman has an area of 2 square miles and a NCTCOG 2007 population estimate of 5,800.

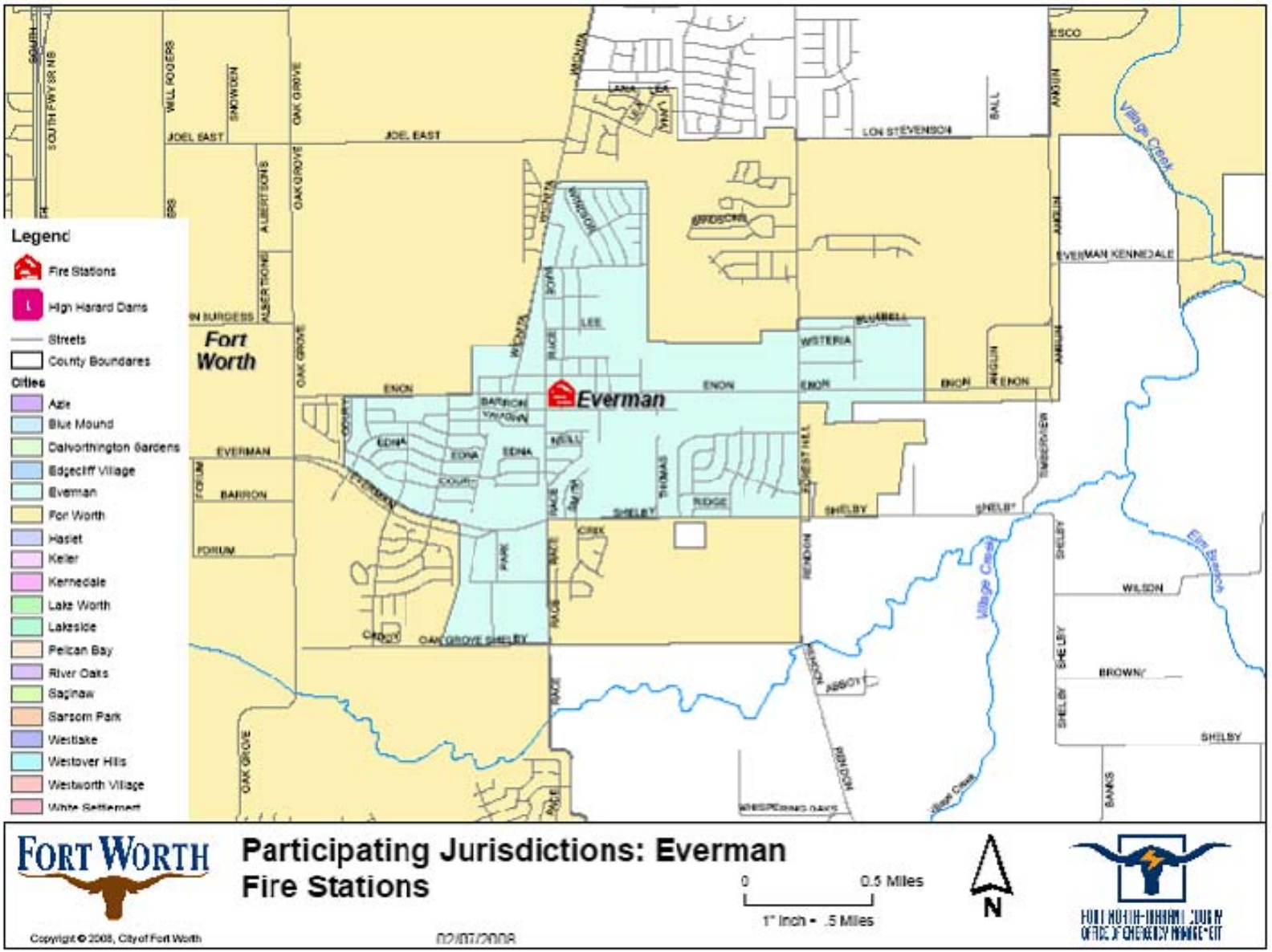
Everman was named for an engineer, John W. Everman, of the International-Great Northern Railroad, on the arrival of which the first established Anglo-American community developed here in 1904. Postal service and schools were established soon after that. Until the 1850s, the Kiowa-Apache and Wichita Native American tribes inhabited this area. A World War I flight training school at nearby Barron Field helped develop the economy. The population reached 150 in the 1920s and 450 in the 1950s, exploding to 5,000 in the 1970s when Dallas-Fort Worth International Airport was built, stabilizing around 5,800 today.

| 1990 | 2000 | 2006 | 2007 |
|---|---|---|---|
| 5,672 | 5,836 | 5,800 | 5,800 |
| 2007 Population Density (persons per square mile): 3,292.52 | | | |

City Point-Of-Contact
Randy Sanders, Police Chief, Emergency Management Coordinator

Land Use and Development Trends
Everman is landlocked, but has vacant areas that are expected to develop in the next few years.

Jurisdiction Unique Hazards
Hazards specific to Everman are discussed below.




**Participating Jurisdictions: Everman**
**Fire Stations**

**DAM FAILURE**

No Vulnerability – There are no high hazard dams located in Everman and none that would affect Everman if they failed. Based on the lack of vulnerability, dam failure will receive no further consideration in this plan for Everman.

**DROUGHT**

Moderate Vulnerability – Everman purchases water from Fort Worth who purchases water from the Tarrant Regional Water District (TRWD). TRWD water supply comes from three reservoirs on the West Fork of the Trinity River in northwest Tarrant County and from two reservoirs located well southeast of Tarrant County. These diverse supply locations help mitigate the effects of a local drought. An additional reservoir location well northeast of Tarrant County is being pursued. There has been some preliminary discussion of constructing a pipeline to carry water from southern Oklahoma. TRWD is installing pipelines to interconnect area water supply lakes with water treatment plants in order to provide maximum flexibility in water supply and treatment.

Location – Drought can affect all of Tarrant County.

Current Extent – As of February 2008, Everman was at DO – Abnormally Dry on the Palmer Drought Severity Index.

Previous Occurrences – National Climatic Data Center records indicate that in the past ten years there have been three periods of drought in Tarrant County, 1996 - 1998, 2000, and 2005 - 2006.

Probability of Future Events – Droughts are certain to occur again in Everman. Significant droughts significantly affecting water supply and resulting in mandatory restrictions traditionally occur on a twenty year cycle. Based on the previously cited National Climatic Data Center recent records, we can anticipate that drought conditions will occur approximately every three years.

Impact – Drought can lead to loss of water for basic needs such as drinking and fire-fighting. Droughts are associated with increased wildfire and damage from expansive soils. More common impacts are damage to landscaping and reduced recreation due to low lake levels.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Everman Drought Mitigation Action #1** | Participate in the design and implementation of the Tarrant County specific water conservation public education efforts to compliment existing programs. |
| **Mitigation Goal/Objective** | 5. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $1,000 |

| | |
|---|---|
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • City Funds<br>• Water Suppliers |
| **Responsible Agency** | • Everman Police/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One year |
| **Effect on New Buildings** | This action will publicize water conservation efforts that can be incorporated into new construction. |
| **Effect on Existing Buildings** | This action will publicize water conservation efforts that can be incorporated into existing construction. |
| **Cost Effectiveness** | Cost Effective – Public education programs can provide significant results for relatively low costs. |
| **Discussion:** Most cities in the area have existing water conservation programs designed to educate the public and businesses on ways to conserve water. This action will develop a Tarrant County specific program that will compliment existing programs. Jurisdictional public education efforts have been very successful in attracting the attention of local citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Everman Drought Mitigation Action #2** | 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. Impacts identified in this plan will be included in updates to the Hazard Mitigation Action Plan. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $20,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • City Funds<br>• Water Suppliers |
| **Responsible Agency** | Everman Police/Emergency Management |
| **Estimated Completion Time Frame** | One Year |

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| **Effect on New Buildings** | This action will identify drought impacts in Everman thus providing specific information for builders of new structures to incorporate drought mitigation into the structures. |
| **Effect on Existing Buildings** | This action will identify drought impacts in Everman thus providing specific information for owners of existing structures to incorporate drought mitigation into the structures. |
| **Cost Effectiveness** | Cost Effective – This planning effort will have a low cost with the potential for significant benefits for the entire community. |
| **Discussion:** This planning effort will focus attention on the effects of drought on the community. Specific drought effects will be identified and efforts can be made to mitigate those effects. | |

**EXPANSIVE SOILS**

Low Vulnerability - Expansive soils have caused damage to some structures in some portions of **Everman**. However, damage has been limited to relatively small geographic areas and there are no reports of significant damage to commercial structures or infrastructure.

Location – Expansive soils are found in various areas of Everman. We could not locate a map of expansive soils in Everman.

Extent – The extent of expansive soils in Everman is believed to be Very Low (0% - 20%) to Low (21% - 50%).

Previous Occurrences – We could find no empirical data on previous occurrences of damage from expansive soils, but it is believed that expansive soils have caused problems since the first buildings were constructed in this area.

Probability of Future Events – Due to the variability of soil types and construction quality, it is very difficult to predict future occurrences of problems with expansive soils. However, a study published in the fall 2003 issue of *Environmental Geology* cited in the September 19, 2003 *Dallas Business Journal* indicates that many new developments in the Metroplex are being built on soil that is more unstable than soils built on prior to 1990. This could lead to a higher incidence of expansive soil related damage in the future.

Impact – The impact of expansive soils ranges from cosmetic cracks in walls to substantial foundation and structural damage that can result in the need to demolish the building. Infrastructure such as pipelines can be damaged causing increased maintenance and repairs, damaged beyond repair requiring replacement, damaged to the point of failure.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Everman Expansive Soils Mitigation Action #1** | Improve construction techniques through building code enhancements. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined (Minimal – Staff Time Only) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building permit fees |
| **Potential Matching Funding Sources** | • City Funds<br>• Building permit fees |
| **Responsible Agency** | Everman Code Enforcement/Building Department |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will make new buildings more resistant to damage from expansive soils. |
| **Effect on Existing Buildings** | This action will require modifications to existing buildings to be more resistant to damage from expansive soils. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will improve construction quality and reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Everman Expansive Soils Mitigation Action #2** | Educate construction contractors, home owners, and business owners about mitigation techniques. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building Permit Fees |
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | • Everman Code Enforcement/Building Department<br>• Everman Police/Emergency Management |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will provide builders of new construction with expansive soil mitigation techniques that will reduce damage. |

| | |
|---|---|
| **Effect on Existing Buildings** | This action will provide owners of existing buildings with expansive soil mitigation techniques that will reduce damage. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will provide construction contractors and home/business owners with techniques designed to reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**EXTREME HEAT**

High Vulnerability - Summer heat and humidity can occur anytime from May through October. Community health services actively work with at risk populations to prevent heat related deaths and injuries. The elderly, very young people and people with poor health are most at risk from summer heat. People who work outside or in un-air-conditioned buildings are also at high risk to the direct effects of summer heat. Summer heat can also lead to electrical service outages if equipment fails or demand exceeds available supply. Most public safety and special facilities are equipped with emergency generators.

Location - Throughout the City.

Extent - Summer temperatures can reach as high as 113 degrees. Everman is also subject to high humidity.

Previous Occurrences - This is an annual occurrence. The summer of 1980 was a record year with 69 consecutive days of temperatures of 100 degrees or more. We were unable to find a reliable record of deaths or injuries related to heat.

Probability of Future Events - Hot summer temperatures are certain to continue to occur in Everman.

Impact - Summer heat can cause widespread electrical outages resulting in dangerous conditions, especially for at-risk populations. Occasionally "cooling centers" are opened at community centers to provide a safe place for citizens to seek refuge from the heat. Extreme heat can have economic impacts if construction work is curtailed or outdoor special events are cancelled.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Everman Extreme Heat Mitigation Action #1** | Determine feasibility of expanding monitoring of populations at risk from extreme heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined. Staff time and GIS resources |

| | |
|---|---|
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Other State or Federal Public Health Grants |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Tarrant County Public Health<br>• Everman Police/Emergency Management |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | None - This action is intended to expand monitoring of people only. |
| **Effect on Existing Buildings** | None - This action is intended to expand monitoring of people only. |
| **Cost Effectiveness** | Pending, but believed to be Cost Effective |
| **Discussion:** This action would determine the feasibility of expanding monitoring of populations at risk from extreme heat. Existing at risk population monitoring programs will be reviewed to ensure all known populations at risk from extreme heat are included. Any newly discovered at risk populations will be evaluated for inclusion in existing monitoring programs. Tarrant County Public Health provides public health services throughout the County. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Everman Extreme Heat Mitigation Action #2** | Increase public education programs on the dangers of excessive heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness |
| **Priority** | Medium |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Other State or Federal Public Health Grants |
| **Responsible Agency** | • Tarrant County Public Health<br>• Everman Police/Emergency Management |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Effect on Existing Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits. |
| **Discussion:** Public education on severe weather in Everman has traditionally focused on severe thunderstorms and associated hazards (tornadoes, lighting, flooding, high winds). This action would expand public education to include hazards from extreme heat. | |

**FLOOD**

High Vulnerability - Topography and the frequency of severe thunderstorms result in frequent flash flood events in Everman.

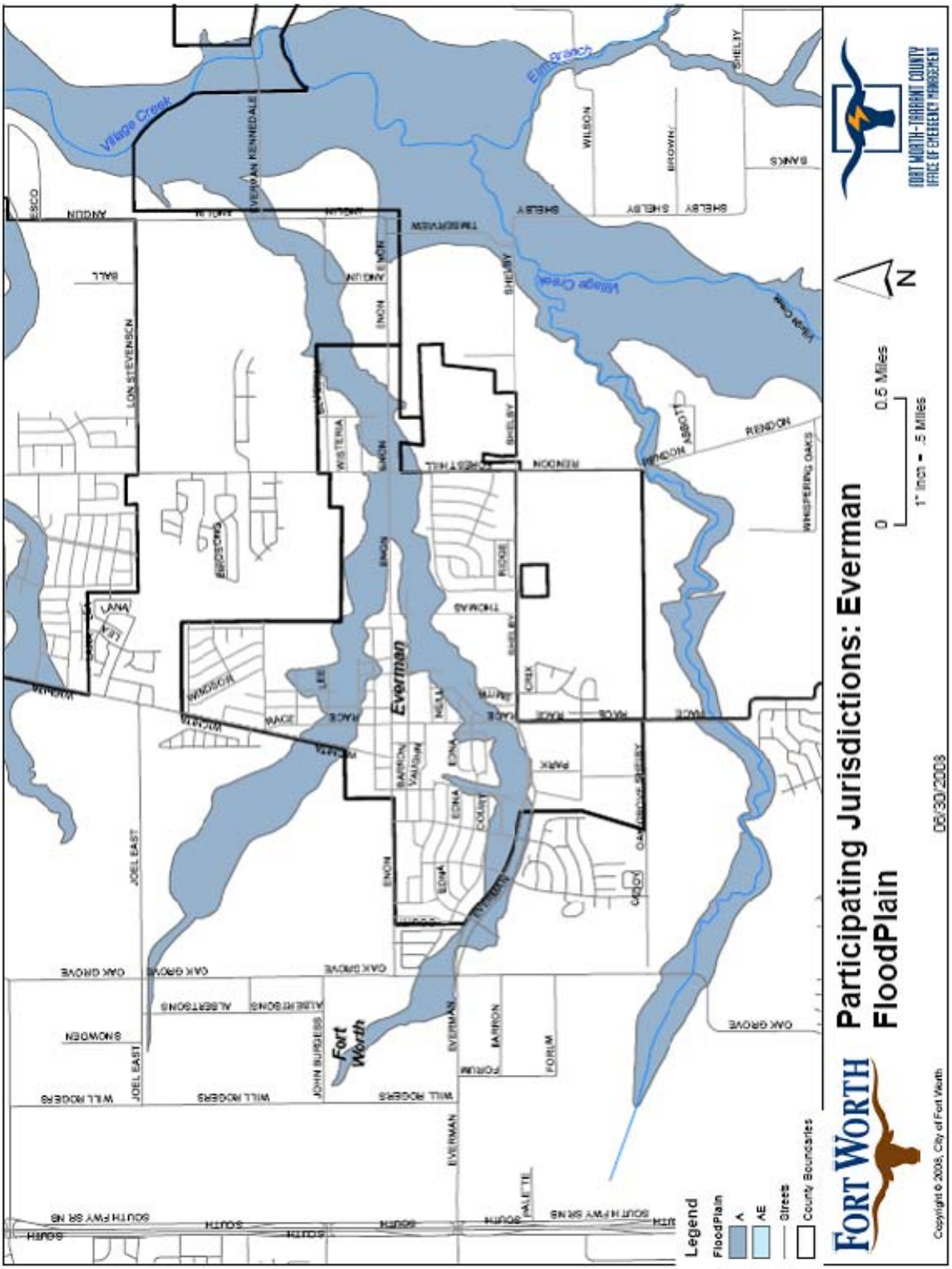
Location - Throughout the City, especially along Chambers Creek which flows from the south-central part of the City to the northeast corner. 40% of the City is within a floodplain and 20% is within a special drainage area. Further analysis using GIS and field verification can specifically identify vulnerable structures.

Extent - Flash floods are the most common type of flooding in Everman which tend to occur and recede very quickly.

Previous Occurrences - Chambers Creek flooded in July 2004 causing major damage to several dozen homes. Street flooding occurs after thunderstorms. In the summer of 2004 some portions of the County received two separate "500-Year" rain events. Tarrant County declared a Local State of Disaster on June 9th and again on August 2nd primarily due to widespread flooding.

Probability of Future Events – Based on previous experience Everman is certain to suffer flash flood events every year. National Weather Service records indicate an average of 11 flash flood events per year in Tarrant County. Continued development throughout the County and the resulting increase in impervious cover will increase the likelihood and severity of flooding.

Impact - Flash floods kill more people than any other hazard associated with thunderstorms. Property damage from flash flooding is seldom covered by insurance, which makes it very difficult for citizens to recover from the flood. Due to the very rapid rate of development and growth throughout Tarrant County we are experiencing problems with determining actual building footprints within flood plains and will be using planimetric GIS data from the NCTCOG to resolve this issue when it becomes available. At that time we will be able to accurately identify the number and types of buildings vulnerable to flooding; as well as access other data associated with those locations such as appraised value, census data, and owner information.


Participating Jurisdictions: Everman
FloodPlain
FORT WORTH
FORT WORTH - TARRANT COUNTY
OFFICE OF EMERGENCY MANAGEMENT
N
0
0.5 Miles
1" Inch = .5 Miles
06/30/2008
Legend
FloodPlain
A
AE
Streets
County Boundaries
Village Creek
Elm Branch
Everman
Fort Worth
Copyright © 2008, City of Fort Worth

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Everman Flood Mitigation Project #1** | Participate in the development of the Tarrant County specific "Flood Preparedness" brochure. |
| **Hazard Addressed** | Flooding |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of Flood events.<br>1. c. Develop effective flood mitigation public education materials. |
| **Priority** | High |
| **Estimated Cost** | Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Private Foundation Grants |
| **Responsible Agency** | • Everman Police/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This action will provide flood mitigation techniques for owners of new buildings. |
| **Effect on Existing Buildings** | This action will provide flood mitigation techniques for owners of existing buildings. |
| **Cost Effectiveness** | Cost Effective - This project will provide valuable information to the public in a relatively short time and with relatively low costs. It will also have the added benefit of increasing public awareness of mitigation. The estimated cost could easily be offset by reduced losses to the public in a single small flood event. |

**Discussion**: Develop Tarrant County specific "Flood Preparedness" brochure. Once developed, the brochure will be distributed County-Wide. Historically flood prone areas will be targeted for door-to-door distribution and neighborhood meetings to present the brochure and solicit input for *Fort Worth Hazard Mitigation Action Plan* revisions.

The brochure will include:

- Description of Tarrant County flood hazards
- "Case Studies" of previous flood events in Tarrant County
- Preparedness and "self-help" mitigation information
- Benefits of city participation in NFIP
- Advantages of flood insurance
- Risks of not having flood insurance
- Warnings that typical homeowner's insurance does not cover rising water
- Solicit input for the *Fort Worth Hazard Mitigation Action Plan*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Everman Flood Mitigation Action #2** | Conduct hydrologic study of Chambers Creek to determine best means of mitigating flooding and implement findings. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined pending engineering analysis |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Everman Village Public Works<br>• Everman Village Fire/Emergency Management |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will provide guidance for locating new buildings away from flood prone areas on Chambers Creek. |
| **Effect on Existing Buildings** | This action will provide guidance for protection of existing buildings from flooding on Chambers Creek. |
| **Cost Effectiveness** | Cost Effective – This project will provide guidance to reduce the hazard to life and property from flooding. |
| **Discussion:** This action will develop a study of flooding along Chambers Creek and provide findings that can reduce the adverse effects of flooding on the creek. | |

**HAILSTORM**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of large hail are a hazard event in Everman. Tarrant County averages eleven significant thunderstorm events (large hail, high winds) per year according to National Weather Service records. Most structures in Everman can resist the effects of all but the most severe hailstorms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to hailstorms. Vehicles have proven to be vulnerable to hailstorms with widespread severe vehicle damage reported in 1980 and 1995.

Location - Throughout the City.

Extent - Everman is subject to the hazards of severe thunderstorms, including large hail. Hail stones up to the size of grapefruit (H9 on the Combined NOAA/TORRO Hailstorm Intensity Scales) have been reported in Tarrant County.

Previous Occurrences – There are no reports of significant hailstorm events in Everman other than the 1980 and 1995 county-wide events.

Previous Occurrences – There are no reports of hailstorms causing significant damage in Everman other than the county-wide storms of 1980 and 1995.

Probability of Future Events - Thunderstorms with hail are certain to continue to occur in Everman. Hail falls on about two or three days per year, ordinarily with only slight and scattered damage (*National Weather Service*).

Impact – The impact from hailstorms can be significant in extreme events such as the hailstorms of 1980 and 1995. Thousands of homes and vehicles can be damaged in a single storm with millions of dollars in damages. Vehicles are especially impacted by large hails with windshields being the vulnerable part. A recurring problem following hailstorms is broken windshields in vehicles belonging to populations who do not have vehicle insurance and cannot afford the replacements costs, resulting in the owners having difficulty traveling to work, medical appointments, etc.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Everman Hailstorm Mitigation Action #1** | Develop a public education campaign to encourage "hail resistant" roofing in new construction and roof replacements. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• Building/Permit Fees<br>• City Funds |
| **Responsible Agency** | • Everman Police/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will potentially decrease the damage caused by most hailstorms to new buildings. |
| **Effect on Existing Buildings** | This action will potentially decrease the damage caused by most hailstorms to existing buildings. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing hailstorm damage. One long term benefit will be reduced property insurance as claims related to hail damage are reduced. |
| **Discussion**: Public education has proven to be a low cost effective means to achieve changes public behavior. Encouraging hail resistant roofing can benefit citizens through reduced damage, business through reduced damage to their buildings and reduced claims against insurance companies, and government through reduced request for assistance. This campaign can be developed in conjunction with the Tarrant County effort. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Everman Hailstorm Mitigation Action #2** | Evaluate City buildings to determine feasibility of installing hail resistant roofing and window coverings with a focus on critical infrastructure. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• City Funds |
| **Responsible Agency** | • Everman Code Enforcement/Building Department<br>• Everman Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on new City buildings. |
| **Effect on Existing Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on existing City buildings. |
| **Cost Effectiveness** | Cost Effective – Although currently undetermined, this project is believed to be cost effective. |
| **Discussion:** Installing hail resistant roofing and window coverings on City buildings could prevent or limit damage to City buildings thus avoiding costs to the City as well as preventing or limiting loss of use of damaged facilities. | |

**HIGH WINDS**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of high winds are a hazard in Everman. Tarrant County averages ten reported significant thunderstorm events (large hail, high winds) per year. In addition, strong weather fronts can sometimes be accompanied by high winds which occasionally cause damage. Most structures in Everman can resist the effects of all but the most severe high wind events. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to high winds.

Location - Throughout the City.

Extent - Severe thunderstorms with high winds with speeds in excess of 90 mph have been reported in Everman.

Previous Occurrences – We could find no records of significant high wind damage in unincorporated Everman.

Probability of Future Events – Based on previous experience Everman can expect to experience an average of ten significant thunderstorm events with high winds per year.

Impact – Records on high wind events are difficult to separate from severe thunderstorm records. High winds in Everman typically cause little damage to commercial buildings. More often high winds cause damage to roofs, trees, and signs.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Everman High Winds Mitigation Action #1** | Enact enhanced building codes to reduce damages from high winds. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined – Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Everman Code Enforcement/Building Department |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will potentially identify a means to reduce high wind damage on new buildings. |
| **Effect on Existing Buildings** | This action will potentially identify a means to reduce high wind damage on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Although costs are undetermined, this action is believed to be cost effective since the action will require staff time only. |
| **Discussion:** Enhanced building codes will reduce damages from high wind events. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Everman High Winds Mitigation Action #2** | Educate builders and residents about mitigating wind damage. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |

| | |
|---|---|
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |
| **Responsible Agency** | • Everman Code Enforcement/Building Department<br>• Everman Police/Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on new buildings. |
| **Effect on Existing Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost of developing and providing high wind mitigation compared with savings to the community make this action cost effective. |
| **Discussion:** Public education has proven to be a low cost and effective means to achieve changes public behavior. High winds have not been a focus of severe weather preparedness. | |

**LANDSLIDES**

No Vulnerability – There are no areas in Everman subject to landslides. Based on the lack of vulnerability, landslides will receive no further consideration in this plan for Everman. However, landslide hazards will be reviewed during the annual review of this plan and we will continue looking for areas with landslide potential during hazard surveys.

**LEVEE FAILURE**

No Vulnerability – There are no levees or areas that would be affected by levee failure in Everman. Based on the lack of vulnerability, levee failure will receive no further consideration in this plan for Everman.

**LIGHTNING**

Moderate Vulnerability – Lightning is one of the most common hazards in Everman. Thunderstorms (and by definition, lightning) occur an average of 30 – 50 days per year (*Oklahoma Climatological Survey*). Lightning is the second most common cause of weather-related deaths in Texas (*National Weather Service*). Lightning information is available only for Tarrant County on a county-wide basis.

Location – Throughout the City.

Extent – We could find no references to the average number of strikes per storm in Everman. However, lightning is by definition associated with thunderstorms.

Previous Occurrences – Everman experiences 30 – 50 thunderstorm days per year. From 1995 – 2004 one person was killed and five were injured by lightning in Tarrant County (*National Weather Service*). Throughout Texas 34 people were killed by lightning, there

were 184 injuries, and an estimated 23 million dollars in damages due to lightning from 1995 - 2004 (*National Weather Service*).

Probability of Future Events – Based on past experience Everman will experience 30 – 50 thunderstorm days each year. Some days will have more than one thunderstorm during a given thunderstorm day.

Impact – Although lightning is the second most common cause of storm related deaths in Texas, lightning deaths remain relatively rare. Lightning does cause property damage several times per year (we could not find statistical data to validate this observation).

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Everman Lightning Mitigation Action #1** | Provide lightning mitigation materials with building permit packets. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Everman Code Enforcement/Building Department |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will provide materials that will reduce the vulnerability of new buildings to lightning. |
| **Effect on Existing Buildings** | This action will provide materials that will reduce the vulnerability of existing buildings that are being remodeled to lightning. |
| **Cost Effectiveness** | Cost Effective – The low cost of this project would be offset by eliminating just one lightning caused building loss. |
| **Discussion:** Lightning mitigation materials will be included in all building permit packets distributed to builders or citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Everman Lightning Mitigation Action #2** | Ensure all City critical infrastructure has adequate lightning mitigation in place and upgrade protection as necessary. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | $20,000 |

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|---|---|
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Everman Code Enforcement/Building Department |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will ensure new City buildings that house critical infrastructure have adequate lightning mitigation. |
| **Effect on Existing Buildings** | This action will ensure existing critical infrastructure has adequate lightning mitigation. |
| **Cost Effectiveness** | Cost Effective – The destructive and sometimes capricious nature of lighting warrant the expense of this action compared with the benefits of avoiding damage to critical infrastructure. |
| **Discussion:** Review and confirmation of the adequacy of lightning protection systems in City buildings housing critical infrastructure is worthwhile considering the number of thunderstorms experienced in Everman. | |

**SEVERE THUNDERSTORM**

High Vulnerability - Severe thunderstorms are the most common hazard in Everman. From 1950 through August 2007 Tarrant County averaged eleven reported severe thunderstorm events county-wide per year. Most structures in Everman can resist the effects of all but the most severe thunderstorms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to thunderstorms.

Location - Throughout the City.

Extent - Everman is subject to the hazards of severe thunderstorms of all magnitudes.

Previous Occurrences - Records are available only on a county-wide basis.

Probability of Future Events – Severe thunderstorms will occur in Everman an average of eleven times per year.

Impact – A single severe thunderstorm can cause damage from hail, high winds, lightning, and/or tornadoes to thousands of structures.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Everman Severe Thunderstorm Mitigation Project #1** | Conduct technical assessment to determine the feasibility of structurally hardening the Everman Fire Station located at 400 West Enon against severe weather. |
| **Hazard Addressed** | Tornado/Severe Thunderstorm |

| | |
|---|---|
| **Mitigation Goal/Objective** | 2. Reduce loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | High |
| **Estimated Cost** | $50,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • Private Foundation Grants<br>• Other State or Federal Grants<br>• City Funds |
| **Responsible Agency** | • Everman Code enforcement/Building Department<br>• Everman Police/Emergency Management |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This project will determine the feasibility of structurally hardening the Everman Fire Station against severe weather. |
| **Effect on Existing Buildings** | This project will determine the feasibility of structurally hardening the Everman Fire Station against severe weather. |
| **Cost Effectiveness** | Cost Effective - This project will provide the basis for a realistic cost benefit analysis of the feasibility of hardening the Everman Fire Station against severe weather events. The relatively low cost of this project compared with the potential benefits of protecting a city's emergency response equipment against the jurisdiction's most likely hazard event result in a favorable cost benefit review. |

**Discussion:**
This project will provide for determining the feasibility of hardening the city's only fire station against severe weather. This project will contribute to protecting emergency response equipment so that it will be available to assist the citizens of Everman in responding to and recovering from severe weather or other events. Final project details will be developed in accordance with grant requirements at the time the project is funded.

The cost estimate is a conservative "best guess" based on a structural analysis of the existing fire station. That analysis would require:

- Structural analysis of the building by a Structural Engineer
- Analysis of electrical systems
- Analysis of HVAC systems
- Review of building codes

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Everman Severe Thunderstorm Mitigation Action #2** | Encourage builders to install storm resistant construction such as "hurricane clips". |

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|---|---|
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | High |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |
| **Responsible Agency** | Everman Code Enforcement/Building Department |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will encourage storm resistant construction in new buildings. |
| **Effect on Existing Buildings** | This action will encourage storm resistant construction in existing buildings as they are remodeled. |
| **Cost Effectiveness** | Cost Effective – The low cost of this action will be offset by a reduction in damage from severe thunderstorms. |
| **Discussion:** Effective education on storm resistant construction can reduce damage from severe thunderstorms. Insurance companies may be willing to fund or provide educational materials and/or provide discounts to persons who install storm resistant devices. | |

**SEVERE WINTER STORMS**

Moderate Vulnerability - Since 2000 the National Weather Service has reported 14 Winter Storm/Ice events. Winter storms in Everman usually consist of short-lived icing events (ice on the roads for a few hours) that primarily affect traffic and cause numerous motor vehicle accidents. Occasionally an ice storm will cause widespread power outages for as long as several days. ONCOR Electric Delivery has an aggressive tree trimming program. Most structures in Everman can resist the effects of all but the most severe winter storms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to winter storms. Electrical service outages are usually the most serious threat in this area. Most public safety and special facilities are equipped with generators.

Location - Throughout the City.

Extent - Severe ice storms have resulted in accumulations in excess of two inches. Most storms leave only a light coating or glaze of ice.

Previous Occurrences – Severe Winter Storms are typically regional events. Everman has averaged two winter storms per year since 2000. Most winter storms resulting only minor inconveniences and a few motor vehicle accidents.

In 1978 up to an inch of ice coated area trees and roadways causing $14 million in damages region-wide and making travel almost impossible for two days.

In 1996 a winter storm dropped two to four inches of a mixture of sleet, freezing rain, and snow in Everman over Thanksgiving weekend causing many motor vehicle accidents and some electrical service outages.

In 2003 a winter storm dropped one inch of sleet across Everman resulting in numerous motor vehicle accidents and closing schools for two days.

Probability of Future Events - Everman can expect to experience two winter storms per year with a severe winter storm once each ten years.

Impact - Winter storms can cause widespread electrical and telephone service outages, make travel dangerous or impossible, and damage structures. Deaths and injuries due to vehicle accidents and slips/falls are common during ice storms. Occasional deaths and injuries from carbon monoxide poisoning due to improper heating have occurred. Economic losses due to lost production can be significant. Damage from frozen pipes can lead to significant expenses for homeowners.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Everman Severe Winter Storm Mitigation Action #1** | Increase public education concerning winter storm preparedness and mitigation. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | Medium |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Everman Police/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into new buildings. |
| **Effect on Existing Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost is effective when compared to benefits provided to citizens. |
| **Discussion:** Winter weather preparedness has not been emphasized in Everman as much as severe thunderstorms. This action will provide preparedness information to citizens during the fall. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Everman Severe Winter Storm Mitigation Action #2** | Purchase additional street sanding capacity |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Everman Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will have no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Sanding streets is essential to allow emergency vehicles to respond during severe winter events. |
| **Discussion:** Sanding equipment can be mounted on existing equipment to provide sanding capabilities. During severe winter weather events streets around hospitals, fire stations and other critical facilities are sanded along with major intersections and roadways. Additional sanding capacity would allow for quicker sanding of these areas and for more repeat sanding during prolonged winter weather events. This will improve public safety by facilitating emergency response as well as reducing motor vehicle accidents. | |

**STREAM BANK EROSION**

Moderate Vulnerability - Flash floods along Chambers Creek can cause stream bank erosion.

Location - Along Rush Creek through the south central and through to the northeast portions of the City.

Extent - Stream bank erosion along Chambers Creek could cause severe damage to homes and roadways.

Previous Occurrences - Some erosion was observed following the 2004 flood event.

Probability of Future Events - Everman is certain to experience stream bank erosion in the future. Continued development and the resulting impervious cover will increase the likelihood and severity of flooding and associated erosion. It is likely that flooding will cause some damage in the next five years.

Vulnerability - Some homes, businesses, and roadways are vulnerable to stream bank erosion. Most buildings are a safe distance from the current path of the creek. Further analysis using GIS and field verification can specifically identify vulnerable structures.

Impact - Extreme stream bank erosion could destroy homes, businesses, and/or roadways. Everman is a small city and any loss of business would have a noticeable impact. Roadway damage can restrict access for home/business owners and cause minor to major inconveniences to for drivers.

Impact – Damage or rupture of the sewer and water lines could cause health/sanitation hazards, loss of service to citizens, and significant environmental damage.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Everman Stream Bank Erosion Mitigation Action #1** | Conduct study to reduce flood impacts of Chambers Creek and implement findings. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |
| **Priority** | Medium |
| **Estimated Cost** | $100,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Everman Police/Emergency Management<br>• Fort Worth – Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 3 years |
| **Effect on New Buildings** | This action will not affect new buildings |
| **Effect on Existing Buildings** | This action may affect existing buildings if significant construction is required. |
| **Cost Effectiveness** | Cost Effective – The action will reduce the adverse effects of flooding. |
| **Discussion:** A hydrologic study and resulting mitigation actions will provide a plan to manage development along Chambers Creek. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Everman Stream Bank Erosion Mitigation Action #2** | Determine and implement expedient erosion control techniques along Chambers Creek. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Everman Public Works |
| **Estimated Completion Time Frame** | One Year |

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|---|---|
| **Effect on New Buildings** | This action will not have an effect on new buildings. |
| **Effect on Existing Buildings** | This action will protect existing buildings along Chambers Creek. |
| **Cost Effectiveness** | Cost Effective – Although the final project cost is undetermined, it is believed the action will be cost effective. |
| **Discussion:** This action will review erosion control techniques and implement the most effective technique for controlling erosion along Chambers Creek. | |

**TORNADO**

High Vulnerability – All structures in Everman are vulnerable to tornadoes. Very few structures can withstand the effects of an F5 tornado. However, the March 28, 2000 F3 tornado that struck Fort Worth provided good evidence that well built structures can protect people who take appropriate shelter inside those buildings.

Location - Tornadoes can occur anywhere in Everman.

Extent - Everman is subject to tornadoes of all magnitudes, including F5 tornadoes.

Previous Occurrences – On April 16, 2002 a tornado developed in south Everman near the intersection of Noble Road and Hansbarger Road and moved northeast. Damage to fences carports and trees occurred. The tornado moved northeast into the Bonaventure Mobile Home Park, partially unroofing one mobile home, with minor damage to others. The tornado dissipated along Lon Stephenson Road and east of Forest Hill Drive.

Probability of Future Events - Tarrant County has averaged one reported tornado per year and can expect that average to continue. Everman, based on its relatively small size, will likely experience tornados very infrequently.

Impact - Tornadoes can cause deaths, injuries and property damage/destruction. Special facilities such as hospitals, fire stations, and utilities can be damaged or destroyed. Citizens who live in neighborhoods struck by tornadoes can experience disruption of their life styles and traditions. Areas struck by tornadoes can experience increased demand for mental health services as people deal with grief and stress.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Everman Tornado Mitigation Project #1** | Assist citizens with funding for building tornado safe rooms or in-ground shelters. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction |
| **Priority** | High |
| **Estimated Cost** | $100,000 (25 Safe Rooms at $4,000 each) |

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|---|---|
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Community Development Block Grant Funds |
| **Potential Matching Funding Sources** | Home/Building Owner |
| **Responsible Agency** | • Everman Police/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This project will encourage new buildings to be constructed with tornado safe rooms as part of the construction process. The safe room will enhance the overall storm resistance of the building. |
| **Effect on Existing Buildings** | This project will encourage homeowners to construct/install tornado safe rooms in their existing homes. A safe room will enhance the overall storm resistance of the building. |
| **Cost Effectiveness** | Cost Effective - Safe rooms and in-ground shelters have been proven to reduce deaths and injuries during tornadoes and severe thunderstorms. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of safe rooms and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

**Discussion:**
This project will reimburse costs associated with tornado safe room or in-ground shelter installation in new or existing homes. Safe rooms provide increased protection for citizens during severe thunderstorms and tornados. Safe rooms have been proven to save lives and reduce injuries from severe weather events. FEMA publication 320 (*Taking Shelter from the Storm, Building a Safe Room Inside Your House*) provides the standards for safe rooms. As stated on the FEMA website: Although a *"residence may be built "to code," that does not mean it can withstand winds from extreme events such as tornadoes and major hurricanes. The purpose of a safe room or a wind shelter is to provide a space where you and your family can seek refuge that provides a high level of protection. To protect its occupants, a safe room must be built to withstand high winds and flying debris, even if the rest of the residence is severely damaged or destroyed."*

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to home owners will be for no more than $3,000 or 75% of cost, whichever is less
- Eligibility will be limited to individuals who own their home at the time of application
- The safe room or in-ground shelter must be constructed/installed in the primary residence of the applicant
- Each eligible homeowner can only receive one reimbursement, regardless of the number of shelters he/she may purchase/install
- In-ground shelters must meet requirements established in the National Performance Criteria for Tornado Shelters dated May 28, 1999.
- Safe Rooms must meet the requirements of FEMA Publication 320
- Safe Rooms and shelters must meet all applicable city and/or county codes
- Previously owned or used shelters will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Everman Tornado Mitigation Project #2** | Assist citizens with funding for purchase of Weather Alert Radios |
| **Mitigation Goal/Objective** | 4. Increase the effectiveness of warning systems in Tarrant County.<br>4. a. Increase the number of homes and businesses with Weather Alert Radios. |
| **Priority** | High |
| **Estimated Cost** | $4,000 (100 Weather Alert Radios at $40 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Private Sector Donations<br>• City Funds |
| **Potential Matching Funding Sources** | Citizen/Business Owner |

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|---|---|
| **Responsible Agency** | • Everman Police/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings except for providing additional warning time of severe weather events thus allowing citizens more time to secure their home or business against approaching severe weather. |
| **Cost Effectiveness** | Cost Effective – Weather Alert Radios are a proven means to alert and warn citizens about severe weather and civil emergencies. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of Weather Alert Radios and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

***NOTE**: We are aware that Weather Alert Radios are on the "2007 Ineligible Planning Activities" list. It is our opinion that Weather Alert Radios should be considered eligible due to their very high benefit and very low cost.*

This project will reimburse 75% of the cost for citizens to purchase Weather Alert Radios, with the citizen responsible for the remaining 25%. Weather Alert Radios provide the best means for citizens to receive emergency alerts when they are indoors. Severe weather is the primary hazard in our area. Early alert and warning has proven to be a significant factor in saving lives during severe weather events.

In addition, the Weather Alert Radios can be activated for civil emergencies such as hazardous materials incidents. Effective warning saves lives, especially during severe weather events. Weather alert radios provide a proven means of indoor warning to citizens any time of the day or night and compose the vital indoor portion of our emergency warning system.

Warning systems have been shown to have value beyond the initial warning. Persons receiving warning relay the information to family and friends to ensure they are aware of the hazard. The secondary and tertiary warning can greatly amplify the effectiveness of the warning system.

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to citizens will be for no more than $30 or 75% of cost of the radio, whichever is less
- Eligibility will be limited to residents of Everman
- The citizen must sign an agreement to keep the radio operational
- Each eligible homeowner can only receive one reimbursement, regardless of the number of radios purchased
- Previously purchased radios will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**WILDFIRE**

Moderate Vulnerability – Everman is vulnerable to wildfire due to a rural-urban interface along the eastern side of the City.

Location - The areas of most concern are wooded areas along Chambers Creek through the center of the city and the wooded area that is undeveloped on the northeast side of the City.

Extent - The effects of wildfire are deaths, injuries, loss of structures, loss of wildlands, and loss of wildlife habitat.

Previous Occurrences – There are no reports of wildfire causing damage in Everman.

Probability of Future Events - Wildfires are likely to occur annually and increase in frequency and severity as the population continues to increase and formally rural areas are developed.

Impact - Wildfires can result in the need for rapid evacuations, casualties, loss of homes and businesses, and loss of wildlife habitat and recreational areas.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Everman Wildfire Mitigation Action #1** | Increase public education on how to reduce the risks from wildfires (construction, landscaping, etc.) |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | High |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Everman Fire Department<br>• Everman Police/Emergency Management |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will reduce the effects of wildfire on new buildings through increased use of wildfire mitigation measures. |
| **Effect on Existing Buildings** | This action will reduce the effects of wildfire on existing buildings through increased use of wildfire mitigation measures. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing the effects of wildfire. |
| **Discussion:** Wildfire mitigation measures are not widely known in urban areas such as Everman. This action will increase that knowledge and reduce casualties and damages from wildfires. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Everman Wildfire Mitigation Action #2** | Enact building permit process that encourages wildfire resistant construction. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |

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|---|---|
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | • Everman Code Enforcement/Building Department<br>• Everman Fire Department |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will reduce the vulnerability of new structure to wildfire. |
| **Effect on Existing Buildings** | This action will reduce the vulnerability of existing buildings to wildfire if they are remodeled to the extent a building permit is required. |
| **Cost Effectiveness** | Cost Effective – This action will integrate wildfire mitigation into the building process at minimal cost. |
| **Discussion:** Integrating mitigation into building permitting provides a process to reduce vulnerability with few negative impacts. | |

**Existing Hazard Mitigation Efforts**

- Everman has requested the USACE to conduct an assessment of drainage in Everman.

**Texas Standards That Exceed 44 CFR Requirements: Local Capability Assessments**

MAP 1

Projects funded under the following programs. Address the type of project that was funded. If you did not receive money from one of the below grants programs, then state that.

1.1: Hazard Mitigation Grant Program - None
1.2: Pre-Disaster Mitigation Grant Program - None
1.3: Project Impact - None
1.4: Hurricane-Property Protection Mitigation - None
1.5: Flood Mitigation Assistance - None
1.6: 406 Mitigation (through the Public Assistance Program) - None

MAP 2

Current Building Codes. Include the following information:
2.1: Date and type of code: 2000 International Building Code
2.2: How is it being enforced? Plans submitted for review. Projects inspected on site.

MAP 3

Current Fire Codes. Include the following information:
3.1: Date and type of code: 2000 International Fire Code
3.2: How is it being enforced?

- Plans are submitted for review
- Projects inspected on site
- Annual Fire Inspection

MAP 4

4.1: Any other codes, sub-division regulations, etc., that are in effect in your jurisdiction? No

4.2: How are they being enforced?

MAP 5

Floodplain Management. Include the following information:

5.1: Ordinance/Order Date: Ordinance #456, adopted 6/13/95

5.2: Do you have a Floodplain Administrator? Yes

5.3: Is the person a Certified Floodplain Manager (CFM)? No

5.4: Date of current floodplain maps. August 23, 2000

5.5: Any codes, regulations, etc. that prohibit development in the floodway and/or floodplain: Ordinance #456

MAP 6

Findings/results of Building Code Effectiveness Grading Report (BCEGS). Include date of report and score. No report.

MAP 7

Identify other plans that your jurisdiction has or have been done in your jurisdiction.

7.1: Capital Improvement Plans: None

7.2: Comprehensive Plans: Adopted 11/8/94, Map revised 10/14/03

7.3: Storm Water Management Plans: Adopted 11/10/87, Revised March '03, Amended June '05

7.4: Master Drainage Plans: None

7.5: Corps of Engineers: USACE Reconnaissance Report, Chambers Creek, Everman Texas, March 1998

7.6: Flood Mitigation Plan: None

7.7: Any other plans, studies, etc. that may have been done in your jurisdiction: None

# City of Fort Worth

Jurisdiction Profile
Fort Worth has an area of 298.7 square miles and a NCTCOG 2007 population estimate of 668,850.

Fort Worth, Texas was settled in 1849 as an Army outpost on the fork of the Trinity River assigned to protect settlers from Indian attacks. As this thriving town became the last major stop on the legendary Chisholm Trail, Fort Worth also became home to settlers and soldiers, cattle drovers and outlaws. Fort Worth, known as the city "Where the 'West Begins" has become more than just a cow-town. Fort Worth, Texas is home to numerous attractions and a variety of special events all year long. From the Fort Worth Zoo to the Cowboy Hall of Fame, this city has it all. Fort Worth is also known as the museum capital of the Southwest encompassing every genre from the Fort Worth Modern Art Museum to the Fort Worth Science & History Museum to the Stockyards Museum.

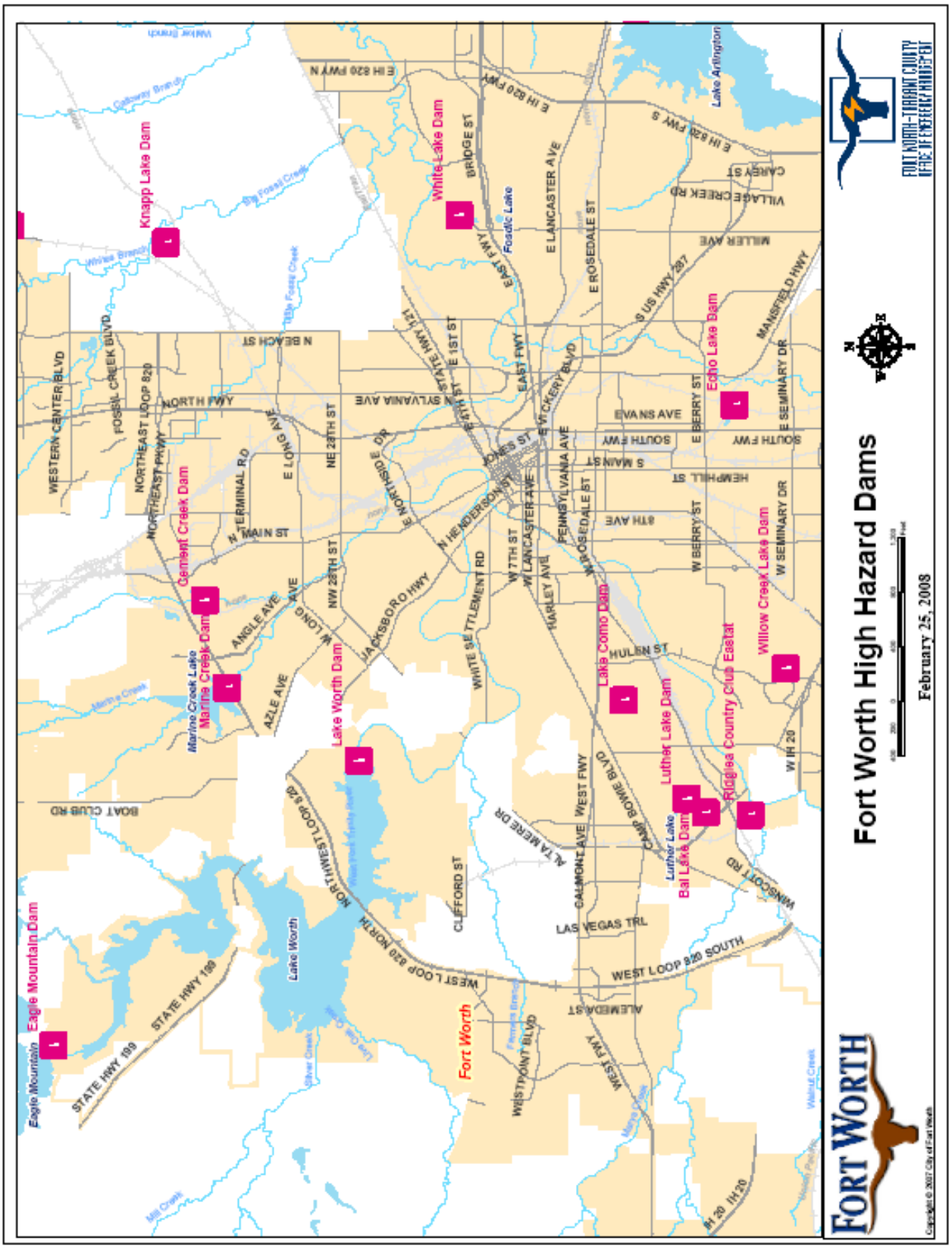
| 1990 | 2000 | 2006 | 2007 |
|---|---|---|---|
| 447,619 | 534,694 | 664,100 | 686,850 |
| 2007 Population Density (persons per square mile): 1,995.09 | | | |

City Point-Of-Contact
Keith Wells, Assistant Emergency Management Coordinator

Land Use and Development Trends
Fort Worth is the 18th largest City in the United States. Fort Worth has the variety of land uses that can be expected of a large city ranging from residential to heavy industrial. Lake Worth is the largest lake in the United States that is completely surrounded by a single city. The City is growing rapidly and expected to continue growing through at least 2030.

Jurisdiction Unique Hazards
Hazards specific to Fort Worth are discussed below.

Mitigation Actions
Mitigation Actions/Projects are listed below in association with the hazards they are intended to mitigate.


Fort Worth High Hazard Dams
February 25, 2008
FORT WORTH
Knapp Lake Dam
White Lake Dam
Echo Lake Dam
Cement Creek Dam
Marine Creek Dam
Lake Worth Dam
Lake Como Dam
Willow Creek Lake Dam
Luther Lake Dam
Bal Lake Dam
Ridglea Country Club East dam
Eagle Mountain Dam
Fort Worth
Lake Worth
Lake Arlington
Foodie Lake
Marine Creek Lake
Luther Lake
EAST FWY
NORTH FWY
SOUTH FWY
WEST FWY
WEST LOOP 820 SOUTH
WEST LOOP 820 NORTH
STATE HWY 199
E LANCASTER AVE
W LANCASTER AVE
E ROSEDALE ST
W ROSEDALE ST
JONES ST
EVANS AVE
HULEN ST
CAMP BOWIE BLVD
CLIFFORD ST
LAS VEGAS TRL
CALMONT AVE
ALTA MERE DR
WINSCOTT RD
BOAT CLUB RD
ALEMEDA ST
WESTPOINT BLVD
W IH 20
E IH 820 FWY N
E IH 820 FWY S
S US HWY 287
MANSFIELD HWY
MILLER AVE
E BERRY ST
W BERRY ST
E SEMINARY DR
W SEMINARY DR
HEMPHILL ST
S MAIN ST
N MAIN ST
N HENDERSON ST
E 1ST ST
E 6TH ST
W 7TH ST
8TH AVE
N BEACH ST
N SYLVANIA AVE
STATE HWY 121
E WICKERY BLVD
HARLEY AVE
PENNSYLVANIA AVE
WHITE SETTLEMENT RD
JACKSBORO HWY
N TERMINAL RD
E LONG AVE
NE 28TH ST
NW 28TH ST
W LONG AVE
ANGLE AVE
AZLE AVE
NORTHEAST LOOP 820
FOSSIL CREEK BLVD
WESTERN CENTER BLVD
NORTHEAST PKWY
VILLAGE CREEK RD
CAREY ST
BRIDGE ST
Lake Arlington
Foodie Lake
Big Fossil Creek
Little Fossil Creek
White Branch
Gateway Branch
Marine Creek
Lake Worth
West Fork Lake Worth
Silver Creek
Mary's Creek
Mary's Creek
Walnut Creek
Mill Creek
Clear Fork
Trinity River
Pelican Branch
Copyright © 2007 City of Fort Worth

**DAM FAILURE**

Low Vulnerability – The state of Texas has identified eleven dams in Fort Worth as high hazard dams. Completion of inundation studies for all high-hazard dams in the county will determine the extent of the hazard. The Fort Worth Transportation and Public Works Department is in the process of expanding their Dam Safety program to include more intensive annual inspections and inundation studies for all high hazard dams.

The high hazard dams in Fort Worth are:

| Location | Dam Name | Latitude | Longitude | River/Stream |
|---|---|---|---|---|
| Fort Worth | Bal Lake Dam | 32.706933 | -97.431150 | Clear Fork Trinity |
| Fort Worth | Cement Creek Dam | 32.828872 | -97.368108 | Cement Creek |
| Fort Worth | Eagle Mountain Dam | 32.869872 | -97.497031 | West Fork Trinity |
| Fort Worth | Echo Lake Dam | 32.698860 | -97.313194 | Sycamore Creek |
| Fort Worth | Lake Como Dam | 32.726667 | -97.398333 | Clear Fork Trinity |
| Fort Worth | Lake Worth Dam | 32.791667 | -97.415000 | West Fork Trinity |
| Fort Worth | Luther Lake Dam | 32.711551 | -97.427055 | Clear Fork Trinity |
| Fort Worth | Marine Creek Dam | 32.823836 | -97.393454 | Marine Creek |
| Fort Worth | Ridglea Country Club Estates | 32.695957 | -97.431828 | Mary's Creek |
| Fort Worth | White Lake Dam | 32.765579 | -97.257263 | West Fork Trinity |
| Fort Worth | Willow Creek Lake Dam | 32.687025 | -97.389622 | Willow Creek |

Location - A map showing the locations of the dams in Fort Worth is attached. Some areas that could be affected by failure of each dam are identified below. Inundation studies to identify specific areas that would be affected are Fort Worth Dam Failure Mitigation Action #1 below.

| Dam Name | Potentially Affected Areas |
|---|---|
| Bal Lake Dam | • Ridglea Hills Neighborhood<br>• Ridglea Hills Addition Neighborhood |
| Cement Creek Dam | • Union Pacific and Burlington Northern Railways<br>• Industrial Area between NE 38th and Long Avenue<br>• Diamond Hill – Jarvis Neighborhood<br>• Long Avenue Railway underpass |
| Eagle Mountain Lake Dam | • Lake Worth Nature Refuge<br>• Homes and businesses around Lake Worth<br>• River Oaks Water Treatment Plant<br>• Lakeland Neighborhood<br>• North Lake Worth Neighborhood<br>• Camp Carter Boy Scout Camp<br>• River Oaks Water Treatment Plant<br>• Riverbend Neighborhood<br>• Rockwood Golf Municipal Course<br>• Crestwood Neighborhood<br>• Gateway Park |

| | |
|---|---|
| Echo Lake Dam | • Morningside Neighborhood<br>• Glencrest Neighborhood<br>• Rolling Hills Neighborhood<br>• Berryhill/Mason Heights Neighborhood |
| Lake Como Dam | • Como neighborhood<br>• Sunset Heights South Neighborhood<br>• Vickery Blvd.<br>• Union Pacific Railway |
| Lake Worth Dam | • Camp Carter Boy Scout Camp<br>• River Oaks Water Treatment Plant<br>• Riverbend Neighborhood<br>• Rockwood Golf Municipal Course<br>• Crestwood Neighborhood<br>• Gateway Park |
| Luther Lake Dam | • Ridglea Hills Neighborhood<br>• River Hollow Neighborhood<br>• Vickery Blvd.<br>• Union Pacific Railway |
| Marine Creek Dam | • Loop 820<br>• Sansom Park<br>• Marine Park<br>• Northside Neighborhood<br>• Belmont Terrace Neighborhood |
| Ridglea Country Club Estates Dam | Ridglea Country Club Estates Neighborhood |
| White Lake Dam | • White Lake Private School<br>• White Lake Hills Neighborhood<br>• Woodhaven Neighborhood |
| Willow Creek Lake Dam | • Foster Park Neighborhood<br>• Westcliff West Neighborhood |

Extent – Pending intensive dam inspections and inundation studies the extent of possible dam failures cannot be determined.

Previous Occurrences – There have been no reports of dam failures in Fort Worth.

Probability of Future Events – The probability of future events is difficult to predict based on the lack of previous occurrences. There is some concern that farm ponds are being converted to park lakes and detention structures in newly developing areas without proper engineering reviews.

Impact – Failure of a high hazard dam has the potential to cause significant damage to urban structures, main highways, and utilities, as well as potential to cause loss of life (Natural Resources Conservation Service). Infrastructure could be damaged and rendered unusable for extended periods of time.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Fort Worth Dam Failure Mitigation Action #1** | Conduct Inundation Studies for all High Hazard Dams in Fort Worth. |
| **Mitigation Goal/Objective** | 2. Reduce the adverse effects of flood events.<br>1. a. Remove structures from flood prone areas |
| **Priority** | Medium |
| **Estimated Cost** | $440,000 ($40,000 for each of eleven dams) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Dam Owner |
| **Potential Matching Funding Sources** | • City Funds<br>• Dam Owner |
| **Responsible Agency** | • Fort Worth Transportation and Public Works<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will identify areas that should be excluded from new development should the dam fail. |
| **Effect on Existing Buildings** | This action will identify existing buildings that may be subject to inundation should a dam failure occur. |
| **Cost Effectiveness** | Cost Effective - Dam failures tend to be low probability/high consequence events. The relatively low cost of conducting these studies compared to the potential benefits in terms of lives saved and property protected make this project cost effective. |
| **Discussion:** Inundation studies of the high hazard dams will provide the data necessary to assess the vulnerability of downstream people and structures. Vulnerable structures and infrastructure can be identified and relocated or protected as necessary. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Fort Worth Dam Failure Mitigation Action #2** | Develop Emergency Action Plans for all High Hazard Dams in Fort Worth. |
| **Mitigation Goal/Objective** | 2. Reduce the adverse effects of flood events. |
| **Priority** | Medium |
| **Estimated Cost** | $275,000 ($25,000 each for eleven dams) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Dam Owners |
| **Potential Matching Funding Sources** | • City Funds<br>• Dam Owners |
| **Responsible Agency** | • Fort Worth Transportation & Public Works<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |

| | |
|---|---|
| **Effect on New Buildings** | This action will identify areas that should potentially be excluded from development. |
| **Effect on Existing Buildings** | This action will identify existing buildings that may be subject to inundation should a dam failure occur. |
| **Cost Effectiveness** | Cost Effective - Dam failures tend to be low probability/high consequence events. The relatively low cost of developing plans compared to the potential benefits in terms of lives saved and property protected make this project cost effective. |
| **Discussion:** Emergency Action Plans will provide the framework necessary to protect lives and property should the dam fail. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Fort Worth Dam Failure Mitigation Action #3** | Conduct a search for previously unidentified High Hazard Dams in Fort Worth. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events.<br>1. a. Remove structures from flood prone areas.<br><br>2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | $20,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Dam Owners |
| **Potential Matching Funding Sources** | • City Funds<br>• Dam Owners |
| **Responsible Agency** | • Fort Worth Public Works & Transportation<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will potentially identify new hazard areas that should be excluded from development. |
| **Effect on Existing Buildings** | This action will potentially identify existing buildings that may be subject to inundation should a dam failure occur. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of locating previously unknown High Hazard Dams. |
| **Discussion:** As the City continues to grow there is concern that farm pond dams are being converted to park dams or housing development detention structures without proper engineering review. This project will conduct a search for previously unknown High Hazard Dams. Any dams located can then be evaluated for safety and vulnerable populations, structures, or infrastructure below the dams. | |

**DROUGHT**

Moderate Vulnerability – Fort Worth purchases water from the Tarrant Regional Water District (TRWD). TRWD water supply comes from three reservoirs on the West Fork of the Trinity River in northwest Tarrant County and from two reservoirs located well southeast of Tarrant County. These diverse supply locations help mitigate the effects of a local drought. An additional reservoir location well northeast of Tarrant County is being pursued. There has been some preliminary discussion of constructing a pipeline to carry water from southern Oklahoma. TRWD is installing pipelines to interconnect area water supply lakes with water treatment plants in order to provide maximum flexibility in water supply and treatment.

Location – Throughout the planning area.

Current Extent – As of February 2008, Fort Worth was at DO – Abnormally Dry on the Palmer Drought Severity Index.

Previous Occurrences – National Climatic Data Center records indicate that in the past ten years there have been three periods of drought in Fort Worth, 1996 - 1998, 2000, and 2005 - 2006.

Probability of Future Events – Droughts are certain to occur again in Fort Worth. Significant droughts significantly affecting water supply and resulting in mandatory restrictions traditionally occur on a twenty year cycle. Based on the previously cited National Climatic Data Center recent records, we can anticipate that drought conditions will occur approximately every three years.

Impact – Drought can lead to loss of water for basic needs such as drinking and fire-fighting. Droughts are associated with increased wildfire and damage from expansive soils. More common impacts are damage to landscaping and reduced recreation due to low lake levels.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Fort Worth Drought Mitigation Action #1** | Participate in the design and implementation of the Tarrant County specific water conservation public education efforts to compliment existing programs. |
| **Mitigation Goal/Objective** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $10,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • City Funds<br>• Water Suppliers |

| | |
|---|---|
| **Responsible Agency** | • Fort Worth Water Department<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One year |
| **Effect on New Buildings** | This action will publicize water conservation efforts that can be incorporated into new construction. |
| **Effect on Existing Buildings** | This action will publicize water conservation efforts that can be incorporated into existing construction. |
| **Cost Effectiveness** | Cost Effective – Public education programs can provide significant results for relatively low costs. |
| **Discussion:** Fort Worth has an existing water conservation program designed to educate the public and businesses on ways to conserve water. This action will develop a Tarrant County specific program that will compliment existing programs. Jurisdictional public education efforts have been very successful in attracting the attention of local citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Fort Worth Drought Mitigation Action #2** | 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. Impacts identified in this plan will be included in updates to the Hazard Mitigation Action Plan. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $25,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • City Funds<br>• Water Suppliers |
| **Responsible Agency** | Fort Worth - Tarrant County OEM |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will identify drought impacts in Fort Worth thus providing specific information for builders of new structures to incorporate drought mitigation into the structures. |
| **Effect on Existing Buildings** | This action will identify drought impacts in Fort Worth thus providing specific information for owners of existing structures to incorporate drought mitigation into the structures. |

| | |
|---|---|
| **Cost Effectiveness** | Cost Effective – This planning effort will have a low cost with the potential for significant benefits for the entire community. |
| **Discussion:** This planning effort will focus attention on the effects of drought on the community. Specific drought effects will be identified and efforts can be made to mitigate those effects. | |

**EXPANSIVE SOILS**

Low Vulnerability - Expansive soils have caused damage to some structures in Fort Worth. However, damage has been limited to relatively small geographic areas and there are no reports of significant damage to commercial structures or infrastructure.

Location – Throughout the planning area.

Extent – The extent of expansive soils in Fort Worth is believed to be Very Low (0% - 20%) to Low (21% - 50%).

Previous Occurrences – We could find no empirical data on previous occurrences of damage from expansive soils, but it is believed that expansive soils have caused problems since the first buildings were constructed in this area.

Probability of Future Events – Due to the variability of soil types and construction quality, it is very difficult to predict future occurrences of problems with expansive soils. However, a study published in the fall 2003 issue of *Environmental Geology* cited in the September 19, 2003 *Dallas Business Journal* indicates that many new developments in the Metroplex are being built on soil that is more unstable than soils built on prior to 1990. This could lead to a higher incidence of expansive soil related damage in the future.

Impact – The impact of expansive soils ranges from cosmetic cracks in walls to substantial foundation and structural damage that can result in the need to demolish the building. Infrastructure such as pipelines can be damaged causing increased maintenance and repairs, damaged beyond repair requiring replacement, damaged to the point of failure.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Fort Worth Expansive Soils Mitigation Action #1** | Improve construction techniques through building code enhancements. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined (Minimal – Staff Time Only) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building permit fees |

| | |
|---|---|
| **Potential Matching Funding Sources** | • City Funds<br>• Building permit fees |
| **Responsible Agency** | Fort Worth Planning & Development |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will make new buildings more resistant to damage from expansive soils. |
| **Effect on Existing Buildings** | This action will require modifications to existing buildings to be more resistant to damage from expansive soils. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will improve construction quality and reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Fort Worth Expansive Soils Mitigation Action #2** | Educate construction contractors, home owners, and business owners about expansive soils mitigation techniques. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building Permit Fees |
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | • Fort Worth Planning & Development<br>• Fort Worth - Tarrant County OEM |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will provide builders of new construction with expansive soil mitigation techniques that will reduce damage. |
| **Effect on Existing Buildings** | This action will provide owners of existing buildings with expansive soil mitigation techniques that will reduce damage. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will provide construction contractors and home/business owners with techniques designed to reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**EXTREME HEAT**

High Vulnerability - Summer heat and humidity can occur anytime from May through October. Community health services actively work with at risk populations to prevent heat related deaths and injuries. The elderly, very young people and people with poor health are most at risk from summer heat. People who work outside or in un-air-conditioned buildings are also at high risk to the direct effects of summer heat. Summer heat can also lead to electrical service outages if equipment fails or demand exceeds available supply. Most public safety and special facilities are equipped with emergency generators.

Location - Throughout the planning area.

Extent - Summer temperatures can reach as high as 113 degrees. Fort Worth is also subject to high humidity.

Previous Occurrences - This is an annual occurrence. The summer of 1980 was a record year with 69 consecutive days of temperatures of 100 degrees or more. We were unable to find a reliable record of deaths or injuries related to heat.

Probability of Future Events - Hot summer temperatures are certain to continue to occur in Fort Worth.

Impact - Summer heat can cause widespread electrical outages resulting in dangerous conditions, especially for at-risk populations. Occasionally "cooling centers" are opened at community centers to provide a safe place for citizens to seek refuge from the heat. Extreme heat can have economic impacts if construction work is curtailed or outdoor special events are cancelled.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Fort Worth Extreme Heat Mitigation Action #1** | Determine feasibility of expanding monitoring of populations at risk from extreme heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined. Staff time and GIS resources |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Other State or Federal Public Health Grants |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Tarrant County Public Health<br>• Fort Worth Public Health |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | None - This action is intended to expand monitoring of people only. |
| **Effect on Existing Buildings** | None - This action is intended to expand monitoring of people only. |

| | |
|---|---|
| **Cost Effectiveness** | Pending, but believed to be Cost Effective |
| **Discussion:** This action would determine the feasibility of expanding monitoring of populations at risk from extreme heat. Existing at risk population monitoring programs will be reviewed to ensure all known populations at risk from extreme heat are included. Any newly discovered at risk populations will be evaluated for inclusion in existing monitoring programs. Tarrant County Public Health provides public health services throughout the County. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Fort Worth Extreme Heat Mitigation Action #2** | Increase public education programs on the dangers of excessive heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness |
| **Priority** | Medium |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Other State or Federal Public Health Grants |
| **Responsible Agency** | • Fort Worth Public Health<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Effect on Existing Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits. |
| **Discussion:** Public education on severe weather in Fort Worth has traditionally focused on severe thunderstorms and associated hazards (tornadoes, lighting, flooding, high winds). This action would expand public education to include hazards from extreme heat. | |

**FLOOD**

High Vulnerability - The topography of Fort Worth combined with the frequency of severe thunderstorms results in frequent flash flood events. There have been 17 deaths in Fort Worth due to flash flooding on roadways since 1986. There is a low risk of riverine flooding due to the presence of a well-maintained levee system. FEMA records indicate only 39 Repetitive Loss Properties in all of Tarrant County. However, this is probably more a reflection of the low number of flood insurance polices than vulnerability to flooding. Homes, businesses, roadways, and some special facilities are vulnerable to flood events in Fort Worth. Further analysis using GIS and field verification can specifically identify vulnerable structures.

Location – Flash floods can occur throughout Fort Worth especially along creeks and drainage structures. Locations of recent flash flood events include:

- Schwartz Creek/Lebow Channel on the north side
- Marine Creek on the northwest side
- Mary's Creek on the west side
- Big Fossil Creek on the far north side

Flooding can also occur in lakefront property on Lake Worth. Riverine flooding may occur along the Clear Fork or West Fork of the Trinity River (see also Levee Failure section of this plan).

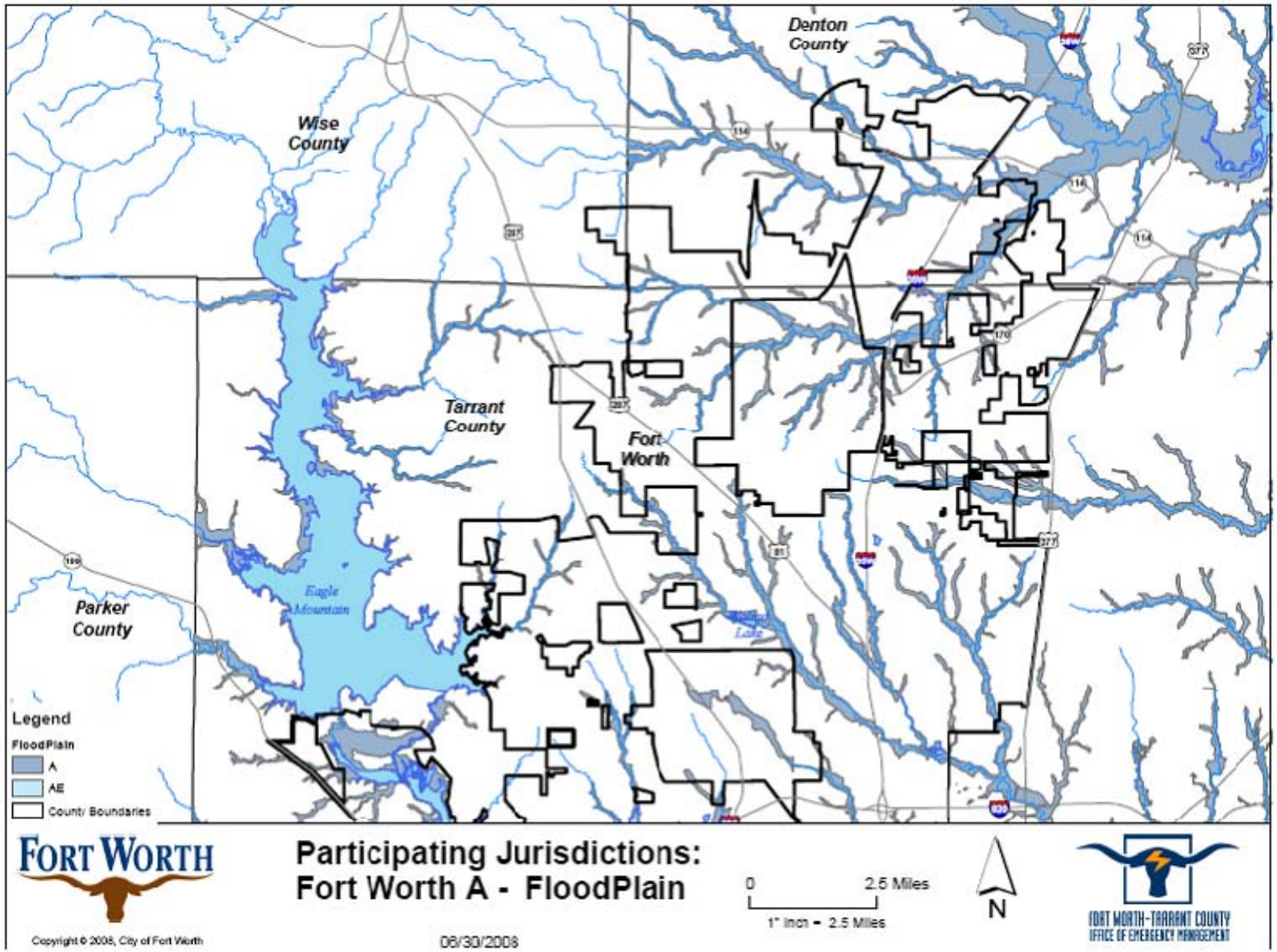
Extent - Flash floods are the most common type of flooding in Fort Worth. The flash floods tend to occur and recede very quickly. Flooding around Lake Worth can reach a depth of several feet in homes on the lake.

Previous Occurrences - Between 1993 and 2006 the National Weather Service reported 155 flash flood events in Tarrant County. Minor flooding occurs frequently, especially during the spring and early summer. Recent significant events include:

- June 2000 - Rains of up to 11 inches fell in a few hours on far west Fort Worth causing major damage to homes and streets
- June 2004 - Significant flooding occurred in many other parts of the city following heavy rain. Homes, businesses, the zoo, and utilities were affected by the flooding. Some portions of the County received two separate "500-Year" rain events. Tarrant County declared a Local State of Disaster on June 9th and again on August 2nd primarily due to widespread flooding.
- June 2007 - Heavy rains damaged or destroyed several homes in far north Fort Worth

Probability of Future Events – Based on previous experience Fort Worth is certain to suffer flash flood events every year. National Weather Service records indicate an average of 11 flash flood events per year in Tarrant County. Continued development throughout the County and the resulting increase in impervious cover will increase the likelihood and severity of flooding.

Impact - Flash floods kill more people than any other hazard associated with thunderstorms. Property damage from flash flooding is seldom covered by insurance, which makes it very difficult for citizens to recover from the flood. Due to the very rapid rate of development and growth throughout Tarrant County we are experiencing problems with determining actual building footprints within flood plains and will be using planimetric GIS data from the NCTCOG to resolve this issue when it becomes available. At that time we will be able to accurately identify the number and types of buildings vulnerable to flooding; as well as access other data associated with those locations such as appraised value, census data, and owner information.


Denton County
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Tarrant County
Fort Worth
Parker County
Eagle Mountain
Legend
FloodPlain
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County Boundaries
FORT WORTH
Participating Jurisdictions:
Fort Worth A - FloodPlain
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1" Inch = 2.5 Miles
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FORT WORTH-TARRANT COUNTY
OFFICE OF EMERGENCY MANAGEMENT
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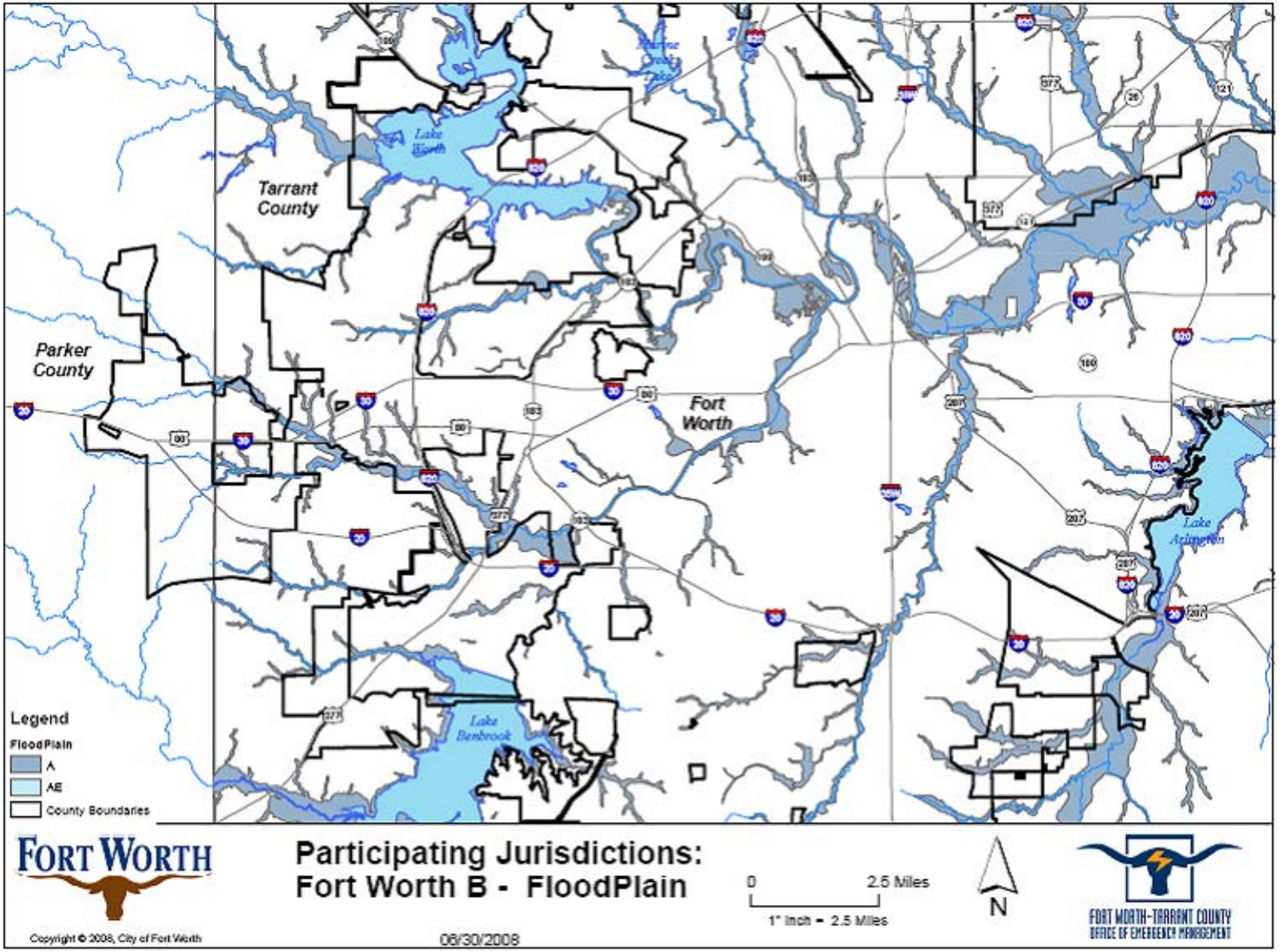
Tarrant County
Parker County
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Lake Worth
Lake Benbrook
Lake Arlington
Legend
FloodPlain
A
AE
County Boundaries
FORT WORTH
Participating Jurisdictions:
Fort Worth B - FloodPlain
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2.5 Miles
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FORT WORTH-TARRANT COUNTY
OFFICE OF EMERGENCY MANAGEMENT
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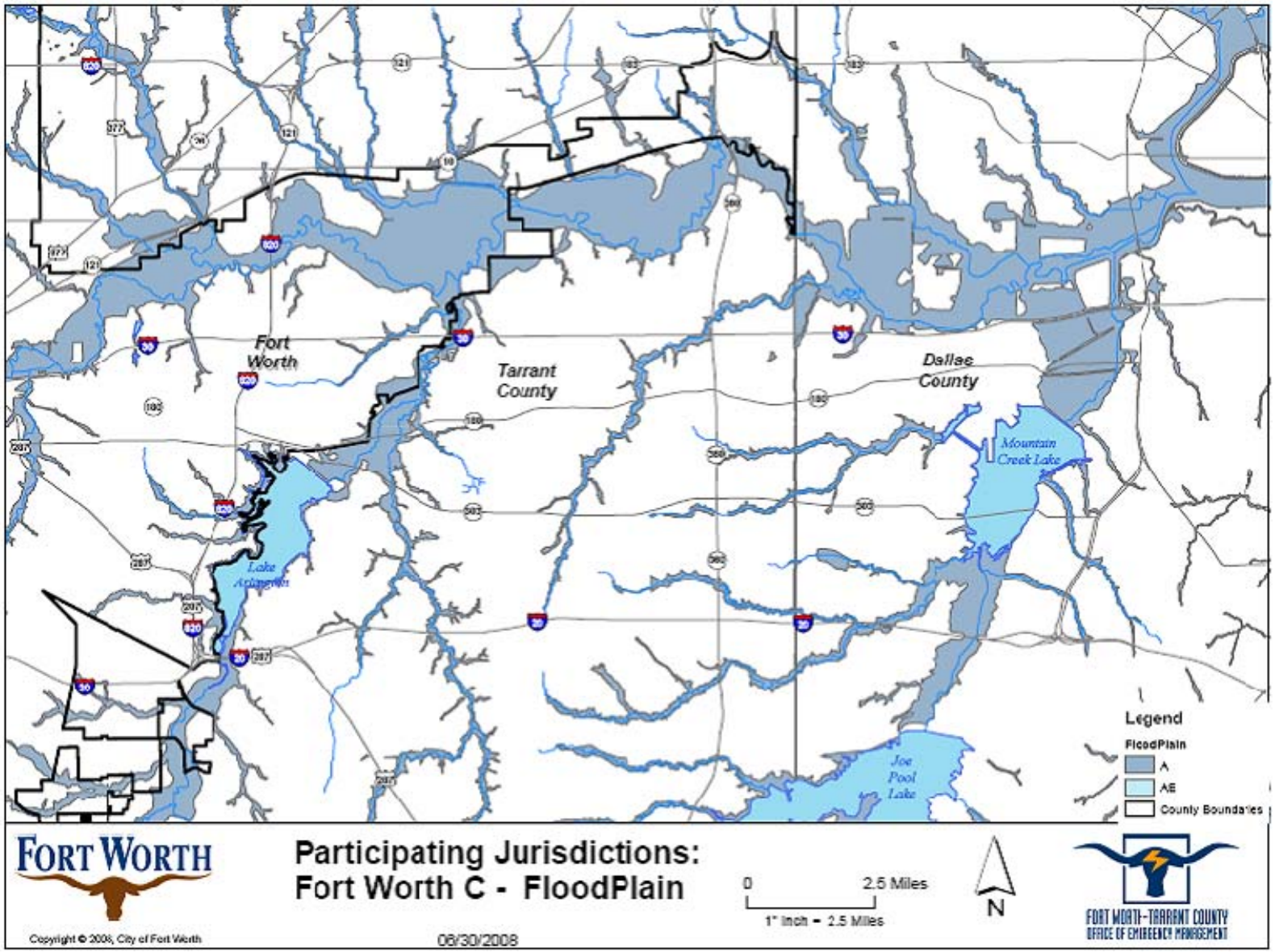
06/30/2008


Fort Worth
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AE
County Boundaries
FORT WORTH
Participating Jurisdictions:
Fort Worth C - FloodPlain
0
2.5 Miles
1" Inch = 2.5 Miles
N
FORT WORTH-TARRANT COUNTY
OFFICE OF EMERGENCY MANAGEMENT
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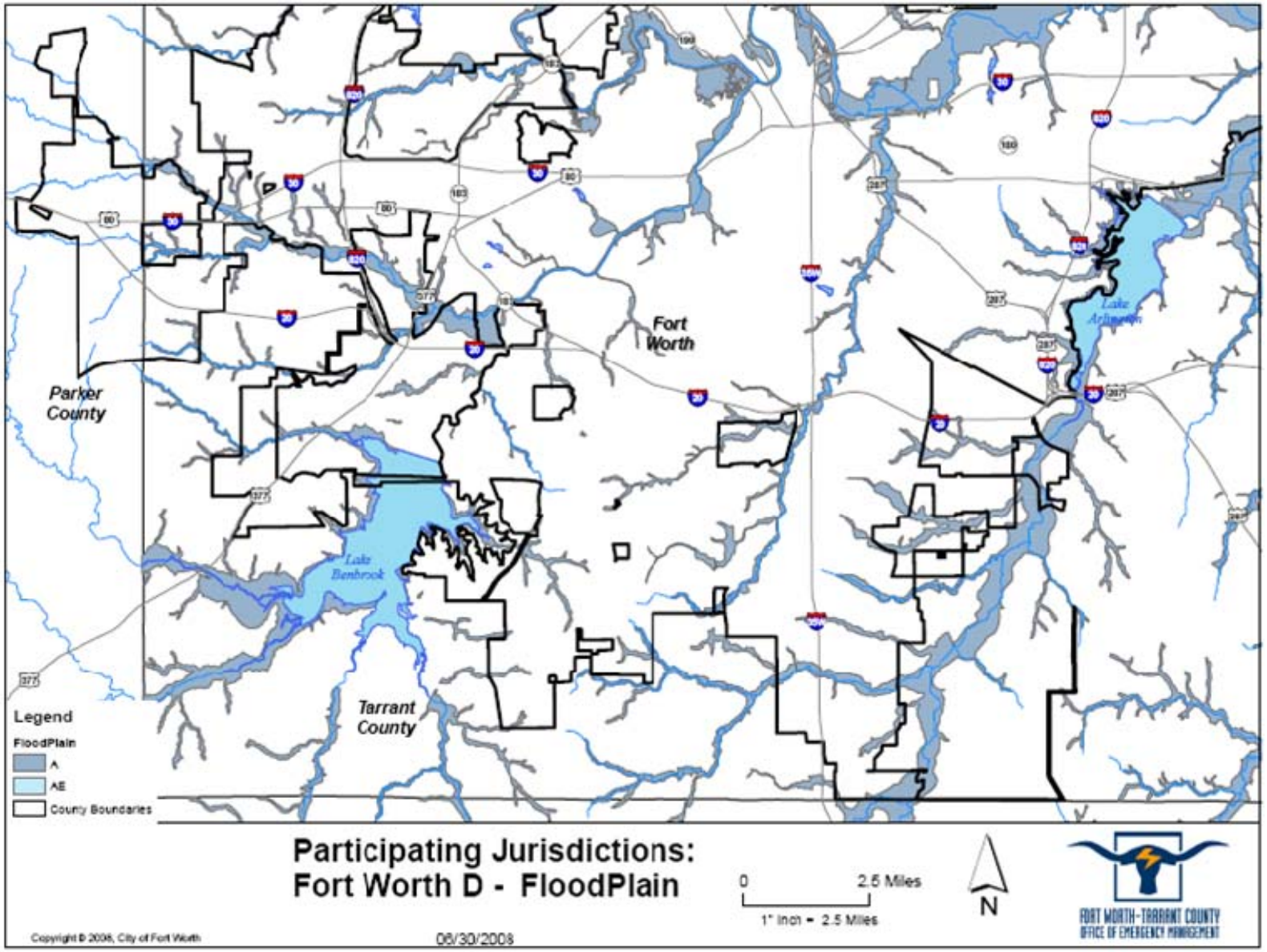
06/30/2008


Parker County
Fort Worth
Tarrant County
Lake Benbrook
Lake Arlington
Legend
FloodPlain
A
AE
County Boundaries
Participating Jurisdictions:
Fort Worth D - FloodPlain
0
2.5 Miles
1" Inch = 2.5 Miles
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OFFICE OF EMERGENCY MANAGEMENT

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Fort Worth Flood Mitigation Project #1** | Participate in the development of the Tarrant County specific "Flood Preparedness" brochure. |
| **Hazard Addressed** | Flooding |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of Flood events.<br>1. c. Develop effective flood mitigation public education materials. |
| **Priority** | High |
| **Estimated Cost** | Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Private Foundation Grants |
| **Responsible Agency** | Fort Worth - Tarrant County OEM |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This action will provide flood mitigation techniques for owners of new buildings. |
| **Effect on Existing Buildings** | This action will provide flood mitigation techniques for owners of existing buildings. |
| **Cost Effectiveness** | Cost Effective - This project will provide valuable information to the public in a relatively short time and with relatively low costs. It will also have the added benefit of increasing public awareness of mitigation. The estimated cost could easily be offset by reduced losses to the public in a single small flood event. |

**Discussion**: Develop Tarrant County specific "Flood Preparedness" brochure. Once developed, the brochure will be distributed County-Wide. Historically flood prone areas will be targeted for door-to-door distribution and neighborhood meetings to present the brochure and solicit input for *Fort Worth Hazard Mitigation Action Plan* revisions.

The brochure will include:

- Description of Tarrant County flood hazards
- "Case Studies" of previous flood events in Tarrant County
- Preparedness and "self-help" mitigation information
- Benefits of city participation in NFIP
- Advantages of flood insurance
- Risks of not having flood insurance
- Warnings that typical homeowner's insurance does not cover rising water
- Solicit input for the *Fort Worth Hazard Mitigation Action Plan*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Fort Worth Flood Mitigation Action #2** | 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. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events.<br>a. Remove structures from flood prone areas |
| **Priority** | High |
| **Estimated Cost** | $2,500,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Stormwater Management District Fees |
| **Potential Matching Funding Sources** | Stormwater Management District Fees |
| **Responsible Agency** | Fort Worth Transportation & Public Works |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will provide guidance for locating new buildings away from flood prone areas on Lebow Channel. |
| **Effect on Existing Buildings** | This action will provide guidance for protection of existing buildings from flooding on Lebow Channel Creek. |
| **Cost Effectiveness** | Cost Effective – This project will provide guidance to reduce the hazard to life and property from flooding. |

Discussion: The City of Fort Worth has completed a detailed watershed plan for improving flooding conditions in the watershed served by Lebow Channel (Tributary WF-4 of West Fork of the Trinity River), located north of downtown Fort Worth. The proposed plan calls for $24 million in improvements that include elimination of dangerous low water crossings, enlargement of restrictive bridges and culverts, channel enlargement, detention, acquisition of flood prone properties, and stream restoration.

The highest priority is four low water crossings that have been associated with five drownings over the last 15 years; one of these has already been closed and the other three crossings will be closed over the next 18 months. The next highest priority is to enlarge three roadway crossings in the lower watershed that severely restrict flow: Dewey Street, $880,000; 28th Street, $1,000,000; and Brennan, $520,000.

**HAILSTORM**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of large hail are a hazard event in Fort Worth. Tarrant County averages eleven significant thunderstorm events (large hail, high winds) per year according to National Weather Service records. Most structures in Fort Worth can resist the effects of all but the most severe hailstorms. Fort Worth does have a number of mobile and manufactured home parks which are more vulnerable to severe weather than site built structures. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to hailstorms. Vehicles have proven to be vulnerable to hailstorms with widespread severe vehicle damage reported in 1980 and 1995.

Location - Throughout the planning area.

Extent - Fort Worth is subject to the hazards of severe thunderstorms, including large hail. Hail stones up to the size of grapefruit (H9 on the Combined NOAA/TORRO Hailstorm Intensity Scales) have been reported in Fort Worth.

Previous Occurrences - In 1980 a hailstorm struck the west side of Fort Worth with hailstones up to 4.5 inches in diameter causing $60 million in damages. Hail was reported to penetrated roofs of homes and cause damage to the interior of homes in southwest Fort Worth. Many vehicles received significant damage and numerous windows in buildings were broken.

On May 5th a supercell thunderstorm developed very rapidly over the west side of Fort Worth and moved across Tarrant and Dallas Counties. The thunderstorm dropped very large hail on Fort Worth and moved eastward into Dallas County. Mayfest, a festival held during the first week of May along the banks of the Trinity River, was in the path of the storm and was subjected to baseball size hail. Damage caused by wind speeds up to 70 miles per hour, softball-size hail, and high-intensity rain caused this storm to be deemed the "costliest thunderstorm event in history" by the National Weather Service. The maximum rainfall intensity was almost 3 in. in 30 minutes. 109 people were injured by hail. Across the region twenty lives were lost, and over $1 billion in damage was reported.

Probability of Future Events - Thunderstorms with large hail are certain to continue to occur again in Fort Worth. Hail falls on about two or three days per year, ordinarily with only slight and scattered damage (*National Weather Service*).

Impact – The impact from hailstorms can be significant in extreme events such as the hailstorms of 1980 and 1995. Thousands of homes and vehicles can be damaged in a single storm with millions of dollars in damages. Vehicles are especially impacted by large hails with windshields being the vulnerable part. A recurring problem following hailstorms is broken windshields in vehicles belonging to populations who do not have vehicle insurance and cannot afford the replacements costs, resulting in the owners having difficulty traveling to work, medical appointments, etc.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Fort Worth Hailstorm Mitigation Action #1** | Develop a public education campaign to encourage "hail resistant" roofing in new construction and roof replacements. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• Building/Permit Fees<br>• City Funds |
| **Responsible Agency** | Fort Worth Planning & Development |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will potentially decrease the damage caused by most hailstorms to new buildings. |
| **Effect on Existing Buildings** | This action will potentially decrease the damage caused by most hailstorms to existing buildings. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing hailstorm damage. One long term benefit will be reduced property insurance as claims related to hail damage are reduced. |
| **Discussion**: Public education has proven to be a low cost effective means to achieve changes public behavior. Encouraging hail resistant roofing can benefit citizens through reduced damage, business through reduced damage to their buildings and reduced claims against insurance companies, and government through reduced request for assistance. This campaign can be developed in conjunction with the Tarrant County effort. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Fort Worth Hailstorm Mitigation Action #2** | Evaluate City buildings to determine feasibility of installing hail resistant roofing and window coverings with a focus on critical infrastructure. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |

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| **Potential Matching Funding Sources** | • Insurance Companies<br>• City Funds |
| **Responsible Agency** | Fort Worth Transportation & Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on new City buildings. |
| **Effect on Existing Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on existing City buildings. |
| **Cost Effectiveness** | Cost Effective – Although currently undetermined, this project is believed to be cost effective. |
| **Discussion:** Installing hail resistant roofing and window coverings on City buildings could prevent or limit damage to City buildings thus avoiding costs to the City as well as preventing or limiting loss of use of damaged facilities. | |

**HIGH WINDS**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of high winds are a hazard in Fort Worth. Tarrant County averages ten reported significant thunderstorm events (large hail, high winds) per year. In addition, strong weather fronts can sometimes be accompanied by high winds which occasionally cause damage. Most structures in s Fort Worth can resist the effects of all but the most severe high wind events. Fort Worth does have a number of mobile and manufactured home parks which are more vulnerable to severe weather than site built structures. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to high winds.

Location - Throughout the planning area.

Extent - Severe thunderstorms with high winds with speeds in excess of 90 mph have been reported in Fort Worth.

Previous Occurrences – We could find no records of significant high wind damage in Fort Worth.

Probability of Future Events – Based on previous experience Fort Worth can expect to experience an average of ten significant thunderstorm events with high winds per year.

Impact – Records on high wind events are difficult to separate from severe thunderstorm records. High winds in Fort Worth typically cause little damage to commercial buildings. More often high winds cause damage to roofs, trees, and signs.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Fort Worth High Winds Mitigation Action #1** | Enact enhanced building codes to reduce damages from high winds. |

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| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined – Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Fort Worth Planning & Development |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will potentially identify a means to reduce high wind damage on new buildings. |
| **Effect on Existing Buildings** | This action will potentially identify a means to reduce high wind damage on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Although costs are undetermined, this action is believed to be cost effective since the action will require staff time only. |
| **Discussion:** Enhanced building codes will reduce damages from high wind events. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Fort Worth High Winds Mitigation Action #2** | Educate builders and residents about mitigating wind damage. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |
| **Responsible Agency** | • Fort Worth Planning & Development<br>• Fort Worth - Tarrant County OEM |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on new buildings. |
| **Effect on Existing Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on existing buildings. |

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| **Cost Effectiveness** | Cost Effective – The low cost of developing and providing high wind mitigation compared with savings to the community make this action cost effective. |
| **Discussion:** Public education has proven to be a low cost and effective means to achieve changes public behavior. High winds have not been a focus of severe weather preparedness. | |

**LANDSLIDES**

Low Vulnerability – Other than infrequent slumping along highways at overpasses, there is no history of landslides in Fort Worth. However, there are areas that may be susceptible to landslides.

Location – Along road cuts in the City's west and northwest areas. On the southeast side of Lake Worth near Inspiration Point.

Extent – A landslide could result in objects below being covered by several feet of dirt and rocks.

Previous Occurrences – In 2001 a road cut on Vickery Blvd. east of Southwest Blvd. developed a cavity and was in danger of collapsing onto Vickery Blvd., potentially blocking a major roadway and a railway. Transportation & Public Works staff removed the portion of the road cut in question.

Probability of Future Events – This is difficult to determine since there is no history of landslides in Fort Worth

Impact – A landslide could block roadways and railways as well as damaging structures and infrastructure.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Fort Worth Landslide Mitigation Action #1** | Conduct a search for potential landslide hazards. |
| **Mitigation Goal/Objective** | 5. Identify and implement hazard mitigation projects to reduce the impact of hazard events and disasters. |
| **Priority** | Low |
| **Estimated Cost** | $10,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Fort Worth Transportation & Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will potentially identify new hazard areas that should be excluded from development. |

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| **Effect on Existing Buildings** | This action will potentially identify existing buildings that may be vulnerable should a landslide occur. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of locating previously unknown landslide hazards. |
| **Discussion:** As the City continues to grow there is concern that there may be landslide hazards that have gone un-detected. This action will develop a program to identify potential landslide hazard areas. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Fort Worth Landslide Mitigation Action #2** | Establish program to regularly evaluate road cuts for landslide hazards. |
| **Mitigation Goal/Objective** | 5. Identify and implement hazard mitigation projects to reduce the impact of hazard events and disasters. |
| **Priority** | Low |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Fort Worth Transportation & Public Works |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will potentially identify new hazard areas that should be excluded from development. |
| **Effect on Existing Buildings** | This action will potentially identify existing buildings that may be vulnerable should a landslide occur. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of locating previously unknown landslide hazards. |
| **Discussion:** This project will establish a program for the T&PW Streets Division to annually evaluate any landslide hazard areas such as the road cut on West Vickery at Southwest Blvd. | |

**LEVEE FAILURE**

Low Vulnerability – There are levees protecting some areas of Fort Worth. The levees are maintained by the Tarrant Regional Water District. The levees are designed to protect against a 500 year flood event and are extremely well maintained.

Location – Along the Clear Fork of the Trinity River in the southwest portions of the City and along the West Fork of the Trinity River on the west side of the City. Please see attached map.

Some specific areas that might be affected by a levee failure on the West Fork on the Trinity River include:

- Riverbend Neighborhood
- Crestwood Neighborhood
- Streets to the west of Meandering Road & north of TX 183
- Streets to the west of Sam Calloway Road & north of TX 183
- Streets to the east of Isbell Road and north of White Settlement Road
- Rockwood Municipal Golf Course

Some specific areas that might be affected by a levee failure on the Clear Fork on the Trinity River include:

- Ridglea Country Club Estates
- Meadows West Neighborhood
- Bellaire Park North Neighborhood
- Riverhollow Neighborhood
- River Park Place Neighborhood

Extent – If the levees failed during a flood event water could reach 10 feet in depth in homes.

Previous Occurrences – In 1949 a levee failure near 12$^{th}$ Street exacerbated the effects of a flood on the Clear Fork of the Trinity River that had backed up the channel of the West Fork.

Probability of Future Events – It is very unlikely that the levees will fail based on the excellent maintenance they receive. No prediction can be made as to a failure.

Impact – A levee failure would destroy homes, roadways, infrastructure, and businesses.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Fort Worth Levee Failure Mitigation Action #1** | Develop a Levee Failure Emergency Action Plan (EAP) with the Tarrant Regional Water District (TRWD). |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |

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| **Estimated Cost** | $20,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Fort Worth – Tarrant County OEM<br>• Tarrant Regional Water District |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will potentially identify a means to protect new buildings from a levee failure if possible. |
| **Effect on Existing Buildings** | This action will potentially identify a means to protect existing buildings from a levee failure if possible. |
| **Cost Effectiveness** | Cost Effective – The low cost and potential benefits make this action cost effective. |
| **Discussion:** An EAP for a levee failure will ensure that Fort Worth and the TRWD have communication lines identified in the event citizens need to evacuate or Fort Worth can provide emergency assistance to prevent a levee failure. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Fort Worth Levee Failure Mitigation Action #2** | Conduct a levee failure inundation study. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $50,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |
| **Responsible Agency** | • Fort Worth Transportation & Public Works<br>• Fort Worth – Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will provide an estimation of the effects of a levee failure so that new buildings can be located in appropriate areas. |
| **Effect on Existing Buildings** | This action will provide an estimation of the effects of a levee failure on existing buildings. Some existing building owners may consider relocating. |
| **Cost Effectiveness** | Cost Effective – The low cost of developing and providing data for informed decision making makes this action cost effective. |
| **Discussion:** An inundation study will provide data that can be use to reach decision regarding potential emergency situations. | |

**LIGHTNING**

Moderate Vulnerability – Lightning is one of the most common hazards in Fort Worth. Thunderstorms (and by definition, lightning) occur an average of 30 – 50 days per year (*Oklahoma Climatological Survey*). Lightning is the second most common cause of weather-related deaths in Texas (*National Weather Service*). Lightning information is available only for Tarrant County on a county-wide basis.

Location – Throughout the planning area.

Extent – We could find no references to the average number of strikes per storm in Fort Worth. However, lightning is by definition associated with thunderstorms.

Previous Occurrences – Fort Worth experiences 30 – 50 thunderstorm days per year. From 1995 – 2004 one person was killed and five were injured by lightning in Tarrant County (*National Weather Service*). Throughout Texas 34 people were killed by lightning, there were 184 injuries, and an estimated 23 million dollars in damages due to lightning from 1995 - 2004 (*National Weather Service*).

Probability of Future Events – Based on past experience Fort Worth will experience 30 – 50 thunderstorm days each year. Some days will have more than one thunderstorm during a given thunderstorm day.

Impact – Although lightning is the second most common cause of storm related deaths in Texas, lightning deaths remain relatively rare. Lightning does cause property damage several times per year (we could not find statistical data to validate this observation).

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Fort Worth Lightning Mitigation Action #1** | Provide lightning mitigation materials with building permit packets. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Fort Worth Planning & Development |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will provide materials that will reduce the vulnerability of new buildings to lightning. |

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| **Effect on Existing Buildings** | This action will provide materials that will reduce the vulnerability of existing buildings that are being remodeled to lightning. |
| **Cost Effectiveness** | Cost Effective – The low cost of this project would be offset by eliminating just one lightning caused building loss. |
| **Discussion:** Lightning mitigation materials will be included in all building permit packets distributed to builders or citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Fort Worth Lightning Mitigation Action #2** | Ensure all City critical infrastructure has adequate lightning mitigation in place and upgrade protection as necessary. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | $40,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Fort Worth Transportation & Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will ensure new City buildings that house critical infrastructure have adequate lightning mitigation. |
| **Effect on Existing Buildings** | This action will ensure existing critical infrastructure has adequate lightning mitigation. |
| **Cost Effectiveness** | Cost Effective – The destructive and sometimes capricious nature of lighting warrant the expense of this action compared with the benefits of avoiding damage to critical infrastructure. |
| **Discussion:** Review and confirmation of the adequacy of lightning protection systems in City buildings housing critical infrastructure is worthwhile considering the number of thunderstorms experienced in Fort Worth. | |

**SEVERE THUNDERSTORM**

High Vulnerability - Severe thunderstorms are the most common hazard in Fort Worth. From 1950 through August 2007 Tarrant County averaged eleven reported severe thunderstorm events county-wide per year. Most structures in Fort Worth can resist the effects of all but the most severe thunderstorms. Fort Worth does have a number of mobile and manufactured home parks which are more vulnerable to severe weather than site built structures. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to thunderstorms.

Location - Throughout the planning area.

Extent - Fort Worth is subject to the hazards of severe thunderstorms of all magnitudes.

Previous Occurrences –

- May 1980 – Severe thunderstorm with large hail caused widespread damage on the west and southwest portions of the City. Hailstones were reported to have crashed through roofs and ceilings into homes in the Wedgwood neighborhood.
- May 1995 – Severe thunderstorm with large hail resulting in over 200 injuries and over $1 billion in damages. Storm is cited by the Weather Channel as the "most expensive thunderstorm in US history".
- March 2000 – Tornado moved through the west side of the City into the downtown area resulting in two deaths, 100 injuries, $500 million in damages, and a Presidential Disaster Declaration. Flash floods resulted in two additional deaths. Large hail caused one death.
- June 2000 – Rainfall amounts up to 11 inches fell in far west Fort Worth causing a flash flood. The flood resulted in a Small Business Administration Disaster Declaration.
- April 2002 – Tornado moved through the Carver Heights East and Handley neighborhoods of east Fort Worth causing few injuries but an estimated $5 million in damages.
- June 2004 – Severe thunderstorms caused widespread loss of electrical service (largest in the history of Texas Utilities) with some residents without electrical service for 9 days, flash floods, and numerous trees downed in streets.
- June 2004 – Additional heavy rains ("500 year" rain event in northwest portions of the County) resulted in additional flash floods as well as flooded homes around Lake Worth.
- July 2004 – Severe thunderstorms and heavy rains ("500 year" rain event in southeast portions of the County) caused flash floods.
- July 2007 – Heavy rains caused flooding in far north Fort Worth damaging homes and roadways.

Probability of Future Events – Severe thunderstorms will occur in Fort Worth an average of eleven times per year.

Impact – A single severe thunderstorm can cause damage from hail, high winds, lightning, and/or tornadoes to thousands of structures.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Fort Worth Severe Thunderstorm Mitigation Project #1** | Develop a program to identify mobile and manufactured home parks and work with park managers to prepare the residents for severe thunderstorms. |
| **Hazard Addressed** | Tornado/Severe Thunderstorm |

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| **Mitigation Goal/Objective** | 2. Reduce loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | High |
| **Estimated Cost** | $15,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • Private Foundation Grants<br>• City Funds |
| **Responsible Agency** | Fort Worth – Tarrant County OEM |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This project will provide preparedness measures for new buildings. |
| **Effect on Existing Buildings** | This project will provide preparedness measures for existing buildings. |
| **Cost Effectiveness** | Cost Effective - This project is low cost with high potential benefits. |
| **Discussion:** This action will identify mobile and manufactured home parks and develop a systematic program for working with park managers to prepare residents for severe thunderstorms. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Fort Worth Severe Thunderstorm Mitigation Action #2** | Encourage builders to install storm resistant construction such as “hurricane clips”. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | High |
| **Estimated Cost** | $1,500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |
| **Responsible Agency** | Fort Worth Planning & Development |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will encourage storm resistant construction in new buildings. |
| **Effect on Existing Buildings** | This action will encourage storm resistant construction in existing buildings as they are remodeled. |
| **Cost Effectiveness** | Cost Effective – The low cost of this action will be offset by a reduction in damage from severe thunderstorms. |

**Discussion:** Effective education on storm resistant construction can reduce damage from severe thunderstorms. Insurance companies may be willing to fund or provide educational materials and/or provide discounts to persons who install storm resistant devices.

**SEVERE WINTER STORMS**

Moderate Vulnerability - Since 2000 the National Weather Service has reported 14 Winter Storm/Ice events. Winter storms in Fort Worth usually consist of short-lived icing events (ice on the roads for a few hours) that primarily affect traffic and cause numerous motor vehicle accidents. Occasionally an ice storm will cause widespread power outages for as long as several days. ONCOR Electric Delivery has an aggressive tree trimming program. Most structures in Fort Worth can resist the effects of all but the most severe winter storms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to winter storms. Electrical service outages are usually the most serious threat in this area. Most public safety and special facilities are equipped with generators.

Location - Throughout the planning area.

Extent - Severe ice storms have resulted in accumulations in excess of two inches. Most storms leave only a light coating or glaze of ice.

Previous Occurrences – Severe Winter Storms are typically regional events. Fort Worth averaged two winter storms per year since 2000. Most winter storms resulting only minor inconveniences and a few motor vehicle accidents.

In 1978 up to an inch of ice coated area trees and roadways causing $14 million in damages region-wide and making travel almost impossible for two days.

In 1996 a winter storm dropped two to four inches of a mixture of sleet, freezing rain, and snow in Fort Worth over Thanksgiving weekend causing many motor vehicle accidents and some electrical service outages.

In 2003 a winter storm dropped one inch of sleet across Fort Worth resulting in numerous motor vehicle accidents and closing schools for two days.

Probability of Future Events - Fort Worth can expect to experience two winter storms per year with a severe winter storm once each ten years.

Impact - Winter storms can cause widespread electrical and telephone service outages, make travel dangerous or impossible, and damage structures. Deaths and injuries due to vehicle accidents and slips/falls are common during ice storms. Occasional deaths and injuries from carbon monoxide poisoning due to improper heating have occurred. Economic losses due to lost production can be significant. Damage from frozen pipes can lead to significant expenses for homeowners.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Fort Worth Severe Winter Storm Mitigation Action #1** | Increase public education concerning winter storm preparedness and mitigation. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | Medium |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Fort Worth - Tarrant County OEM |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into new buildings. |
| **Effect on Existing Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost is effective when compared to benefits provided to citizens. |
| **Discussion:** Winter weather preparedness has not been emphasized in Fort Worth as much as severe thunderstorms. This action will provide preparedness information to citizens during the fall. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Fort Worth Severe Winter Storm Mitigation Action #2** | Purchase additional street sanding capacity |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Fort Worth Transportation & Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will have no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings. |

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| **Cost Effectiveness** | Cost Effective – Sanding streets is essential to allow emergency vehicles to respond during severe winter events. |
| **Discussion:** Sanding equipment can be mounted on existing equipment to provide sanding capabilities. During severe winter weather events streets around hospitals, fire stations and other critical facilities are sanded along with major intersections and roadways. Additional sanding capacity would allow for quicker sanding of these areas and for more repeat sanding during prolonged winter weather events. This will improve public safety by facilitating emergency response as well as reducing motor vehicle accidents. | |

**STREAM BANK EROSION**

Low Vulnerability - Some homes, businesses, and roadways are vulnerable to stream bank erosion. Most buildings are a safe distance from the current path of the creek. Further analysis using GIS and field verification can specifically identify vulnerable structures.

Location – Along creeks throughout the City. Creeks of particular concern for stream bank erosion are:

- Schwartz Creek/Lebow Channel on the north side
- Marine Creek on the northwest side
- Mary's Creek on the west side
- Big Fossil Creek on the far north side

Extent - Stream banks can erode several feet during a single flood event.

Previous Occurrences - Minor flooding associated erosion occurs frequently, especially during the spring and early summer. Flood events on 2000, 2004, and 2007 caused some erosion on stream banks on west and north Fort Worth.

Probability of Future Events – Fort Worth is certain to experience stream bank erosion in the future. Continued development and the resulting impervious cover will increase the likelihood and severity of flooding and associated erosion. It is likely that flooding will cause some damage in the next five years.

Impact - Extreme stream bank erosion could destroy homes, businesses, and/or roadways. Roadway damage can restrict access for emergency responders, home/business owners and cause minor to major inconveniences to for drivers.

Impact – Damage or rupture of the sewer and water lines could cause health/sanitation hazards, loss of service to citizens, and significant environmental damage.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Fort Worth Stream Bank Erosion Mitigation Action #1** | Survey creeks in Fort Worth and develop a database of locations subject to stream bank erosion. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |

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| **Priority** | Medium |
| **Estimated Cost** | $10,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Fort Worth Transportation & Public works |
| **Estimated Completion Time Frame** | 1 Year |
| **Effect on New Buildings** | This action will identify locations subject to stream bank erosion. This information can be used to avoid placing new buildings in hazard areas. |
| **Effect on Existing Buildings** | This action will identify locations subject to stream bank erosion. This information can be used to develop means to protect existing buildings that are vulnerable to stream bank erosion. |
| **Cost Effectiveness** | Cost Effective – The action will reduce the adverse effects of flooding. |
| **Discussion:** The database developed in this project will provide data that can be used to identify hazard areas. Mitigation measures can be taken to reduce or eliminate the hazard. The locations can be monitored during floods to protect structures and citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Fort Worth Stream Bank Erosion Mitigation Action #2** | Determine and implement expedient erosion control techniques to use on area creek banks. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Fort Worth Transportation & Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will not have an effect on new buildings. |
| **Effect on Existing Buildings** | This action will protect existing buildings from stream bank erosion. |
| **Cost Effectiveness** | Cost Effective – Although the final project cost is undetermined, it is believed the action will be cost effective. |
| **Discussion:** This action will review erosion control techniques and implement the most effective technique for controlling erosion pending permanent solutions. | |

**TORNADO**

High Vulnerability – All structures in Fort Worth are vulnerable to tornadoes. Fort Worth has a number of mobile and manufactured home parks that are particularly vulnerable to tornadoes. Very few structures can withstand the effects of an F5 tornado. However, the March 28, 2000 F3 tornado that struck Fort Worth provided good evidence that well built structures can protect people who take appropriate shelter inside those buildings.

Location - Throughout the planning area.

Extent - Fort Worth is subject to tornadoes of all magnitudes, including F5 tornadoes.

Previous Occurrences - A tornado on March 28, 2000 caused significant damage in the west side and downtown areas of Fort Worth killing two people, resulting in a Presidential Disaster Declaration. On April 16, 2002 a tornado struck the Carver Heights East neighborhood in east Fort Worth causing several minor injuries and $5 million in damages.

Probability of Future Events - Tarrant County has averaged one reported tornado per year and we can expect that average to continue.

Impact - Tornadoes can cause deaths, injuries and property damage/destruction. Special facilities such as hospitals, fire stations, and utilities can be damaged or destroyed. Citizens who live in neighborhoods struck by tornadoes can experience disruption of their life styles and traditions. Areas struck by tornadoes can experience increased demand for mental health services as people deal with grief and stress.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Fort Worth Tornado Mitigation Project #1** | Assist citizens with funding for building tornado safe rooms or in-ground shelters. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction |
| **Priority** | High |
| **Estimated Cost** | $500,000 (150 Safe Rooms at $4,000 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Community Development Block Grant Funds |
| **Potential Matching Funding Sources** | Home/Building Owner |
| **Responsible Agency** | Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This project will encourage new buildings to be constructed with tornado safe rooms as part of the construction process. The safe room will enhance the overall storm resistance of the building. |

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| **Effect on Existing Buildings** | This project will encourage homeowners to construct/install tornado safe rooms in their existing homes. A safe room will enhance the overall storm resistance of the building. |
| **Cost Effectiveness** | Cost Effective - Safe rooms and in-ground shelters have been proven to reduce deaths and injuries during tornadoes and severe thunderstorms. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of safe rooms and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

**Discussion:**

This project will reimburse costs associated with tornado safe room or in-ground shelter installation in new or existing homes. Safe rooms provide increased protection for citizens during severe thunderstorms and tornados. Safe rooms have been proven to save lives and reduce injuries from severe weather events. FEMA publication 320 (*Taking Shelter from the Storm, Building a Safe Room Inside Your House*) provides the standards for safe rooms. As stated on the FEMA website: Although a "*residence may be built "to code," that does not mean it can withstand winds from extreme events such as tornadoes and major hurricanes. The purpose of a safe room or a wind shelter is to provide a space where you and your family can seek refuge that provides a high level of protection. To protect its occupants, a safe room must be built to withstand high winds and flying debris, even if the rest of the residence is severely damaged or destroyed."*

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to home owners will be for no more than $3,000 or 75% of cost, whichever is less
- Eligibility will be limited to individuals who own their home at the time of application
- The safe room or in-ground shelter must be constructed/installed in the primary residence of the applicant
- Each eligible homeowner can only receive one reimbursement, regardless of the number of shelters he/she may purchase/install
- In-ground shelters must meet requirements established in the National Performance Criteria for Tornado Shelters dated May 28, 1999.
- Safe Rooms must meet the requirements of FEMA Publication 320
- Safe Rooms and shelters must meet all applicable city and/or county codes
- Previously owned or used shelters will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Fort Worth Tornado Mitigation Project #2** | Assist citizens with funding for purchase of Weather Alert Radios |
| **Mitigation Goal/Objective** | 4. Increase the effectiveness of warning systems in Tarrant County.<br>4. a. Increase the number of homes and businesses with Weather Alert Radios. |
| **Priority** | High |
| **Estimated Cost** | $100,000 (2,500 Weather Alert Radios at $40 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Private Sector Donations<br>• City Funds |
| **Potential Matching Funding Sources** | Citizen/Business Owner |
| **Responsible Agency** | Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will not affect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings except for providing additional warning time of severe weather events thus allowing citizens more time to secure their home or business against approaching severe weather. |
| **Cost Effectiveness** | Cost Effective – Weather Alert Radios are a proven means to alert and warn citizens about severe weather and civil emergencies. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of Weather Alert Radios and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

***NOTE**: We are aware that Weather Alert Radios are on the "2007 Ineligible Planning Activities" list. It is our opinion that Weather Alert Radios should be considered eligible due to their very high benefit and very low cost.*

This project will reimburse 75% of the cost for citizens to purchase Weather Alert Radios, with the citizen responsible for the remaining 25%. Weather Alert Radios provide the best means for citizens to receive emergency alerts when they are indoors. Severe weather is the primary hazard in our area. Early alert and warning has proven to be a significant factor in saving lives during severe weather events.

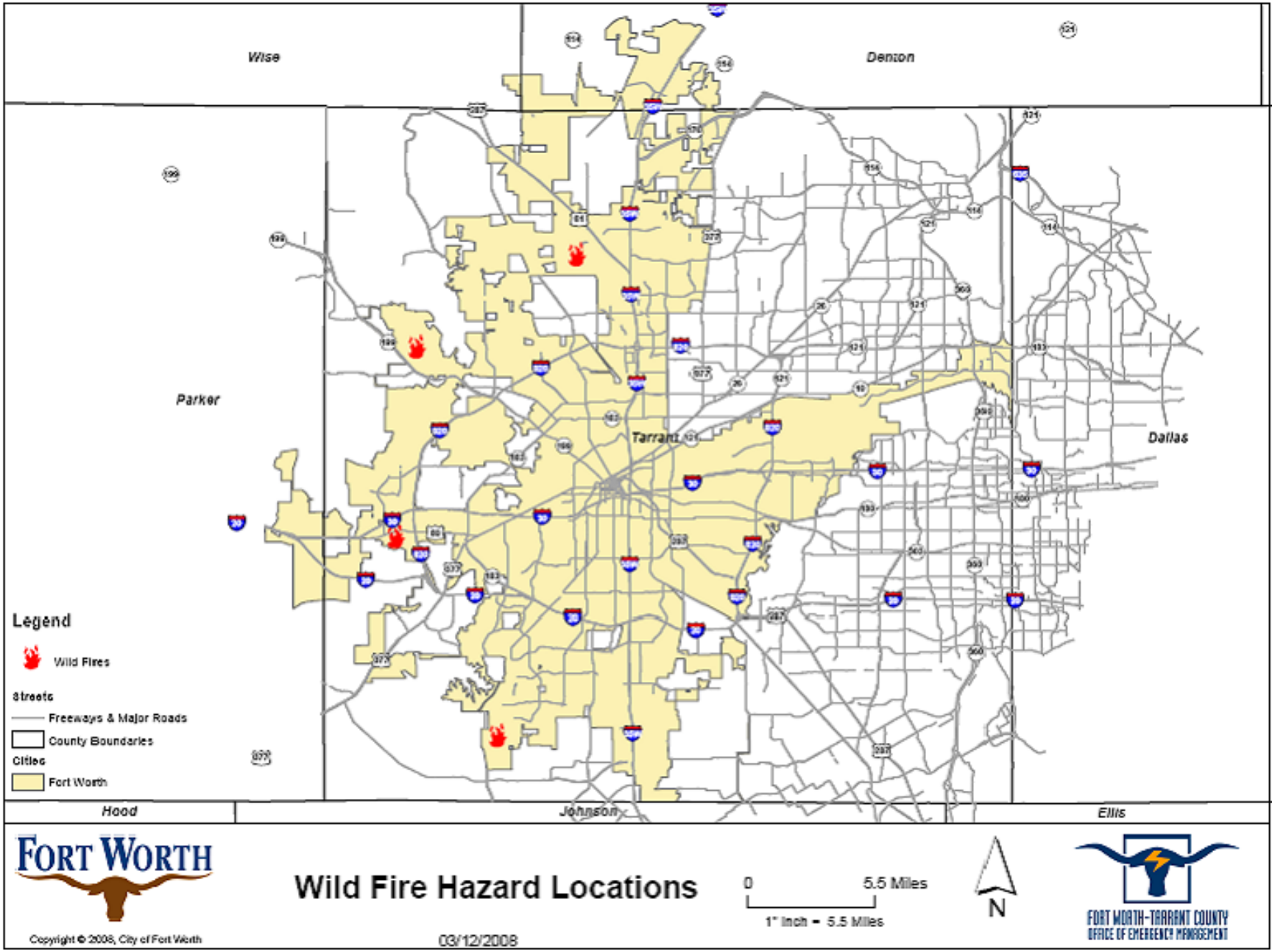
In addition, the Weather Alert Radios can be activated for civil emergencies such as hazardous materials incidents. Effective warning saves lives, especially during severe weather events. Weather alert radios provide a proven means of indoor warning to citizens any time of the day or night and compose the vital indoor portion of our emergency warning system.

Warning systems have been shown to have value beyond the initial warning. Persons receiving warning relay the information to family and friends to ensure they are aware of the hazard. The secondary and tertiary warning can greatly amplify the effectiveness of the warning system.

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to citizens will be for no more than $30 or 75% of cost of the radio, whichever is less
- Eligibility will be limited to residents of Fort Worth
- The citizen must sign an agreement to keep the radio operational
- Each eligible homeowner can only receive one reimbursement, regardless of the number of radios purchased
- Previously purchased radios will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*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FORT WORTH-TARRANT COUNTY
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**WILDFIRE**

Moderate Vulnerability - Fort Worth has a significant amount of rural-urban interface that is subject to wildfires. Homes are most vulnerable to wildfires. The tendency to locate homes on tree covered lots and lack of fire breaks (such as parking lots around businesses) can enable fires to spread more easily to homes. Special facilities tend to be less vulnerable due to construction type (brick or metal).

Location - The areas of most concern are:

- Lake Worth Nature Refuge in northwest Fort Worth
- Far southwest Fort Worth (Developing Area)
- Far north Fort Worth (Developing Area)
- Far west Fort Worth (Developing Area)

Access to fight wildfires in these areas is often difficult due to thick trees and undergrowth, semi-swampy terrain, and lack of roads.

Extent - The effects of wildfire are deaths, injuries, loss of structures, loss of wildlands, and loss of wildlife habitat.

Previous Occurrences - Wildfires in Fort Worth are typically associated with droughts. A number of wildfires occurred during the droughts from 1996 - 1998, 2000, 2005 – 2006, and in January 2008.

Probability of Future Events - Wildfires are likely to occur annually and increase in frequency and severity as the population continues to increase and formally rural areas are developed.

Impact - Wildfires can result in the need for rapid evacuations, casualties, loss of homes and businesses, and loss of wildlife habitat and recreational areas.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Fort Worth Wildfire Mitigation Action #1** | Increase public education on how to reduce the risks from wildfires (construction, landscaping, etc.) |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | High |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | Six Months |

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| **Effect on New Buildings** | This action will reduce the effects of wildfire on new buildings through increased use of wildfire mitigation measures. |
| **Effect on Existing Buildings** | This action will reduce the effects of wildfire on existing buildings through increased use of wildfire mitigation measures. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing the effects of wildfire. |
| **Discussion:** Wildfire mitigation measures are not widely known in urban areas such as Tarrant County. This action will increase that knowledge and reduce casualties and damages from wildfires. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Fort Worth Wildfire Mitigation Action #2** | Enact building permit process that encourages wildfire resistant construction. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | Fort Worth Planning & Development |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will reduce the vulnerability of new structure to wildfire. |
| **Effect on Existing Buildings** | This action will reduce the vulnerability of existing buildings to wildfire if they are remodeled to the extent a building permit is required. |
| **Cost Effectiveness** | Cost Effective – This action will integrate wildfire mitigation into the building process at minimal cost. |
| **Discussion:** Integrating mitigation into building permitting provides a process to reduce vulnerability with few negative impacts. | |

**Existing Hazard Mitigation Efforts**

- Marine Creek Linear Park- The properties on both sides of Marine Creek were purchased and the land converted to Park land. A paved or gravel trail was installed along the length of the park. Low water crossings were converted into cul-de-sacs.
- Schwartz Creek/Lebow Channel - Property is being purchased to convert the creek to a linear park.
- The City operates an outdoor warning system consisting of 132 sirens.

- The Fort Worth - Tarrant County Office of Emergency Management conducts public education programs and presentations upon request.

**Other Projects Identified for Further Consideration**

**Watershed Planning Studies**

**Cost: $1,300,000 (TPW)**

No comprehensive studies of the City's underground storm drain systems have been performed since 1982 (downtown) or 1967 (rest of City). Planning studies will be undertaken in several major storm drain systems to assess structural conditions and hydraulic capacities, to identify flood-prone properties, and to develop detailed comprehensive recommendations for future improvements and proposed phasing and prioritization. State-of-the-art computer modeling software will allow a level of detailed analysis not previously available. It is recommended that a lead consultant be selected to aid City staff to define study procedures and to apply for matching grant funds. The following storm drain watersheds are targeted for detailed study; others will be included as funds are available:

- Eastern Hills-Meadowbrook Hills drainage system
- Central Arlington Heights storm drain system (from Western Avenue to South Hi Mount to Vickery)
- Forest Park-Berry-McCart storm drain system (from West Butler to Paschal to Fort Worth Zoo)
- Henderson-Seventh storm drain system (Hospital District and western CBD)
- Mercado drainage system (from Park Street through Marine Park to Mercado channel)
- East Ninth-Rock Island drainage system (eastern CBD)

**Citywide Assessment of Roadway Flooding**

Due to several deaths in 2004 due to vehicles being swept away by high water, the City has also hired a consultant to perform a Citywide Assessment of Roadway Flooding Hazards. Assessment will include evaluating the severity of public safety hazard at 200+ potential high water locations in the City and in identifying appropriate treatments ranging from simple signage up to and including long term capital improvements. The consultant will compile and analyze existing flood plain data throughout the city and complete approximate calculations as needed to establish the frequency and height of flooding that can be expected along city streets. This information will be used along with other data to establish priorities and types of treatments appropriate at each location. The consultant will also help identify and lay out designs for 14 locations for automated flashing units to be installed. The consultant's work program will also include a detailed analysis of flooding conditions within the Butler-McClure neighborhood, the purpose of which is to present specific capital improvement alternatives.

**Briarhaven-Fieldcrest Drainage Improvements**

**Cost: $1,000,000 (Department of Engineering)**

Storms on July 1, 2001, flooded 12 homes in this vicinity. Several homes have received repeated severe flooding and other property damage due to an undersized

storm drain system, and South Hulen Street is often blocked by high water after heavy downpours. Storm drain improvements are required to protect these homes from future flooding, to prevent Hulen Street from being blocked by high water, and to allow upstream development to continue. A study and conceptual design were performed by City drainage staff.

**Robin-Denver Storm Drain Reconstruction**
**Cost: $1,200,000**
The existing storm drain is structurally deficient. A June 2000 storm-related collapse of a 50-foot section required a $26,000 emergency street and storm drain repair, in addition to a water line repair. Additional collapses could threaten streets, water and sewer lines, other underground utilities, as well as houses built near or over the existing storm drain line. The proposed project will construct a new storm drain on a new alignment and properly abandon the existing storm drain. A study and conceptual design were prepared by Halff Associates, Inc., in 2002.

**Lost Creek Phase 2 Drainage Improvements**
**Cost: $250,000 (Department of Engineering)**
Storms on June 4, 2000, flooded more than 12 residences in the Lost Creek and Westpoint neighborhoods due to undersized storm drain systems. Phase 1 storm drain improvements are being constructed in Lost Creek in 2004. Phase 2 storm drain improvements are required to protect additional homes from future flooding. A portion of the Phase 2 project is on Powderhorn in the Westpoint neighborhood in CCD 7. J.B. Davies, Inc., has prepared the concept study and preliminary engineering plans and has submitted a proposal to prepare Phase 2 final plans.

**Morningside Neighborhood Drainage Improvements**
**Cost: $1,600,000 (Department of Engineering)**
Storms on July 1, 2001, and again in spring 2002 caused repeated severe flooding of a number of homes and other property damage due to an undersized storm drain system. A proposed storm drain relief line and other improvements will be installed to protect these homes from future flooding and to keep roadways passable during flash floods. A study and conceptual design were prepared by Turner, Collie & Braden, Inc., in 2002.

**Kellis-May Drainage Improvements**
**Cost: $300,000 (Department of Engineering)**
Storms on July 1, 2001, and again in Spring 2002 caused repeated severe flooding of a church and several homes due to an undersized storm drain system. Roadways are also subject to flooding, making them impassable to motorists and emergency vehicles. Storm drain improvements are required to protect these homes and church from future flooding and to keep roadways passable during flash floods. A study and conceptual design were prepared by DeOtte, Inc., in 2002.

**Southland Terrace Drainage Improvements**
**Cost: $1,000,000 (Department of Engineering)**

This project was misidentified in the bond package as Southridge Terrace. Storms in spring 2002 caused flooding of several homes and other property damage in this neighborhood without any storm drains. Roadway flooding also cuts off several homes from emergency vehicle access. A new storm drain system is required to protect these homes from future flooding and to keep roadways passable during flash floods. A concept study has not yet been performed.

**High-Water Warning System**
**Cost: $500,000 (TPW)**
Numerous roadways in the City are subject to flash flooding during heavy storms. In 2003, the City installed a pilot high-water warning system at three locations in far east Fort Worth in order to enhance safety of the traveling public. The high-water warning system is proposed for expansion at additional locations to be determined by City staff assisted by consultant performing Citywide Assessment of Roadway Flooding Hazards. Further future expansion of this system is anticipated.

**Lebow Channel Watershed Improvements**
**Cost: $2,500,000 (Department of Engineering)**
Numerous flood-prone properties and roadways subject to inundation lie along this natural creek. Funding is proposed for the first phase of the proposed long-term drainage improvements. This phase will include a detailed master plan, some culvert improvements, elimination of several dangerous low-water crossings, purchase of some flood-prone properties, and acquisition of land for future detention facilities. A study and conceptual design were prepared by Teague Nall and Perkins, Inc., in 2002.

**Central Handley Drainage Improvements**
**Cost: $850,000 (Department of Engineering)**
Several business properties have received repeated flooding and other damage due to flash floods overtaxing existing under-sized storm drains. Roadways are also subject to flooding, making them impassable to motorists and emergency vehicles. The proposed storm drain improvements are designed to protect these businesses from future flooding and to keep roadways passable during flash floods. A study and conceptual design were prepared by ANA Consultants, LLC, in 2002.

**Ryan Southeast Drainage Improvements**
**Cost: $1,200,000 (Department of Engineering)**
Storms in spring 2002 caused repeated flooding of several homes and other property damage in this neighborhood, the upper end of which has no storm drains. South Riverside Drive is also often blocked by high water after heavy downpours, making it impassable to motorists and emergency vehicles. Storm drain improvements are required to protect these homes from future flooding and to keep South Riverside Drive passable during flash floods. A study and conceptual design were prepared by Turner, Collie & Braden, Inc., in 2002.

**Trinity Boulevard Culvert Improvements**
**Cost: $400,000 (Department of Engineering)**

During flash floods, several creeks rise and overtop Trinity Boulevard, cutting off access to portions of the area. March 28, 2000, flooding temporarily cut off access to two residential subdivisions and resulted in two fatalities at Valley View Branch near Bell Helicopter. Culvert improvements to carry the 100-year flash flood storm under the roadway are proposed at this location in order to provide all-weather roadway access. A concept study has not yet been performed.

**Buy Out of Sump Area (Ohio Garden Road)**
**Cost: Unknown**
The Tarrant Regional Water District's internal drainage system has residential structures encroaching on the sumps themselves. One location that is especially flood-prone is the mobile home park on Sump 12. Several of the residences flooded during the event of 1990, and buy-outs would be prudent.

**Texas Standards That Exceed 44 CFR Requirements: Local Capability Assessments**
MAP 1
Projects funded under the following programs. Address the type of project that was funded. If you did not receive money from one of the below grants programs, then state that.
1.1: Hazard Mitigation Grant Program
- Sludge Drying Beds Completed February 1, 1993 DR-863
- Levee Enhancements Completed October 13, 1995 DR-863
- Dam Improvements Completed October 15, 1996 DR-863

1.2: Pre-Disaster Mitigation Grant Program - None
1.3: Project Impact - None
1.4: Hurricane-Property Protection Mitigation - None
1.5: Flood Mitigation Assistance - None
1.6: 406 Mitigation (through the Public Assistance Program) - None

MAP 2
Current Building Codes. Include the following information:
2.1: Date and type of code: 2003 International Building Code
2.2: How is it being enforced? Plans submitted for review. Projects inspected on site.

MAP 3
Current Fire Codes. Include the following information:
3.1: Date and type of code: 2003 International Fire Code
3.2: How is it being enforced?
- Plans are submitted for review
- Projects inspected on site
- Annual Fire Inspection

MAP 4
4.1: Any other codes, sub-division regulations, etc., that are in effect in your jurisdiction? Yes
Sub-Division Design/Construction Codes

4.2: How are they being enforced?

Exemptions Requests are reviewed by staff and approved by Council
Development Department Inspectors Inspect Construction
Code Compliance Inspects Existing Construction

MAP 5

Floodplain Management. Include the following information:
5.1: Ordinance/Order Date: Ordinance #10056, adopted February 9, 1988
5.2: Do you have a Floodplain Administrator? Yes
5.3: Is the person a Certified Floodplain Manager (CFM)? Yes
5.4: Date of current floodplain maps. August 23, 2000
5.5: Any codes, regulations, etc. that prohibit development in the floodway and/or floodplain: Ordinance #10056

MAP 6

Findings/results of Building Code Effectiveness Grading Report (BCEGS). Include date of report and score. Not applicable

MAP 7

Identify other plans that your jurisdiction has or have been done in your jurisdiction.
7.1: Capital Improvement Plans: Revised and adopted annually (currently in progress)
7.2: Comprehensive Plans: Revised and adopted annually (currently in progress)
7.3: Storm Water Management Plans: In Progress
7.4: Master Drainage Plans: In Progress
7.5: Corps of Engineers: None Known
7.6: Flood Mitigation Plan: Fort Worth - Tarrant County Emergency Management Plan
**7.7:** Any other plans, studies, etc. that may have been done in your jurisdiction.

# City of Haslet

Jurisdiction Profile

Haslet has an area of 7.4 square miles and a NCTCOG 2007 population estimate of 1,300.

The City of Haslet is located on Farm Road 156 approximately 16 miles northwest of Fort Worth in extreme north central Tarrant County. The area was settled around 1880, but it is likely that no distinct community was formed until 1883 when the tracks of the Gulf, Colorado, and Santa Fe Railway were extended through the area. The first Post Office was opened there in 1887 and the community was named for the Michigan hometown of the railroad's contractor. In 1896 the community had a school with twenty-one students and one teacher. Ten years later, the Haslet school had twenty-five students. During the 1920's, Haslet had three grocery stores as well as a hardware store, dry goods store, and cotton gin. The availability of war-related employment in Fort Worth probably contributed to the growth of Haslet's population by the late 1940's. By the 1990's, Haslet had become a commuter community for Fort Worth with approximately 795 residents and some twelve businesses. Today, Haslet is a thriving city that continues to grow.

| 1990 | 2000 | 2006 | 2007 |
|---|---|---|---|
| 795 | 1,134 | 1,400 | 1,400 |
| 2007 Population Density (persons per square mile): 170.56 | | | |

City Point-Of-Contact

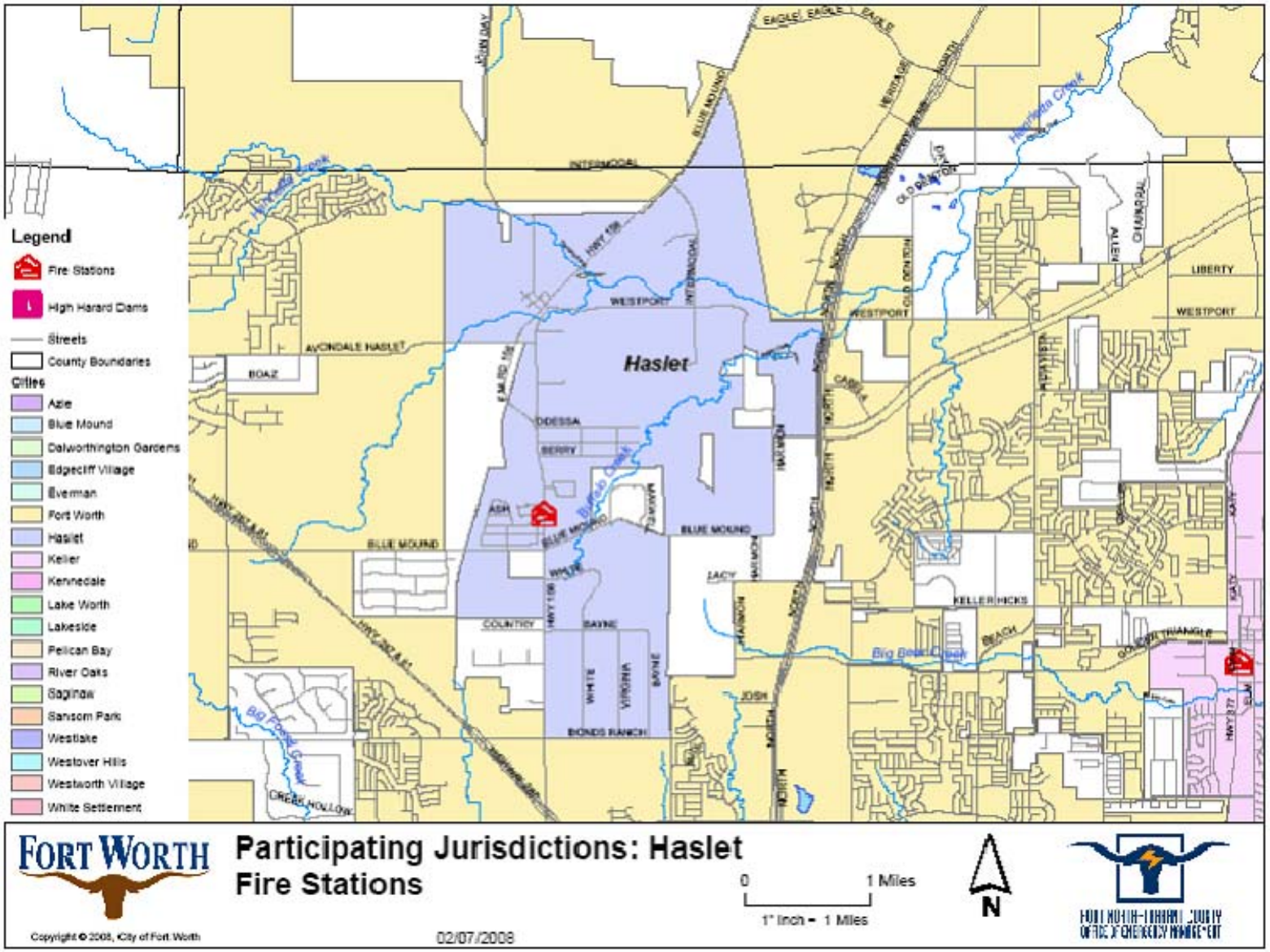
Fire Chief/ Emergency Management Coordinator Mike Thetford

Land Use and Development Trends

Haslet is transitioning from a small town to a commuter community. While mostly residential, there are a growing number of retail businesses serving the community. The growth of the Fort Worth Intermodal Center along the east side of the City has resulted in very large light manufacturing and warehousing facilities being located in Haslet. Haslet has relatively large areas that are undeveloped, and growth in both residential and businesses sectors is expected to continue.

Jurisdiction Unique Hazards

Hazards specific to Haslet are discussed below.


Legend
Fire Stations
High Hazard Dams
Streets
County Boundaries
Cities
Azle
Blue Mound
Dalworthington Gardens
Edgecliff Village
Everman
Fort Worth
Haslet
Keller
Kennedale
Lake Worth
Lakeside
Pelican Bay
River Oaks
Saginaw
Sansom Park
Westlake
Westover Hills
Westworth Village
White Settlement
Haslet
Participating Jurisdictions: Haslet
Fire Stations
0
1 Miles
1" Inch = 1 Miles
N
02/07/2008
Copyright © 2008, City of Fort Worth

**DAM FAILURE**

No Vulnerability – There are no high hazard dams located in Haslet and none that would affect Haslet if they failed. Based on the lack of vulnerability, dam failure will receive no further consideration in this plan for Haslet.

**DROUGHT**

Moderate Vulnerability – Haslet purchases water from Fort Worth who purchases water from the Tarrant Regional Water District (TRWD). TRWD water supply comes from three reservoirs on the West Fork of the Trinity River in northwest Tarrant County and from two reservoirs located well southeast of Tarrant County. These diverse supply locations help mitigate the effects of a local drought. An additional reservoir location well northeast of Tarrant County is being pursued. There has been some preliminary discussion of constructing a pipeline to carry water from southern Oklahoma. TRWD is installing pipelines to interconnect area water supply lakes with water treatment plants in order to provide maximum flexibility in water supply and treatment.

Location – Drought can affect all of Haslet.

Current Extent – As of February 2008, Haslet was at DO – Abnormally Dry on the Palmer Drought Severity Index.

Previous Occurrences – National Climatic Data Center records indicate that in the past ten years there have been three periods of drought in Haslet, 1996 - 1998, 2000, and 2005 - 2006.

Probability of Future Events – Droughts are certain to occur again in Haslet. Significant droughts significantly affecting water supply and resulting in mandatory restrictions traditionally occur on a twenty year cycle. Based on the previously cited National Climatic Data Center recent records, we can anticipate that drought conditions will occur approximately every three years.

Impact – Drought can lead to loss of water for basic needs such as drinking and fire-fighting. Droughts are associated with increased wildfire and damage from expansive soils. More common impacts are damage to landscaping and reduced recreation due to low lake levels.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Haslet Drought Mitigation Action #1** | Participate in the design and implementation of the Tarrant County specific water conservation public education efforts to compliment existing programs. |
| **Mitigation Goal/Objective** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $1,000 |

| | |
|---|---|
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • City Funds<br>• Water Suppliers |
| **Responsible Agency** | • Haslet Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One year |
| **Effect on New Buildings** | This action will publicize water conservation efforts that can be incorporated into new construction. |
| **Effect on Existing Buildings** | This action will publicize water conservation efforts that can be incorporated into existing construction. |
| **Cost Effectiveness** | Cost Effective – Public education programs can provide significant results for relatively low costs. |
| **Discussion:** Most cities in the area have existing water conservation programs designed to educate the public and businesses on ways to conserve water. This action will develop a Haslet specific program that will compliment existing programs. Jurisdictional public education efforts have been very successful in attracting the attention of local citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Haslet Drought Mitigation Action #2** | 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. Impacts identified in this plan will be included in updates to the Hazard Mitigation Action Plan. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $2,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • City Funds<br>• Water Suppliers |
| **Responsible Agency** | • Haslet Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM |
| **Estimated Completion Time Frame** | One Year |

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|---|---|
| **Effect on New Buildings** | This action will identify drought impacts in Haslet thus providing specific information for builders of new structures to incorporate drought mitigation into the structures. |
| **Effect on Existing Buildings** | This action will identify drought impacts in Haslet thus providing specific information for owners of existing structures to incorporate drought mitigation into the structures. |
| **Cost Effectiveness** | Cost Effective – This planning effort will have a low cost with the potential for significant benefits for the entire community. |
| **Discussion:** This planning effort will focus attention on the effects of drought on the community. Specific drought effects will be identified and efforts can be made to mitigate those effects. | |

**EXPANSIVE SOILS**

Low Vulnerability - Expansive soils have caused damage to some structures in some portions of Haslet. However, damage has been limited to relatively small geographic areas and there are no reports of significant damage to commercial structures or infrastructure.

Location – Expansive soils are found in various areas of Haslet. We could not locate a map of expansive soils in Haslet.

Extent – The extent of expansive soils in Haslet is believed to be Very Low (0% - 20%) to Low (21% - 50%).

Previous Occurrences – We could find no empirical data on previous occurrences of damage from expansive soils, but it is believed that expansive soils have caused problems since the first buildings were constructed in this area.

Probability of Future Events – Due to the variability of soil types and construction quality, it is very difficult to predict future occurrences of problems with expansive soils. However, a study published in the fall 2003 issue of *Environmental Geology* cited in the September 19, 2003 *Dallas Business Journal* indicates that many new developments in the Metroplex are being built on soil that is more unstable than soils built on prior to 1990. This could lead to a higher incidence of expansive soil related damage in the future.

Impact – The impact of expansive soils ranges from cosmetic cracks in walls to substantial foundation and structural damage that can result in the need to demolish the building. Infrastructure such as pipelines can be damaged causing increased maintenance and repairs, damaged beyond repair requiring replacement, damaged to the point of failure.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Haslet Expansive Soils Mitigation Action #1** | Improve construction techniques through building code enhancements. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined (Minimal – Staff Time Only) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building permit fees |
| **Potential Matching Funding Sources** | • City Funds<br>• Building permit fees |
| **Responsible Agency** | Haslet Building Inspections Department |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will make new buildings more resistant to damage from expansive soils. |
| **Effect on Existing Buildings** | This action will require modifications to existing buildings to be more resistant to damage from expansive soils. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will improve construction quality and reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Haslet Expansive Soils Mitigation Action #2** | Educate construction contractors, home owners, and business owners about mitigation techniques. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building Permit Fees |
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | • Haslet Building Inspections Department<br>• Haslet Fire/Emergency Management (Support) |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will provide builders of new construction with expansive soil mitigation techniques that will reduce damage. |

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| **Effect on Existing Buildings** | This action will provide owners of existing buildings with expansive soil mitigation techniques that will reduce damage. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will provide construction contractors and home/business owners with techniques designed to reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**EXTREME HEAT**

High Vulnerability - Summer heat and humidity can occur anytime from May through October. Community health services actively work with at risk populations to prevent heat related deaths and injuries. The elderly, very young people and people with poor health are most at risk from summer heat. People who work outside or in un-air-conditioned buildings are also at high risk to the direct effects of summer heat. Summer heat can also lead to electrical service outages if equipment fails or demand exceeds available supply. Most public safety and special facilities are equipped with emergency generators.

Location - Throughout the City.

Extent - Summer temperatures can reach as high as 113 degrees. Haslet is also subject to high humidity.

Previous Occurrences - This is an annual occurrence. The summer of 1980 was a record year with 69 consecutive days of temperatures of 100 degrees or more. We were unable to find a reliable record of deaths or injuries related to heat.

Probability of Future Events - Hot summer temperatures are certain to continue to occur in Haslet.

Impact - Summer heat can cause widespread electrical outages resulting in dangerous conditions, especially for at-risk populations. Occasionally "cooling centers" are opened at community centers to provide a safe place for citizens to seek refuge from the heat. Extreme heat can have economic impacts if construction work is curtailed or outdoor special events are cancelled.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Haslet Extreme Heat Mitigation Action #1** | Determine feasibility of expanding monitoring of populations at risk from extreme heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined. Staff time and GIS resources |

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| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Other State or Federal Public Health Grants |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Tarrant County Public Health<br>• Haslet Fire/Emergency Management |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | None - This action is intended to expand monitoring of people only. |
| **Effect on Existing Buildings** | None - This action is intended to expand monitoring of people only. |
| **Cost Effectiveness** | Pending, but believed to be Cost Effective |
| **Discussion:** This action would determine the feasibility of expanding monitoring of populations at risk from extreme heat. Existing at risk population monitoring programs will be reviewed to ensure all known populations at risk from extreme heat are included. Any newly discovered at risk populations will be evaluated for inclusion in existing monitoring programs. Tarrant County Public Health provides public health services throughout the County. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Haslet Extreme Heat Mitigation Action #2** | Increase public education programs on the dangers of excessive heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness |
| **Priority** | Medium |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Other State or Federal Public Health Grants |
| **Responsible Agency** | • Tarrant County Public Health<br>• Haslet Fire/Emergency Management |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Effect on Existing Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits. |
| **Discussion:** Public education on severe weather in Haslet has traditionally focused on severe thunderstorms and associated hazards (tornadoes, lighting, flooding, high winds). This action would expand public education to include hazards from extreme heat. | |

**FLOOD**

High Vulnerability - The topography of Halset combined with the frequency of severe thunderstorms results in frequent flash flood events. FEMA records indicate only 39 Repetitive Loss Properties in all of Tarrant County. However, this is probably more a reflection of the low number of flood insurance polices than vulnerability to flooding. Further analysis using GIS and field verification can specifically identify vulnerable structures. Homes, business, and roadways along and crossing Henrietta Creek and Buffalo Creek are most vulnerable to flooding. Flash floods in Haslet typically have a very short warning time. There are no known special facilities in the flood prone area.

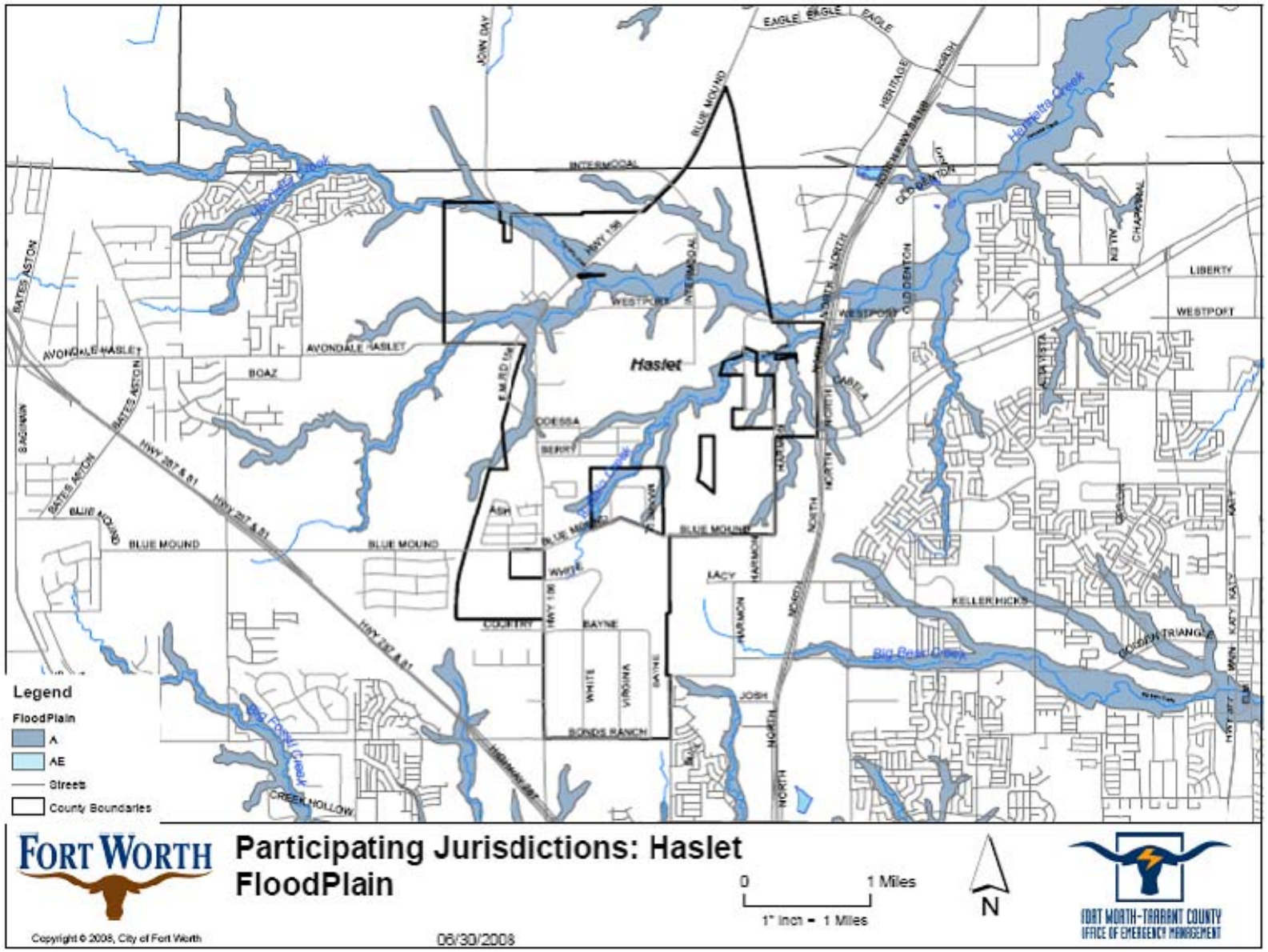
Location – Areas throughout the City along Henrietta and Buffalo Creek are prone to flooding.

Previous Occurrences - Minor flooding occurs frequently, especially during the spring and early summer. In May of 1999 a flash flood occurred along Henrietta Creek flooding roadways and causing minor damage to several homes.

Extent - Flash floods are the most common type of flooding in Tarrant County which tend to occur and recede very quickly.

Probability of Future Events – Based on previous experience Haslet is certain to suffer flash flood events every year. National Weather Service records indicate an average of 11 flash flood events per year in Tarrant County. Continued development throughout the County and the resulting increase in impervious cover will increase the likelihood and severity of flooding.

Impact - Flash floods kill more people than any other hazard associated with thunderstorms. Property damage from flash flooding is seldom covered by insurance, which makes it very difficult for citizens to recover from the flood. Due to the very rapid rate of development and growth throughout Tarrant County we are experiencing problems with determining actual building footprints within flood plains and will be using planimetric GIS data from the NCTCOG to resolve this issue when it becomes available. At that time we will be able to accurately identify the number and types of buildings vulnerable to flooding; as well as access other data associated with those locations such as appraised value, census data, and owner information.


Haslet
Legend
FloodPlain
A
AE
Streets
County Boundaries
FORT WORTH
Participating Jurisdictions: Haslet
FloodPlain
0
1 Miles
1" Inch = 1 Miles
N
FORT WORTH-TARRANT COUNTY
OFFICE OF EMERGENCY MANAGEMENT
Copyright © 2008, City of Fort Worth
06/30/2008

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Haslet Flood Mitigation Project #1** | Participate in the development of the Tarrant County specific "Flood Preparedness" brochure. |
| **Hazard Addressed** | Flooding |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of Flood events.<br>1. c. Develop effective flood mitigation public education materials. |
| **Priority** | High |
| **Estimated Cost** | Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Private Foundation Grants |
| **Responsible Agency** | • Haslet Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This action will provide flood mitigation techniques for owners of new buildings. |
| **Effect on Existing Buildings** | This action will provide flood mitigation techniques for owners of existing buildings. |
| **Cost Effectiveness** | Cost Effective - This project will provide valuable information to the public in a relatively short time and with relatively low costs. It will also have the added benefit of increasing public awareness of mitigation. The estimated cost could easily be offset by reduced losses to the public in a single small flood event. |

**Discussion**: Develop Tarrant County specific "Flood Preparedness" brochure. Once developed, the brochure will be distributed County-Wide. Historically flood prone areas will be targeted for door-to-door distribution and neighborhood meetings to present the brochure and solicit input for *Fort Worth Hazard Mitigation Action Plan* revisions.

The brochure will include:

- Description of Tarrant County flood hazards
- "Case Studies" of previous flood events in Tarrant County
- Preparedness and "self-help" mitigation information
- Benefits of city participation in NFIP
- Advantages of flood insurance
- Risks of not having flood insurance
- Warnings that typical homeowner's insurance does not cover rising water
- Solicit input for the *Fort Worth Hazard Mitigation Action Plan*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Haslet Flood Mitigation Action #2** | Conduct City wide drainage study and implement findings. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |
| **Priority** | Medium |
| **Estimated Cost** | $50,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Haslet Public Works<br>• Haslet Fire/Emergency Management |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will provide guidance for locating new buildings away from flood prone areas. |
| **Effect on Existing Buildings** | This action will provide guidance for protection of existing buildings from flooding. |
| **Cost Effectiveness** | Cost Effective – This project will provide guidance to reduce the hazard to life and property from flooding. |
| **Discussion:** This action will develop a study of drainage and flooding throughout the City and provide findings that can reduce the adverse effects of flooding. | |

**HAILSTORM**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of large hail are a hazard event in Haslet. Tarrant County averages eleven significant thunderstorm events (large hail, high winds) per year according to National Weather Service records. Most structures in Haslet can resist the effects of all but the most severe hailstorms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to hailstorms. Vehicles have proven to be vulnerable to hailstorms with widespread severe vehicle damage reported in 1980 and 1995.

Location - Throughout the City.

Extent - Haslet is subject to the hazards of severe thunderstorms, including large hail. Hail stones up to the size of grapefruit (H9 on the Combined NOAA/TORRO Hailstorm Intensity Scales) have been reported in Tarrant County.

Previous Occurrences – There are no reports of significant hailstorm events in Haslet other than the 1980 and 1995 county-wide events.

Probability of Future Events - Thunderstorms with hail are certain to continue to occur in Haslet. Hail falls on about two or three days per year, ordinarily with only slight and scattered damage (*National Weather Service*).

Impact – The impact from hailstorms can be significant in extreme events such as the hailstorms of 1980 and 1995. Thousands of homes and vehicles can be damaged in a single storm with millions of dollars in damages. Vehicles are especially impacted by

large hails with windshields being the vulnerable part. A recurring problem following hailstorms is broken windshields in vehicles belonging to populations who do not have vehicle insurance and cannot afford the replacements costs, resulting in the owners having difficulty traveling to work, medical appointments, etc.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Haslet Hailstorm Mitigation Action #1** | Develop a public education campaign to encourage "hail resistant" roofing in new construction and roof replacements. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• Building/Permit Fees<br>• City Funds |
| **Responsible Agency** | • Haslet Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will potentially decrease the damage caused by most hailstorms to new buildings. |
| **Effect on Existing Buildings** | This action will potentially decrease the damage caused by most hailstorms to existing buildings. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing hailstorm damage. One long term benefit will be reduced property insurance as claims related to hail damage are reduced. |
| **Discussion**: Public education has proven to be a low cost effective means to achieve changes public behavior. Encouraging hail resistant roofing can benefit citizens through reduced damage, business through reduced damage to their buildings and reduced claims against insurance companies, and government through reduced request for assistance. This campaign can be developed in conjunction with the Tarrant County effort. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Haslet Hailstorm Mitigation Action #2** | Evaluate City buildings to determine feasibility of installing hail resistant roofing and window coverings with a focus on critical infrastructure. |

| | |
|---|---|
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• City Funds |
| **Responsible Agency** | • Haslet Public Works<br>• Haslet Building Inspection Department |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on new City buildings. |
| **Effect on Existing Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on existing City buildings. |
| **Cost Effectiveness** | Cost Effective – Although currently undetermined, this project is believed to be cost effective. |
| **Discussion:** Installing hail resistant roofing and window coverings on City buildings could prevent or limit damage to City buildings thus avoiding costs to the City as well as preventing or limiting loss of use of damaged facilities. | |

**HIGH WINDS**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of high winds are a hazard in Haslet. Tarrant County averages ten reported significant thunderstorm events (large hail, high winds) per year. In addition, strong weather fronts can sometimes be accompanied by high winds which occasionally cause damage. Most structures in Haslet can resist the effects of all but the most severe high wind events. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to high winds.

Location - Throughout the City.

Extent - Severe thunderstorms with high winds with speeds in excess of 90 mph have been reported in Haslet.

Previous Occurrences – We could find no records of significant high wind damage in Haslet.

Probability of Future Events – Based on previous experience Haslet can expect to experience an average of ten significant thunderstorm events with high winds per year.

Impact – Records on high wind events are difficult to separate from severe thunderstorm records. High winds in Haslet typically cause little damage to commercial. More often high winds cause damage to roofs, trees, and signs.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Haslet High Winds Mitigation Action #1** | Enact enhanced building codes to reduce damages from high winds. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined – Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Haslet Building Inspection Department |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will potentially identify a means to reduce high wind damage on new buildings. |
| **Effect on Existing Buildings** | This action will potentially identify a means to reduce high wind damage on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Although costs are undetermined, this action is believed to be cost effective since the action will require staff time only. |
| **Discussion:** Enhanced building codes will reduce damages from high wind events. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Haslet High Winds Mitigation Action #2** | Educate builders and residents about mitigating wind damage. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |
| **Responsible Agency** | • Haslet Building Inspection Department<br>• Haslet Fire/Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |

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|---|---|
| **Effect on New Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on new buildings. |
| **Effect on Existing Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost of developing and providing high wind mitigation compared with savings to the community make this action cost effective. |
| **Discussion:** Public education has proven to be a low cost and effective means to achieve changes public behavior. High winds have not been a focus of severe weather preparedness. | |

**LANDSLIDES**

No Vulnerability – There are no areas in Haslet subject to landslides. Based on the lack of vulnerability, landslides will receive no further consideration in this plan for Haslet. However, landslide hazards will be reviewed during the annual review of this plan and we will continue looking for areas with landslide potential during hazard surveys.

**LEVEE FAILURE**

No Vulnerability – There are no levees or areas that would be affected by levee failure in Haslet. Based on the lack of vulnerability, levee failure will receive no further consideration in this plan for Haslet.

**LIGHTNING**

Moderate Vulnerability – Lightning is one of the most common hazards in Haslet. Thunderstorms (and by definition, lightning) occur an average of 30 – 50 days per year (*Oklahoma Climatological Survey*). Lightning is the second most common cause of weather-related deaths in Texas (*National Weather Service*). Lightning information is available only for Tarrant County on a county-wide basis.

Location – Throughout the City.

Extent – We could find no references to the average number of strikes per storm in Haslet. However, lightning is by definition associated with thunderstorms.

Previous Occurrences – Tarrant County experiences 30 – 50 thunderstorm days per year. From 1995 – 2004 one person was killed and five were injured by lightning in Tarrant County (*National Weather Service*). Throughout Texas 34 people were killed by lightning, there were 184 injuries, and an estimated 23 million dollars in damages due to lightning from 1995 - 2004 (*National Weather Service*).

Probability of Future Events – Based on past experience Haslet will experience 30 – 50 thunderstorm days each year. Some days will have more than one thunderstorm during a given thunderstorm day.

Impact – Although lightning is the second most common cause of storm related deaths in Texas, lightning deaths remain relatively rare. Lightning does cause property damage several times per year (we could not find statistical data to validate this observation).

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Haslet Lightning Mitigation Action #1** | Provide lightning mitigation materials with building permit packets. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Haslet Building Inspection Department |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will provide materials that will reduce the vulnerability of new buildings to lightning. |
| **Effect on Existing Buildings** | This action will provide materials that will reduce the vulnerability of existing buildings that are being remodeled to lightning. |
| **Cost Effectiveness** | Cost Effective – The low cost of this project would be offset by eliminating just one lightning caused building loss. |
| **Discussion:** Lightning mitigation materials will be included in all building permit packets distributed to builders or citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Haslet Lightning Mitigation Action #2** | Ensure all City critical infrastructure has adequate lightning mitigation in place and upgrade protection as necessary. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | $4,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Haslet Building Inspection Department<br>• Haslet Public Works |

| | |
|---|---|
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will ensure new City buildings that house critical infrastructure have adequate lightning mitigation. |
| **Effect on Existing Buildings** | This action will ensure existing critical infrastructure has adequate lightning mitigation. |
| **Cost Effectiveness** | Cost Effective – The destructive and sometimes capricious nature of lighting warrant the expense of this action compared with the benefits of avoiding damage to critical infrastructure. |
| **Discussion:** Review and confirmation of the adequacy of lightning protection systems in City buildings housing critical infrastructure is worthwhile considering the number of thunderstorms experienced in Haslet. | |

**SEVERE THUNDERSTORM**

High Vulnerability - Severe thunderstorms are the most common hazard in Haslet. From 1950 through August 2007 Tarrant County averaged eleven reported severe thunderstorm events county-wide per year. Most structures in Haslet can resist the effects of all but the most severe thunderstorms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to thunderstorms.

Location - Throughout the City.

Extent - Tarrant County is subject to the hazards of severe thunderstorms of all magnitudes.

Previous Occurrences - Records are available only on a county-wide basis.

Probability of Future Events – Severe thunderstorms will occur in Tarrant County an average of eleven times per year.

Impact – A single severe thunderstorm can cause damage from hail, high winds, lightning, and/or tornadoes to thousands of structures.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Haslet Severe Thunderstorm Mitigation Project #1** | Conduct technical assessment to determine the feasibility of structurally hardening the Haslet Fire Station located at 1701 FM 156 against severe weather. |
| **Hazard Addressed** | Tornado/Severe Thunderstorm |
| **Mitigation Goal/Objective** | 2. Reduce loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | High |
| **Estimated Cost** | $10,000 |

| | |
|---|---|
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • Private Foundation Grants<br>• Other State or Federal Grants<br>• City Funds |
| **Responsible Agency** | Haslet Fire/Emergency Management |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This project will determine the feasibility of structurally hardening the Haslet Fire Station against severe weather. |
| **Effect on Existing Buildings** | This project will determine the feasibility of structurally hardening the Haslet Fire Station against severe weather. |
| **Cost Effectiveness** | Cost Effective - This project will provide the basis for a realistic cost benefit analysis of the feasibility of hardening the Haslet Fire Station against severe weather events. The relatively low cost of this project compared with the potential benefits of protecting a city's emergency response equipment against the jurisdiction's most likely hazard event result in a favorable cost benefit review. |

**Discussion:**
This project will provide for determining the feasibility of hardening the city's only fire station against severe weather. This project will contribute to protecting emergency response equipment so that it will be available to assist the citizens of Haslet in responding to and recovering from severe weather or other events. Final project details will be developed in accordance with grant requirements at the time the project is funded.

The cost estimate is a conservative "best guess" based on a structural analysis of the existing fire station. That analysis would require:

- Structural analysis of the building by a Structural Engineer
- Analysis of electrical systems
- Analysis of HVAC systems
- Review of building codes

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Haslet Severe Thunderstorm Mitigation Action #2** | Encourage builders to install storm resistant construction such as "hurricane clips". |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | High |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |

| | |
|---|---|
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |
| **Responsible Agency** | Haslet Building Inspection Department |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will encourage storm resistant construction in new buildings. |
| **Effect on Existing Buildings** | This action will encourage storm resistant construction in existing buildings as they are remodeled. |
| **Cost Effectiveness** | Cost Effective – The low cost of this action will be offset by a reduction in damage from severe thunderstorms. |
| **Discussion:** Effective education on storm resistant construction can reduce damage from severe thunderstorms. Insurance companies may be willing to fund or provide educational materials and/or provide discounts to persons who install storm resistant devices. | |

**SEVERE WINTER STORMS**

Moderate Vulnerability - Since 2000 the National Weather Service has reported 14 Winter Storm/Ice events. Haslet's location in northern Tarrant County make it slightly more vulnerable to winter storms than other cities in the County. Winter storms in Haslet usually consist of short-lived icing events (ice on the roads for a few hours) that primarily affect traffic and cause numerous motor vehicle accidents. Occasionally an ice storm will cause widespread power outages for as long as several days. ONCOR Electric Delivery has an aggressive tree trimming program. Most structures in Haslet can resist the effects of all but the most severe winter storms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to winter storms. Electrical service outages are usually the most serious threat in this area. Most public safety and special facilities are equipped with generators.

Location - Throughout the City.

Extent - Severe ice storms have resulted in accumulations in excess of two inches. Most storms leave only a light coating or glaze of ice.

Previous Occurrences – Severe Winter Storms are typically regional events. Haslet has averaged two winter storms per year since 2000. Most winter storms resulting only minor inconveniences and a few motor vehicle accidents.

In 1978 up to an inch of ice coated area trees and roadways causing $14 million in damages region-wide and making travel almost impossible for two days.

In 1996 a winter storm dropped two to four inches of a mixture of sleet, freezing rain, and snow in Haslet over Thanksgiving weekend causing many motor vehicle accidents and some electrical service outages.

In 2003 a winter storm dropped one inch of sleet across Haslet resulting in numerous motor vehicle accidents and closing schools for two days.

Probability of Future Events - Haslet can expect to experience two winter storms per year with a severe winter storm once each ten years.

Impact - Winter storms can cause widespread electrical and telephone service outages, make travel dangerous or impossible, and damage structures. Deaths and injuries due to vehicle accidents and slips/falls are common during ice storms. Occasional deaths and injuries from carbon monoxide poisoning due to improper heating have occurred. Economic losses due to lost production can be significant. Damage from frozen pipes can lead to significant expenses for homeowners.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Haslet Severe Winter Storm Mitigation Action #1** | Increase public education concerning winter storm preparedness and mitigation. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | Medium |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Haslet Fire/Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into new buildings. |
| **Effect on Existing Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost is effective when compared to benefits provided to citizens. |
| **Discussion:** Winter weather preparedness has not been emphasized in Haslet as much as severe thunderstorms. This action will provide preparedness information to citizens during the fall. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Haslet Severe Winter Storm Mitigation Action #2** | Purchase additional street sanding capacity |

| | |
|---|---|
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Haslet Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will have no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Sanding streets is essential to allow emergency vehicles to respond during severe winter events. |
| **Discussion:** Sanding equipment can be mounted on existing equipment to provide sanding capabilities. During severe winter weather events streets around hospitals, fire stations and other critical facilities are sanded along with major intersections and roadways. Additional sanding capacity would allow for quicker sanding of these areas and for more repeat sanding during prolonged winter weather events. This will improve public safety by facilitating emergency response as well as reducing motor vehicle accidents. | |

**STREAM BANK EROSION**

No Vulnerability - The predominantly low rolling topography of Haslet prevents stream bank erosion from causing a hazard. No vulnerability to stream bank erosion has been identified in Haslet. This hazard will be reviewed during annual reviews of this plan.

**TORNADO**

High Vulnerability – All structures in Haslet are vulnerable to tornadoes. Very few structures can withstand the effects of an F5 tornado. However, the March 28, 2000 F3 tornado that struck Fort Worth provided good evidence that well built structures can protect people who take appropriate shelter inside those buildings.

Location - Tornadoes can occur anywhere in Haslet.

Extent - Haslet is subject to tornadoes of all magnitudes, including F5 tornadoes.

Previous Occurrences – On April 13, 2007 a F0 tornado touched down causing light dame to a home.

Probability of Future Events - Tarrant County has averaged one reported tornado per year and can expect that average to continue. Haslet, based on its relatively small size, will likely experience tornados very infrequently.

Impact - Tornadoes can cause deaths, injuries and property damage/destruction. Special facilities such as hospitals, fire stations, and utilities can be damaged or destroyed.

Citizens who live in neighborhoods struck by tornadoes can experience disruption of their life styles and traditions. Areas struck by tornadoes can experience increased demand for mental health services as people deal with grief and stress.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Haslet Tornado Mitigation Project #1** | Assist citizens with funding for building tornado safe rooms or in-ground shelters. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction |
| **Priority** | High |
| **Estimated Cost** | $120,000 (30 Safe Rooms at $4,000 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Community Development Block Grant Funds |
| **Potential Matching Funding Sources** | Home/Building Owner |
| **Responsible Agency** | • Haslet Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This project will encourage new buildings to be constructed with tornado safe rooms as part of the construction process. The safe room will enhance the overall storm resistance of the building. |
| **Effect on Existing Buildings** | This project will encourage homeowners to construct/install tornado safe rooms in their existing homes. A safe room will enhance the overall storm resistance of the building. |
| **Cost Effectiveness** | Cost Effective - Safe rooms and in-ground shelters have been proven to reduce deaths and injuries during tornadoes and severe thunderstorms. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of safe rooms and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

**Discussion:**
This project will reimburse costs associated with tornado safe room or in-ground shelter installation in new or existing homes. Safe rooms provide increased protection for citizens during severe thunderstorms and tornados. Safe rooms have been proven to save lives and reduce injuries from severe weather events. FEMA publication 320 (*Taking Shelter from the Storm, Building a Safe Room Inside Your House*) provides the standards for safe rooms. As stated on the FEMA website: Although a *"residence may be built "to code," that does not mean it can withstand winds from extreme events such as tornadoes and major hurricanes. The purpose of a safe room or a wind shelter is to provide a space where you and your family can seek refuge that provides a high level of protection. To protect its occupants, a safe room must be built to withstand high winds and flying debris, even if the rest of the residence is severely damaged or destroyed."*

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to home owners will be for no more than $3,000 or 75% of cost, whichever is less
- Eligibility will be limited to individuals who own their home at the time of application
- The safe room or in-ground shelter must be constructed/installed in the primary residence of the applicant
- Each eligible homeowner can only receive one reimbursement, regardless of the number of shelters he/she may purchase/install
- In-ground shelters must meet requirements established in the National Performance Criteria for Tornado Shelters dated May 28, 1999.
- Safe Rooms must meet the requirements of FEMA Publication 320
- Safe Rooms and shelters must meet all applicable city and/or county codes
- Previously owned or used shelters will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Haslet Tornado Mitigation Project #2** | Assist citizens with funding for purchase of Weather Alert Radios |
| **Mitigation Goal/Objective** | 4. Increase the effectiveness of warning systems in Tarrant County.<br>4. a. Increase the number of homes and businesses with Weather Alert Radios. |
| **Priority** | High |
| **Estimated Cost** | $40,000 (100 Weather Alert Radios at $40 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Private Sector Donations<br>• City Funds |
| **Potential Matching Funding Sources** | Citizen/Business Owner |

| | |
|---|---|
| **Responsible Agency** | • Haslet Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings except for providing additional warning time of severe weather events thus allowing citizens more time to secure their home or business against approaching severe weather. |
| **Cost Effectiveness** | Cost Effective – Weather Alert Radios are a proven means to alert and warn citizens about severe weather and civil emergencies. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of Weather Alert Radios and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

***NOTE**: We are aware that Weather Alert Radios are on the "2007 Ineligible Planning Activities" list. It is our opinion that Weather Alert Radios should be considered eligible due to their very high benefit and very low cost.*

This project will reimburse 75% of the cost for citizens to purchase Weather Alert Radios, with the citizen responsible for the remaining 25%. Weather Alert Radios provide the best means for citizens to receive emergency alerts when they are indoors. Severe weather is the primary hazard in our area. Early alert and warning has proven to be a significant factor in saving lives during severe weather events.

In addition, the Weather Alert Radios can be activated for civil emergencies such as hazardous materials incidents. Effective warning saves lives, especially during severe weather events. Weather alert radios provide a proven means of indoor warning to citizens any time of the day or night and compose the vital indoor portion of our emergency warning system.

Warning systems have been shown to have value beyond the initial warning. Persons receiving warning relay the information to family and friends to ensure they are aware of the hazard. The secondary and tertiary warning can greatly amplify the effectiveness of the warning system.

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to citizens will be for no more than $30 or 75% of cost of the radio, whichever is less
- Eligibility will be limited to residents of Haslet
- The citizen must sign an agreement to keep the radio operational
- Each eligible homeowner can only receive one reimbursement, regardless of the number of radios purchased
- Previously purchased radios will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**WILDFIRE**

Moderate Vulnerability - Haslet has a significant amount of rural-urban interface that is vulnerable to wildfires.

Location - The areas of most concern are wooded areas Henrietta Creek and Buffalo Creek. Grassfires can occur through the city.

Extent - The effects of wildfire are deaths, injuries, loss of structures, loss of wildlands, and loss of wildlife habitat.

Previous Occurrences - Wildfires in Haslet are typically associated with droughts. A number of wildfires and grassfires occurred during the droughts from 1996 - 1998, 2000, and from 2005 - 2006.

Probability of Future Events - Wildfires are likely to occur annually and increase in frequency and severity as the population continues to increase and formally rural areas are developed.

Impact - Wildfires can result in the need for rapid evacuations, casualties, loss of homes and businesses, and loss of wildlife habitat and recreational areas.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Haslet Wildfire Mitigation Action #1** | Increase public education on how to reduce the risks from wildfires (construction, landscaping, etc.) |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | High |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Haslet Fire/Emergency Management |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will reduce the effects of wildfire on new buildings through increased use of wildfire mitigation measures. |
| **Effect on Existing Buildings** | This action will reduce the effects of wildfire on existing buildings through increased use of wildfire mitigation measures. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing the effects of wildfire. |
| **Discussion:** Wildfire mitigation measures are not widely known in urban areas such as Haslet. This action will increase that knowledge and reduce casualties and damages from wildfires. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Haslet Wildfire Mitigation Action #2** | Enact building permit process that encourages wildfire resistant construction. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |

| | |
|---|---|
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | • Haslet Building Inspection Department<br>• Haslet Fire/Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will reduce the vulnerability of new structure to wildfire. |
| **Effect on Existing Buildings** | This action will reduce the vulnerability of existing buildings to wildfire if they are remodeled to the extent a building permit is required. |
| **Cost Effectiveness** | Cost Effective – This action will integrate wildfire mitigation into the building process at minimal cost. |
| **Discussion:** Integrating mitigation into building permitting provides a process to reduce vulnerability with few negative impacts. | |

**Texas Standards That Exceed 44 CFR Requirements: Local Capability Assessments**

MAP 1
Projects funded under the following programs. Address the type of project that was funded. If you did not receive money from one of the below grants programs, then state that.
1.1: Hazard Mitigation Grant Program - None
1.2: Pre-Disaster Mitigation Grant Program - None
1.3: Project Impact - None
1.4: Hurricane-Property Protection Mitigation - None
1.5: Flood Mitigation Assistance - None
1.6: 406 Mitigation (through the Public Assistance Program) - None

MAP 2
Current Building Codes. Include the following information:
2.1: Date and type of code: 2006 International Building Code
2.2: How is it being enforced? Plans submitted for review. Projects inspected on site.

MAP 3
Current Fire Codes. Include the following information:
3.1: Date and type of code: 2006 International Building Code
3.2: How is it being enforced?
- Plans are submitted for review
- Projects inspected on site
- Annual Fire Inspection

MAP 4
4.1: Any other codes, sub-division regulations, etc., that are in effect in your jurisdiction? No
4.2: How are they being enforced?

MAP 5

Floodplain Management. Include the following information:

5.1: Ordinance/Order Date: Addressed in Building Codes

5.2: Do you have a Floodplain Administrator? Yes

5.3: Is the person a Certified Floodplain Manager (CFM)? No

5.4: Date of current floodplain maps. August 23, 2000

5.5: Any codes, regulations, etc. that prohibit development in the floodway and/or floodplain: Building Codes

MAP 6

Findings/results of Building Code Effectiveness Grading Report (BCEGS). Include date of report and score. Not applicable

MAP 7

Identify other plans that your jurisdiction has or have been done in your jurisdiction.

7.1: Capital Improvement Plans: None

7.2: Comprehensive Plans: Amended on June 5, 2006

7.3: Storm Water Management Plans: None

7.4: Master Drainage Plans: None

7.5: Corps of Engineers: None

7.6: Flood Mitigation Plan: None

7.7: Any other plans, studies, etc. that may have been done in your jurisdiction.

# City of Keller

Jurisdiction Profile

Keller has an area of 18.4 square miles and a NCTCOG 2004 Population Estimate of 37,700.

The Texas and Pacific Railroad between Fort Worth and Texarkana was completed in April 1881, and the first train ran on this track on 9 May 1881. With the advent of rail service, new villages were established all along the line. The Keller of today was one of them. With railroad service now available, Keller began to prosper as a trade center for the surrounding farm community. The post office was established in 1886 when the post office at Double Springs, located about 2 miles northeast of Keller, was discontinued. In the first years, the closest school to Keller stood on Bear Creek Road and Elaine Street. The building was erected by the Mount Gilead Baptist Church as a school reserving church privileges. It was a subscription school. The exact date when this was abandoned and a new building was erected at the southwest corner of Olive and Elm Streets in the town has not been verified. This was a frame structure and the building was torn down only about twenty years ago. By 1898, property was purchased on the corner of Price and College Streets. The school was moved to this new location, where the Keller Elementary School now stands. Keller had benefited not only from being situated on the Texas and Pacific Railroad - it had the advantage of U.S. Highway 377 which runs from Fort Worth to Denton. Keller was incorporated on 20 February 1958. New residential development is expanding the city in all directions. The 1980 Census calculated Keller's population at 4,555; today, about 37,700 residents call Keller home.[1] The city planned for its growth and has recently constructed a new town hall, municipal service center, recreation and aquatic center, and has expanded the police and municipal court facility. Keller Independent School District has 25 campuses serving more than 20,000 students. Enrollment in the school district has doubled during the past ten years and is expected to do the same during the next decade, making it the ninth-fastest growing school district in Texas.

| 1990 | 2000 | 2006 | 2007 |
|---|---|---|---|
| 13,683 | 27,345 | 36,500 | 37,700 |
| 2007 Population Density (persons per square mile): 2,044.45 | | | |

City Point of Contact

Kelly King, Fire Chief/Emergency Management Coordinator

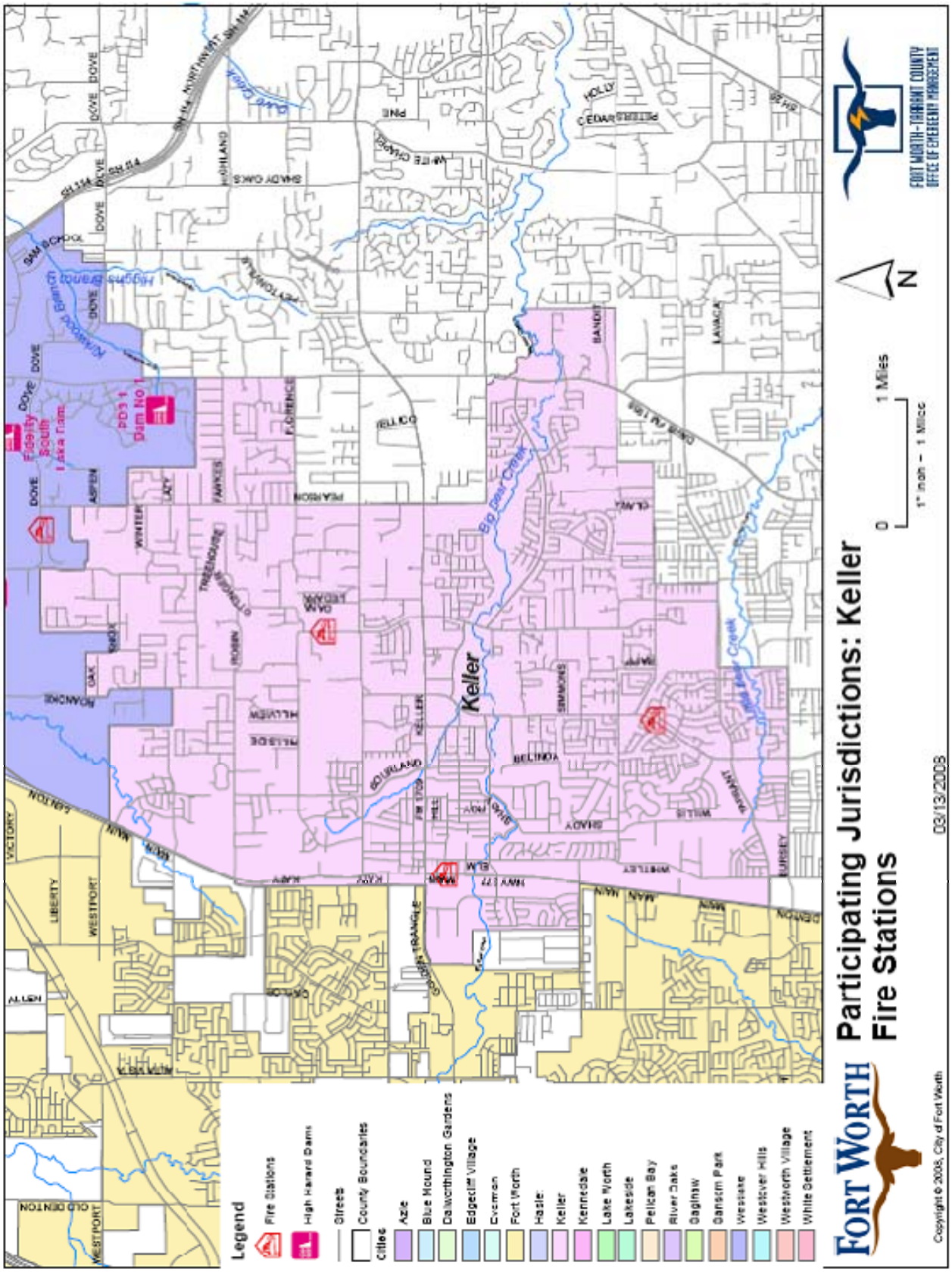
Land Use and Development Trends

The predominate land use category in the City is single-family residential uses, which encompasses approximately 58% of the developed land area in Keller. Other land uses such as two-family, multi-family, park and open spaces, office, retail, commercial, light industrial, and streets and rights-of-way account for approximately the remaining 42% of the developed land area. Keller is approximately 60% developed and is expected to be “built-out” 10 -15 years.

The City of Keller Future Land Use Plan documents a trend of future growth in the City of Keller where the single-family residence will remain as the prominent land use but there will be a significant increase in the non-residential land uses, especially along the major thoroughfares throughout the city

Jurisdiction Unique Hazards

Hazards specific to Keller are discussed below.


Participating Jurisdictions: Keller
Fire Stations
FORT WORTH
FORT WORTH-TARRANT COUNTY
OFFICE OF EMERGENCY MANAGEMENT
N
0
1 Miles
1" man = 1 Miles
03/13/2008
Keller
Legend
Fire Stations
High Hazard Dams
Streets
County Boundaries
Cities
Azle
Blue Mound
Dalworthington Gardens
Edgecliff Village
Everman
Fort Worth
Haslet
Keller
Kennedale
Lake Worth
Lakeside
Pelican Bay
River Oaks
Saginaw
Sansom Park
Westlake
Westover Hills
Westworth Village
White Settlement
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**DAM FAILURE**

No Vulnerability – There are no high hazard dams located in Keller and none that would affect Keller if they failed. Based on the lack of vulnerability, dam failure will receive no further consideration in this plan for Keller.

**DROUGHT**

Moderate Vulnerability – Keller purchases water from Fort Worth who purchases water from the Tarrant Regional Water District (TRWD). TRWD water supply comes from three reservoirs on the West Fork of the Trinity River in northwest Tarrant County and from two reservoirs located well southeast of Tarrant County. These diverse supply locations help mitigate the effects of a local drought. An additional reservoir location well northeast of Tarrant County is being pursued. There has been some preliminary discussion of constructing a pipeline to carry water from southern Oklahoma. TRWD is installing pipelines to interconnect area water supply lakes with water treatment plants in order to provide maximum flexibility in water supply and treatment.

Location – Drought can affect all of Keller.

Current Extent – As of February 2008, Keller was at DO – Abnormally Dry on the Palmer Drought Severity Index.

Previous Occurrences – National Climatic Data Center records indicate that in the past ten years there have been three periods of drought in Keller, 1996 - 1998, 2000, and 2005 - 2006.

Probability of Future Events – Droughts are certain to occur again in Keller. Significant droughts significantly affecting water supply and resulting in mandatory restrictions traditionally occur on a twenty year cycle. Based on the previously cited National Climatic Data Center recent records, we can anticipate that drought conditions will occur approximately every three years.

Impact – Drought can lead to loss of water for basic needs such as drinking and fire-fighting. Droughts are associated with increased wildfire and damage from expansive soils. More common impacts are damage to landscaping and reduced recreation due to low lake levels.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Keller Drought Mitigation Action #1** | Participate in the design and implementation of the Tarrant County specific water conservation public education efforts to compliment existing programs. |
| **Mitigation Goal/Objective** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $1,000 |

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| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • City Funds<br>• Water Suppliers |
| **Responsible Agency** | • Keller Fire/emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One year |
| **Effect on New Buildings** | This action will publicize water conservation efforts that can be incorporated into new construction. |
| **Effect on Existing Buildings** | This action will publicize water conservation efforts that can be incorporated into existing construction. |
| **Cost Effectiveness** | Cost Effective – Public education programs can provide significant results for relatively low costs. |
| **Discussion:** Most cities in the area have existing water conservation programs designed to educate the public and businesses on ways to conserve water. This action will develop a Tarrant County specific program that will compliment existing programs. Jurisdictional public education efforts have been very successful in attracting the attention of local citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Keller Drought Mitigation Action #2** | 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. Impacts identified in this plan will be included in updates to the Hazard Mitigation Action Plan. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $2,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • City Funds<br>• Water Suppliers |
| **Responsible Agency** | Keller Fire/Emergency Management |
| **Estimated Completion Time Frame** | One Year |

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| **Effect on New Buildings** | This action will identify drought impacts in Keller thus providing specific information for builders of new structures to incorporate drought mitigation into the structures. |
| **Effect on Existing Buildings** | This action will identify drought impacts in Keller thus providing specific information for owners of existing structures to incorporate drought mitigation into the structures. |
| **Cost Effectiveness** | Cost Effective – This planning effort will have a low cost with the potential for significant benefits for the entire community. |
| **Discussion:** This planning effort will focus attention on the effects of drought on the community. Specific drought effects will be identified and efforts can be made to mitigate those effects. | |

**EXPANSIVE SOILS**

Low Vulnerability - Expansive soils have caused damage to some structures in Keller. However, damage has been limited to relatively small geographic areas and there are no reports of significant damage to commercial structures or infrastructure.

Location – Expansive soils are found in various areas of Keller. We could not locate a map of expansive soils in Keller.

Extent – The extent of expansive soils in Keller is believed to be Very Low (0% - 20%) to Low (21% - 50%).

Previous Occurrences – We could find no empirical data on previous occurrences of damage from expansive soils, but it is believed that expansive soils have caused problems since the first buildings were constructed in this area.

Probability of Future Events – Due to the variability of soil types and construction quality, it is very difficult to predict future occurrences of problems with expansive soils. However, a study published in the fall 2003 issue of *Environmental Geology* cited in the September 19, 2003 *Dallas Business Journal* indicates that many new developments in the Metroplex are being built on soil that is more unstable than soils built on prior to 1990. This could lead to a higher incidence of expansive soil related damage in the future.

Impact – The impact of expansive soils ranges from cosmetic cracks in walls to substantial foundation and structural damage that can result in the need to demolish the building. Infrastructure such as pipelines can be damaged causing increased maintenance and repairs, damaged beyond repair requiring replacement, damaged to the point of failure.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Keller Expansive Soils Mitigation Action #1** | Improve construction techniques through building code enhancements. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined (Minimal – Staff Time Only) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building permit fees |
| **Potential Matching Funding Sources** | • City Funds<br>• Building permit fees |
| **Responsible Agency** | Keller Community Development Department |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will make new buildings more resistant to damage from expansive soils. |
| **Effect on Existing Buildings** | This action will require modifications to existing buildings to be more resistant to damage from expansive soils. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will improve construction quality and reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Keller Expansive Soils Mitigation Action #2** | Educate construction contractors, home owners, and business owners about mitigation techniques. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building Permit Fees |
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | • Keller Community Development Department<br>• Keller Fire/Emergency Management |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will provide builders of new construction with expansive soil mitigation techniques that will reduce damage. |

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| **Effect on Existing Buildings** | This action will provide owners of existing buildings with expansive soil mitigation techniques that will reduce damage. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will provide construction contractors and home/business owners with techniques designed to reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**EXTREME HEAT**

High Vulnerability - Summer heat and humidity can occur anytime from May through October. Community health services actively work with at risk populations to prevent heat related deaths and injuries. The elderly, very young people and people with poor health are most at risk from summer heat. People who work outside or in un-air-conditioned buildings are also at high risk to the direct effects of summer heat. Summer heat can also lead to electrical service outages if equipment fails or demand exceeds available supply. Most public safety and special facilities are equipped with emergency generators.

Location - Throughout the City.

Extent - Summer temperatures can reach as high as 113 degrees. Keller is also subject to high humidity.

Previous Occurrences - This is an annual occurrence. The summer of 1980 was a record year with 69 consecutive days of temperatures of 100 degrees or more. We were unable to find a reliable record of deaths or injuries related to heat.

Probability of Future Events - Hot summer temperatures are certain to continue to occur in Keller.

Impact - Summer heat can cause widespread electrical outages resulting in dangerous conditions, especially for at-risk populations. Occasionally "cooling centers" are opened at community centers to provide a safe place for citizens to seek refuge from the heat. Extreme heat can have economic impacts if construction work is curtailed or outdoor special events are cancelled.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Keller Extreme Heat Mitigation Action #1** | Determine feasibility of expanding monitoring of populations at risk from extreme heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined. Staff time and GIS resources |

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| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Other State or Federal Public Health Grants |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Tarrant County Public Health<br>• Keller Fire/Emergency Management |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | None - This action is intended to expand monitoring of people only. |
| **Effect on Existing Buildings** | None - This action is intended to expand monitoring of people only. |
| **Cost Effectiveness** | Pending, but believed to be Cost Effective |
| **Discussion:** This action would determine the feasibility of expanding monitoring of populations at risk from extreme heat. Existing at risk population monitoring programs will be reviewed to ensure all known populations at risk from extreme heat are included. Any newly discovered at risk populations will be evaluated for inclusion in existing monitoring programs. Tarrant County Public Health provides public health services throughout the County. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Keller Extreme Heat Mitigation Action #2** | Increase public education programs on the dangers of excessive heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness |
| **Priority** | Medium |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Other State or Federal Public Health Grants |
| **Responsible Agency** | • Tarrant County Public Health<br>• Keller Fire Emergency Management |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Effect on Existing Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits. |
| **Discussion:** Public education on severe weather in Keller has traditionally focused on severe thunderstorms and associated hazards (tornadoes, lighting, flooding, high winds). This action would expand public education to include hazards from extreme heat. | |

**FLOOD**

High Vulnerability - The topography of Keller combined with the frequency of severe thunderstorms results in frequent flash flood events. The *City Keller Drainage Master Plan* has identified 514 buildings or structures within or near floodplains with a total value of $108,541,892. FEMA records indicate only 39 Repetitive Loss Properties in all of Tarrant County. However, this is probably more a reflection of the low number of flood insurance polices than vulnerability to flooding. Further analysis using GIS and field verification may identify additional vulnerable structures.

Location - The greatest flood risk is along Big Bear Creek through central Keller.

Previous Occurrences - Keller faced significant floods in the years 1935, 1942, 1949, 1957, 1962, 1964, and 1966. In 1989, a Federal Disaster was declared (FEMA-828-DR) for severe storms, tornadoes, and flooding. Flooding in July of 2004 caused major damage to several homes on Big Bear Creek. On June 18, 2007 flooding damaged 20 homes along Big Bear Creek in Keller.

Extent - Flash floods are the most common type of flooding in Keller which tend to occur and recede very quickly.

Probability of Future Events – Based on previous experience Keller is certain to suffer flash flood events every year. National Weather Service records indicate an average of 11 flash flood events per year in Tarrant County. Continued development throughout the County and the resulting increase in impervious cover will increase the likelihood and severity of flooding.

Impact - Flash floods kill more people than any other hazard associated with thunderstorms. Property damage from flash flooding is seldom covered by insurance, which makes it very difficult for citizens to recover from the flood. Due to the very rapid rate of development and growth throughout Tarrant County we are experiencing problems with determining actual building footprints within flood plains and will be using planimetric GIS data from the NCTCOG to resolve this issue when it becomes available. At that time we will be able to accurately identify the number and types of buildings vulnerable to flooding; as well as access other data associated with those locations such as appraised value, census data, and owner information.

Participating Jurisdictions: Keller
FloodPlain
FORT WORTH
FORT WORTH-TARRANT COUNTY
OFFICE OF EMERGENCY MANAGEMENT
Legend
FloodPlain
A
AE
Streets
County Boundaries
Keller
Fort Worth
Westlake
Big Bear Creek
Denton Creek
0
1 Miles
1" inch = 1 Miles
N
08/30/2008
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**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Keller Flood Mitigation Project #1** | Participate in the development of the Tarrant County specific "Flood Preparedness" brochure. |
| **Hazard Addressed** | Flooding |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of Flood events.<br>1. c. Develop effective flood mitigation public education materials. |
| **Priority** | High |
| **Estimated Cost** | Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Private Foundation Grants |
| **Responsible Agency** | • Keller Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This action will provide flood mitigation techniques for owners of new buildings. |
| **Effect on Existing Buildings** | This action will provide flood mitigation techniques for owners of existing buildings. |
| **Cost Effectiveness** | Cost Effective - This project will provide valuable information to the public in a relatively short time and with relatively low costs. It will also have the added benefit of increasing public awareness of mitigation. The estimated cost could easily be offset by reduced losses to the public in a single small flood event. |

**Discussion**: Develop Tarrant County specific "Flood Preparedness" brochure. Once developed, the brochure will be distributed County-Wide. Historically flood prone areas will be targeted for door-to-door distribution and neighborhood meetings to present the brochure and solicit input for *Fort Worth Hazard Mitigation Action Plan* revisions.

The brochure will include:

- Description of Tarrant County flood hazards
- "Case Studies" of previous flood events in Tarrant County
- Preparedness and "self-help" mitigation information
- Benefits of city participation in NFIP
- Advantages of flood insurance
- Risks of not having flood insurance
- Warnings that typical homeowner's insurance does not cover rising water
- Solicit input for the *Fort Worth Hazard Mitigation Action Plan*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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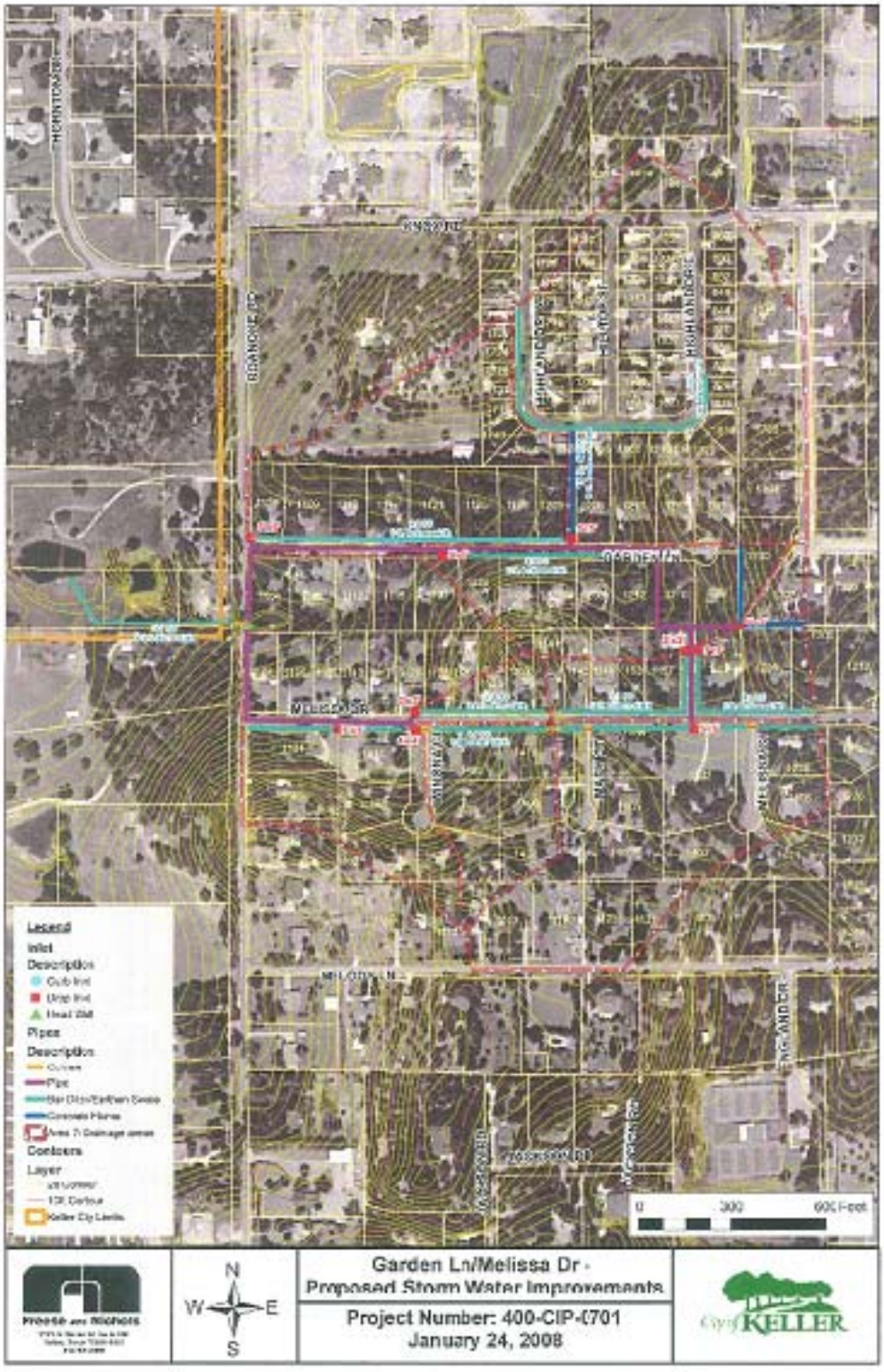
| **Keller Flood Mitigation Action #2** | Drainage improvements on Daryll Lane, Garden lane, and Melissa drive. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |
| **Priority** | High |
| **Estimated Cost** | Undetermined pending engineering analysis |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Keller Public Works Department<br>• Keller Fire/Emergency Management |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will provide guidance for locating new buildings away from flood prone areas. |
| **Effect on Existing Buildings** | This action will protect existing buildings from flooding. |
| **Cost Effectiveness** | Cost Effective – Pending cost estimate, but this project is expected to provide protection from 100 year flood events at a reasonable cost. |

**Discussion**: The project entails providing an appropriate size system of roadside ditches, underground storm drain pipe, box culverts, concrete drop inlets, and downstream energy dissipation and channelization to handle the 100-year storm runoff without flooding the existing homes in the area. The surveying and the preliminary plan layout have been completed. Keller had a public meeting with the property owners within the drainage area affected by the proposed improvements. After additional visits with some of the homeowners to discuss specifics about the preliminary plans, we plan to proceed with the final plans. Final plans are expected to be completed by June or July, 2008. Barring any problems with easement acquisitions, construction should start shortly thereafter. Attached is a layout of the improvements with a cost estimate.

***NOTE: Attached drawings are not in final state and are subject to change***.

NOTE: Project is still in design phase and is subject to change.




NOTE: Project is still in design phase and is subject to change.

NOTE: Project is still in design phase and is subject to change.

**HAILSTORM**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of large hail are a hazard event in Keller. Tarrant County averages eleven significant thunderstorm events (large hail, high winds) per year according to National Weather Service records. Most structures in Keller can resist the effects of all but the most severe hailstorms. Keller has a number of mobile and manufactured home parks that are more vulnerable to the effects of thunderstorms than site built structures. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to hailstorms. Vehicles have proven to be vulnerable to hailstorms with widespread severe vehicle damage reported in 1980 and 1995.

Location - Throughout the City.

Extent - Keller is subject to the hazards of severe thunderstorms, including large hail. Hail stones up to the size of baseballs (H8 on the Combined NOAA/TORRO Hailstorm Intensity Scales) have been reported in Keller.

Previous Occurrences - Thunderstorms are common in Keller. On May 3, 2000 baseball size hail was reported in Keller.

Probability of Future Events - Thunderstorms with hail are certain to continue to occur in Keller. Hail falls on about two or three days per year, ordinarily with only slight and scattered damage (*National Weather Service*).

Impact – The impact from hailstorms can be significant in extreme events such as the hailstorms of 1980 and 1995. Thousands of homes and vehicles can be damaged in a single storm with millions of dollars in damages. Vehicles are especially impacted by large hails with windshields being the vulnerable part. A recurring problem following hailstorms is broken windshields in vehicles belonging to populations who do not have vehicle insurance and cannot afford the replacements costs, resulting in the owners having difficulty traveling to work, medical appointments, etc.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Keller Hailstorm Mitigation Action #1** | Develop a public education campaign to encourage "hail resistant" roofing in new construction and roof replacements. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |

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| **Potential Matching Funding Sources** | • Insurance Companies<br>• Building/Permit Fees<br>• City Funds |
| **Responsible Agency** | • Keller Community Development<br>• Keller Fire/Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will potentially decrease the damage caused by most hailstorms to new buildings. |
| **Effect on Existing Buildings** | This action will potentially decrease the damage caused by most hailstorms to existing buildings. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing hailstorm damage. One long term benefit will be reduced property insurance as claims related to hail damage are reduced. |
| **Discussion**: Public education has proven to be a low cost effective means to achieve changes public behavior. Encouraging hail resistant roofing can benefit citizens through reduced damage, business through reduced damage to their buildings and reduced claims against insurance companies, and government through reduced request for assistance. This campaign can be developed in conjunction with the Tarrant County effort. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Keller Hailstorm Mitigation Action #2** | Evaluate City buildings to determine feasibility of installing hail resistant roofing and window coverings with a focus on critical infrastructure. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• City Funds |
| **Responsible Agency** | Keller Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on new City buildings. |
| **Effect on Existing Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on existing City buildings. |
| **Cost Effectiveness** | Cost Effective – Although currently undetermined, this project is believed to be cost effective. |

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| **Discussion:** Installing hail resistant roofing and window coverings on City buildings could prevent or limit damage to City buildings thus avoiding costs to the City as well as preventing or limiting loss of use of damaged facilities. |

**HIGH WINDS**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of high winds are a hazard in Keller. Tarrant County averages ten reported significant thunderstorm events (large hail, high winds) per year. In addition, strong weather fronts can sometimes be accompanied by high winds which occasionally cause damage. Most structures in Keller can resist the effects of all but the most severe high wind events. Keller has a number of mobile and manufactured home parks that are more vulnerable to the effects of thunderstorms than site built structures. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to high winds.

Location - Throughout the City.

Extent - Severe thunderstorms with high winds with speeds in excess of 90 mph have been reported in Keller.

Previous Occurrences – We could find no records of significant high wind damage in Keller.

Probability of Future Events – Based on previous experience Keller can expect to experience an average of ten significant thunderstorm events with high winds per year.

Impact – Records on high wind events are difficult to separate from severe thunderstorm records. High winds in Keller typically cause little damage to commercial buildings. More often high winds cause damage to roofs, trees, and signs.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Keller High Winds Mitigation Action #1** | Enact enhanced building codes to reduce damages from high winds. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined – Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Keller Community Development |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will potentially identify a means to reduce high wind damage on new buildings. |

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| **Effect on Existing Buildings** | This action will potentially identify a means to reduce high wind damage on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Although costs are undetermined, this action is believed to be cost effective since the action will require staff time only. |
| **Discussion:** Enhanced building codes will reduce damages from high wind events. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Keller High Winds Mitigation Action #2** | Educate builders and residents about mitigating wind damage. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |
| **Responsible Agency** | • Keller Community Development<br>• Keller Fire/Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on new buildings. |
| **Effect on Existing Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost of developing and providing high wind mitigation compared with savings to the community make this action cost effective. |
| **Discussion:** Public education has proven to be a low cost and effective means to achieve changes to public behavior. High winds have not been a focus of severe weather preparedness. | |

**LANDSLIDES**

No Vulnerability - Although there is some relatively steep terrain in portions of Keller, the relief is associated with rocky outcrops and not susceptible to landslides. Other than infrequent slumping along highways at overpasses, there is no history of landslides in Keller. Based on the lack of vulnerability, landslides will receive no further consideration in this plan for Keller. However, landslide hazards will be reviewed during the annual review of this plan and we will continue looking for areas with landslide potential during hazard surveys.

**LEVEE FAILURE**

No Vulnerability – There are no levees or areas that would be affected by levee failure in Keller. Based on the lack of vulnerability, levee failure will receive no further consideration in this plan for Keller.

**LIGHTNING**

Moderate Vulnerability – Lightning is one of the most common hazards in Keller. Thunderstorms (and by definition, lightning) occur an average of 30 – 50 days per year (*Oklahoma Climatological Survey*). Lightning is the second most common cause of weather-related deaths in Texas (*National Weather Service*). Lightning information is available only for Tarrant County on a county-wide basis.

Location – Throughout the City.

Extent – We could find no references to the average number of strikes per storm in Keller. However, lightning is by definition associated with thunderstorms.

Previous Occurrences – Keller experiences 30 – 50 thunderstorm days per year. From 1995 – 2004 one person was killed and five were injured by lightning in Tarrant County (*National Weather Service*). Throughout Texas 34 people were killed by lightning, there were 184 injuries, and an estimated 23 million dollars in damages due to lightning from 1995 - 2004 (*National Weather Service*).

Probability of Future Events – Based on past experience Keller will experience 30 – 50 thunderstorm days each year. Some days will have more than one thunderstorm during a given thunderstorm day.

Impact – Although lightning is the second most common cause of storm related deaths in Texas, lightning deaths remain relatively rare. Lightning does cause property damage several times per year (we could not find statistical data to validate this observation).

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Keller Lightning Mitigation Action #1** | Provide lightning mitigation materials with building permit packets. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Keller Community Development |
| **Estimated Completion Time Frame** | Six Months |

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| **Effect on New Buildings** | This action will provide materials that will reduce the vulnerability of new buildings to lightning. |
| **Effect on Existing Buildings** | This action will provide materials that will reduce the vulnerability of existing buildings that are being remodeled to lightning. |
| **Cost Effectiveness** | Cost Effective – The low cost of this project would be offset by eliminating just one lightning caused building loss. |
| **Discussion:** Lightning mitigation materials will be included in all building permit packets distributed to builders or citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Keller Lightning Mitigation Action #2** | Ensure all City critical infrastructure has adequate lightning mitigation in place and upgrade protection as necessary. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | $2,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Keller Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will ensure new City buildings that house critical infrastructure have adequate lightning mitigation. |
| **Effect on Existing Buildings** | This action will ensure existing critical infrastructure has adequate lightning mitigation. |
| **Cost Effectiveness** | Cost Effective – The destructive and sometimes capricious nature of lighting warrant the expense of this action compared with the benefits of avoiding damage to critical infrastructure. |
| **Discussion:** Review and confirmation of the adequacy of lightning protection systems in City buildings housing critical infrastructure is worthwhile considering the number of thunderstorms experienced in Keller. | |

**SEVERE THUNDERSTORM**

High Vulnerability - Severe thunderstorms are the most common hazard in Keller. From 1950 through August 2007 Tarrant County averaged eleven reported severe thunderstorm events county-wide per year. Most structures in Keller can resist the effects of all but the most severe thunderstorms. Keller has a number of mobile and manufactured home parks that are more vulnerable to the effects of thunderstorms than site built structures. Public

safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to thunderstorms.

Location - Throughout the City.

Extent - Keller is subject to the hazards of severe thunderstorms of all magnitudes.

Previous Occurrences - Records are available only on a county-wide basis.

Probability of Future Events – Severe thunderstorms will occur in Keller an average of eleven times per year.

Impact – A single severe thunderstorm can cause damage from hail, high winds, lightning, and/or tornadoes to thousands of structures.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Keller Severe Thunderstorm Mitigation Project #1** | Conduct technical assessment to determine the feasibility of structurally hardening all Keller Fire Stations against severe weather. |
| **Hazard Addressed** | Tornado/Severe Thunderstorm |
| **Mitigation Goal/Objective** | 2. Reduce loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | High |
| **Estimated Cost** | $45,000 (Three stations at $15,000 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • Private Foundation Grants<br>• Other State or Federal Grants<br>• City Funds |
| **Responsible Agency** | • Keller Public Works<br>• Keller Fire/Emergency Management |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This project will determine the feasibility of structurally hardening all Keller Fire Stations against severe weather. |
| **Effect on Existing Buildings** | This project will determine the feasibility of structurally hardening all Keller Fire Stations against severe weather. |

| | |
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| **Cost Effectiveness** | Cost Effective - This project will provide the basis for a realistic cost benefit analysis of the feasibility of hardening all Keller Fire Stations against severe weather events. The relatively low cost of this project compared with the potential benefits of protecting a city's emergency response equipment against the jurisdiction's most likely hazard event result in a favorable cost benefit review. |

**Discussion:**
This project will provide for determining the feasibility of hardening the city's three fire stations against severe weather. This project will contribute to protecting emergency response equipment so that it will be available to assist the citizens of Keller in responding to and recovering from severe weather or other events. Final project details will be developed in accordance with grant requirements at the time the project is funded.

The cost estimate is a conservative "best guess" based on a structural analysis of all existing fire stations. That analysis would require:

- Structural analysis of the building by a Structural Engineer
- Analysis of electrical systems
- Analysis of HVAC systems
- Review of building codes

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Keller Severe Thunderstorm Mitigation Action #2** | Encourage builders to install storm resistant construction such as "hurricane clips". |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | High |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |
| **Responsible Agency** | Keller Community Development |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will encourage storm resistant construction in new buildings. |
| **Effect on Existing Buildings** | This action will encourage storm resistant construction in existing buildings as they are remodeled. |
| **Cost Effectiveness** | Cost Effective – The low cost of this action will be offset by a reduction in damage from severe thunderstorms. |

**Discussion:** Effective education on storm resistant construction can reduce damage from severe thunderstorms. Insurance companies may be willing to fund or provide educational materials and/or provide discounts to persons who install storm resistant devices.

**SEVERE WINTER STORMS**

Moderate Vulnerability - Since 2000 the National Weather Service has reported 14 Winter Storm/Ice events. Winter storms in Keller usually consist of short-lived icing events (ice on the roads for a few hours) that primarily affect traffic and cause numerous motor vehicle accidents. Occasionally an ice storm will cause widespread power outages for as long as several days. ONCOR Electric Delivery has an aggressive tree trimming program. Most structures in Keller can resist the effects of all but the most severe winter storms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to winter storms. Electrical service outages are usually the most serious threat in this area. Most public safety and special facilities are equipped with generators.

Location - Throughout the City.

Extent - Severe ice storms have resulted in accumulations in excess of two inches. Most storms leave only a light coating or glaze of ice.

Previous Occurrences – Severe Winter Storms are typically regional events. Keller averaged two winter storms per year since 2000. Most winter storms resulting only minor inconveniences and a few motor vehicle accidents.

In 1978 up to an inch of ice coated area trees and roadways causing $14 million in damages region-wide and making travel almost impossible for two days.

In 1996 a winter storm dropped two to four inches of a mixture of sleet, freezing rain, and snow in Keller over Thanksgiving weekend causing many motor vehicle accidents and some electrical service outages.

In 2003 a winter storm dropped one inch of sleet across Keller resulting in numerous motor vehicle accidents and closing schools for two days.

Probability of Future Events - Keller can expect to experience two winter storms per year with a severe winter storm once each ten years.

Impact - Winter storms can cause widespread electrical and telephone service outages, make travel dangerous or impossible, and damage structures. Deaths and injuries due to vehicle accidents and slips/falls are common during ice storms. Occasional deaths and injuries from carbon monoxide poisoning due to improper heating have occurred. Economic losses due to lost production can be significant. Damage from frozen pipes can lead to significant expenses for homeowners.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Keller Severe Winter Storm Mitigation Action #1** | Increase public education concerning winter storm preparedness and mitigation. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | Medium |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Keller Fire/Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into new buildings. |
| **Effect on Existing Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost is effective when compared to benefits provided to citizens. |
| **Discussion:** Winter weather preparedness has not been emphasized in Keller as much as severe thunderstorms. This action will provide preparedness information to citizens during the fall. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Keller Severe Winter Storm Mitigation Action #2** | Purchase additional street sanding capacity |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Keller Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will have no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings. |

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| **Cost Effectiveness** | Cost Effective – Sanding streets is essential to allow emergency vehicles to respond during severe winter events. |
| **Discussion:** Sanding equipment can be mounted on existing equipment to provide sanding capabilities. During severe winter weather events streets around hospitals, fire stations and other critical facilities are sanded along with major intersections and roadways. Additional sanding capacity would allow for quicker sanding of these areas and for more repeat sanding during prolonged winter weather events. This will improve public safety by facilitating emergency response as well as reducing motor vehicle accidents. | |

**STREAM BANK EROSION**

Moderate Vulnerability - Flash floods have caused stream bank erosion in Keller. Homes and businesses adjunct to Big Bear Creek, Little Bear Creek, and Marshall Branch are vulnerable to erosion. Further analysis using GIS and field verification can specifically identify vulnerable structures.

Location - Along Big Bear Creek, Little Bear Creek, and Marshall Branch.

Extent – Flooding along Big Bear Creek, Little Bear Creek, and Marshall Branch has eroded several feet of bank in places.

Previous Occurrences - Minor flooding associated erosion occurs frequently, especially during the spring and early summer. Flood events in 2004 and 2007 resulted in some creek bank erosion.

Probability of Future Events - Keller is certain to experience stream bank erosion in the future. Continued development and the resulting impervious cover will increase the likelihood and severity flooding and associated erosion.

Vulnerability - Some homes, businesses, and roadways are vulnerable to stream bank erosion. Most buildings are a safe distance from the current path of the creek. Further analysis using GIS and field verification can specifically identify vulnerable structures.

Impact - Extreme stream bank erosion could destroy homes, businesses, and/or roadways. Keller is a small city and any loss of business would have a noticeable impact. Roadway damage can restrict access for home/business owners and cause minor to major inconveniences to for drivers.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Keller Stream Bank Erosion Mitigation Action #1** | Conduct study to reduce stream bank erosion impacts along Big Bear Creek, Little Bear Creek, and Marshall Branch and implement findings. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |
| **Priority** | Medium |
| **Estimated Cost** | $100,000 |

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| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Keller Public Works Department |
| **Estimated Completion Time Frame** | 3 years |
| **Effect on New Buildings** | This action will not affect new buildings |
| **Effect on Existing Buildings** | This action may affect existing buildings if significant construction is required. |
| **Cost Effectiveness** | Cost Effective – The action will reduce the adverse effects of flooding. |
| **Discussion:** This project will explore options for stabilizing the banks along Big Bear Creek, Little Bear Creek, and Marshall Branch Creek. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Keller Stream Bank Erosion Mitigation Action #2** | Determine and implement expedient erosion control techniques along Big Bear Creek, Little Bear Creek, and Marshall Branch Creek. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Keller Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will not have an effect on new buildings. |
| **Effect on Existing Buildings** | This action will protect existing buildings along Big Bear Creek, Little Bear Creek, and Marshall Branch Creek. |
| **Cost Effectiveness** | Cost Effective – Although the final project cost is undetermined, it is believed the action will be cost effective. |
| **Discussion:** This action will review erosion control techniques and implement the most effective technique for controlling erosion along Big Bear Creek, Little Bear Creek, and Marshall Branch Creek. | |

**TORNADO**

<u>High Vulnerability</u> – All structures in Keller are vulnerable to tornadoes. Very few structures can withstand the effects of an F5 tornado. However, the March 28, 2000 F3 tornado that struck Fort Worth provided good evidence that well built structures can protect people who take appropriate shelter inside those buildings.

Location - Tornadoes can occur anywhere in Keller.

Extent - Keller is subject to tornadoes of all magnitudes, including F5 tornadoes.

Previous Occurrences – We found no reports of tornados causing damage in Keller. However, Tarrant County has an average of one tornado reported per year county-wide (Source: National Climatic Data Center). In 2007 there were eight tornadoes reported by storm spotters county-wide. Four of those tornados caused damage, all within incorporated areas. Since 2000 tornadoes have caused damage in Arlington, Benbrook, Euless, Everman, Fort Worth, Grand Prairie, Haltom City, Mansfield, North Richland Hills, and River Oaks.

Probability of Future Events - Tarrant County has averaged one reported tornado per year and can expect that average to continue. Keller, based on its relatively small size, will likely experience tornados very infrequently.

Impact - Tornadoes can cause deaths, injuries and property damage/destruction. Special facilities such as hospitals, fire stations, and utilities can be damaged or destroyed. Citizens who live in neighborhoods struck by tornadoes can experience disruption of their life styles and traditions. Areas struck by tornadoes can experience increased demand for mental health services as people deal with grief and stress.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Keller Tornado Mitigation Project #1** | Assist citizens with funding for building tornado safe rooms or in-ground shelters. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction |
| **Priority** | High |
| **Estimated Cost** | $200,000 (50 Safe Rooms at $4,000 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Community Development Block Grant Funds |
| **Potential Matching Funding Sources** | Home/Building Owner |
| **Responsible Agency** | • Keller Fire/Emergency Management<br>• Keller Community Development Department<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This project will encourage new buildings to be constructed with tornado safe rooms as part of the construction process. The safe room will enhance the overall storm resistance of the building. |

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| **Effect on Existing Buildings** | This project will encourage homeowners to construct/install tornado safe rooms in their existing homes. A safe room will enhance the overall storm resistance of the building. |
| **Cost Effectiveness** | Cost Effective - Safe rooms and in-ground shelters have been proven to reduce deaths and injuries during tornadoes and severe thunderstorms. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of safe rooms and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

**Discussion:**

This project will reimburse costs associated with tornado safe room or in-ground shelter installation in new or existing homes. Safe rooms provide increased protection for citizens during severe thunderstorms and tornados. Safe rooms have been proven to save lives and reduce injuries from severe weather events. FEMA publication 320 (*Taking Shelter from the Storm, Building a Safe Room Inside Your House*) provides the standards for safe rooms. As stated on the FEMA website: Although a "*residence may be built "to code," that does not mean it can withstand winds from extreme events such as tornadoes and major hurricanes. The purpose of a safe room or a wind shelter is to provide a space where you and your family can seek refuge that provides a high level of protection. To protect its occupants, a safe room must be built to withstand high winds and flying debris, even if the rest of the residence is severely damaged or destroyed."*

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to home owners will be for no more than $3,000 or 75% of cost, whichever is less
- Eligibility will be limited to individuals who own their home at the time of application
- The safe room or in-ground shelter must be constructed/installed in the primary residence of the applicant
- Each eligible homeowner can only receive one reimbursement, regardless of the number of shelters he/she may purchase/install
- In-ground shelters must meet requirements established in the National Performance Criteria for Tornado Shelters dated May 28, 1999.
- Safe Rooms must meet the requirements of FEMA Publication 320
- Safe Rooms and shelters must meet all applicable city and/or county codes
- Previously owned or used shelters will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Keller Tornado Mitigation Project #2** | Assist citizens with funding for purchase of Weather Alert Radios |
| **Mitigation Goal/Objective** | 4. Increase the effectiveness of warning systems in Tarrant County.<br>4. a. Increase the number of homes and businesses with Weather Alert Radios. |
| **Priority** | High |
| **Estimated Cost** | $6,000 (150 Weather Alert Radios at $40 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Private Sector Donations<br>• City Funds |
| **Potential Matching Funding Sources** | Citizen/Business Owner |
| **Responsible Agency** | • Keller Fire Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings except for providing additional warning time of severe weather events thus allowing citizens more time to secure their home or business against approaching severe weather. |
| **Cost Effectiveness** | Cost Effective – Weather Alert Radios are a proven means to alert and warn citizens about severe weather and civil emergencies. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of Weather Alert Radios and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

***NOTE**: We are aware that Weather Alert Radios are on the "2007 Ineligible Planning Activities" list. It is our opinion that Weather Alert Radios should be considered eligible due to their very high benefit and very low cost.*

This project will reimburse 75% of the cost for citizens to purchase Weather Alert Radios, with the citizen responsible for the remaining 25%. Weather Alert Radios provide the best means for citizens to receive emergency alerts when they are indoors. Severe weather is the primary hazard in our area. Early alert and warning has proven to be a significant factor in saving lives during severe weather events.

In addition, the Weather Alert Radios can be activated for civil emergencies such as hazardous materials incidents. Effective warning saves lives, especially during severe weather events. Weather alert radios provide a proven means of indoor warning to citizens any time of the day or night and compose the vital indoor portion of our emergency warning system.

Warning systems have been shown to have value beyond the initial warning. Persons receiving warning relay the information to family and friends to ensure they are aware of the hazard. The secondary and tertiary warning can greatly amplify the effectiveness of the warning system.

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to citizens will be for no more than $30 or 75% of cost of the radio, whichever is less
- Eligibility will be limited to residents of Keller
- The citizen must sign an agreement to keep the radio operational
- Each eligible homeowner can only receive one reimbursement, regardless of the number of radios purchased
- Previously purchased radios will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**WILDFIRE**

Moderate Vulnerability - Keller has a significant amount of rural-urban interface that is subject to wildfires.

Location - The areas of most concern are along Big Bear Creek which runs through the center of the City, Little Bear Creek on the south side of the City, and Marshall Branch in the northern part of the City. These are the primary areas of rural-urban interface.

Extent - The effects of wildfire are deaths, injuries, loss of structures, loss of wildlands, and loss of wildlife habitat.

Previous Occurrences - Wildfires in Keller are typically associated with droughts. A number of wildfires occurred during the droughts from 1996 - 1998, 2000, and from 2005 - 2006. Wildfires in December 2005 destroyed four homes and damaged several others

Probability of Future Events - Wildfires are likely to occur annually and increase in frequency and severity as the population continues to increase and formally rural areas are developed.

Vulnerability - Homes are most vulnerable to wildfires. The tendency to locate homes on tree covered lots and lack of fire breaks (such as parking lots around businesses) can enable fires to spread more easily to homes. Special facilities tend to be less vulnerable due to construction type (brick or metal).

Impact - Wildfires can result in the need for rapid evacuations, casualties, loss of homes and businesses, and loss of wildlife habitat and recreational areas.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Keller Wildfire Mitigation Action #1** | Increase public education on how to reduce the risks from wildfires (construction, landscaping, etc.) |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | High |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Keller Fire/Emergency Management |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will reduce the effects of wildfire on new buildings through increased use of wildfire mitigation measures. |
| **Effect on Existing Buildings** | This action will reduce the effects of wildfire on existing buildings through increased use of wildfire mitigation measures. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing the effects of wildfire. |
| **Discussion:** Wildfire mitigation measures are not widely known in urban areas such as Tarrant County. This action will increase that knowledge and reduce casualties and damages from wildfires. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Keller Wildfire Mitigation Action #2** | Enact building permit process that encourages wildfire resistant construction. |

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|---|---|
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | • Keller Community Development<br>• Keller Fire/Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will reduce the vulnerability of new structure to wildfire. |
| **Effect on Existing Buildings** | This action will reduce the vulnerability of existing buildings to wildfire if they are remodeled to the extent a building permit is required. |
| **Cost Effectiveness** | Cost Effective – This action will integrate wildfire mitigation into the building process at minimal cost. |
| **Discussion:** Integrating mitigation into building permitting provides a process to reduce vulnerability with few negative impacts. | |

**Existing Hazard Mitigation Efforts**

- The City of Keller operates an outdoor warning system (sirens)
- Keller has an aggressive creek channel clearance program to reduce the effects of flash floods

**Texas Standards That Exceed 44 CFR Requirements: Local Capability Assessments**

MAP 1

Projects funded under the following programs. Address the type of project that was funded. If you did not receive money from one of the below grants programs, then state that.

1.1: Hazard Mitigation Grant Program - None
1.2: Pre-Disaster Mitigation Grant Program - None
1.3: Project Impact - None
1.4: Hurricane-Property Protection Mitigation - None
1.5: Flood Mitigation Assistance - None
1.6: 406 Mitigation (through the Public Assistance Program) - None

MAP 2

Current Building Codes. Include the following information:
2.1: Date and type of code: 2003 International Building Code
2.2: How is it being enforced? Plans submitted for review. Projects inspected on site.

MAP 3

Current Fire Codes. Include the following information:

3.1: Date and type of code: 2003 International Fire Code
3.2: How is it being enforced?

- Plans are submitted for review
- Projects inspected on site
- Annual Fire Inspection

MAP 4

4.1: Any other codes, sub-division regulations, etc., that are in effect in your jurisdiction?

- Unified Development Code

4.2: How are they being enforced?

Developments must submit application that must be reviewed by City staff and approved by City Council. After approval, the Building Permit process can begin.

MAP 5

Floodplain Management. Include the following information:
5.1: Ordinance/Order Date: Flood Hazard Prevention Ordinance/December 1, 1987
5.2: Do you have a Floodplain Administrator? Yes
5.3: Is the person a Certified Floodplain Manager (CFM)? Yes
5.4: Date of current floodplain maps. August 23, 2000
5.5: Any codes, regulations, etc. that prohibit development in the floodway and/or floodplain: Flood Hazard Prevention Ordinance

MAP 6

Findings/results of Building Code Effectiveness Grading Report (BCEGS). Include date of report and score: None.

MAP 7

Identify other plans that your jurisdiction has or have been done in your jurisdiction.
7.1: Capital Improvement Plans: Amended annually
7.2: Comprehensive Plans: Future Land Use Plan adopted 1998
7.3: Storm Water Management Plans: No
7.4: Master Drainage Plans: Adopted 1991
7.5: Corps of Engineers: None
7.6: Flood Mitigation Plan: None
7.7: Any other plans, studies, etc. that may have been done in your jurisdiction: None

# City of Kennedale

Jurisdiction Profile

Kennedale has an area of six square miles and a NCTCOG 2007 Population Estimate of 6,350.

In the mid 1800's, there were early signs of Kennedale becoming a transportation hub. Many wagon trails crossed at the site in numbers that exceeded the trails through what was to become the City of Arlington. In 1882, John D. Hudson, along with C.B. Teague and O.S. Kennedy, purchased land and established the town of Kennedale at the site of a mineral well. The well formed the focal point for development of a central business district with a train depot, hotel, general merchandise store, drug store, bank post office, lumber company and blacksmith. In 1886, the Fort Worth and New Orleans Railway Company was built through Kennedale to Waxahachie. A brick yard was established in 1888 at the location of the present City Park. Fire raged through the business district in 1908 destroying all but the general store that remains standing today. The business district was never rebuilt and business activity gradually migrated to Mansfield Highway. After an election with 42 voters in July 1947, the Town of Kennedale was incorporated with a population of 300. By 1950, the population had increased to 500 and a petition to the State was approved changing the status of Kennedale from a "Town" to a "City".

| 1990 | 2000 | 2006 | 2007 |
|---|---|---|---|
| 4,096 | 5,850 | 6,150 | 6,350 |
| 2007 Population Density (persons per square mile): 973.52 | | | |

City Point-Of-Contact

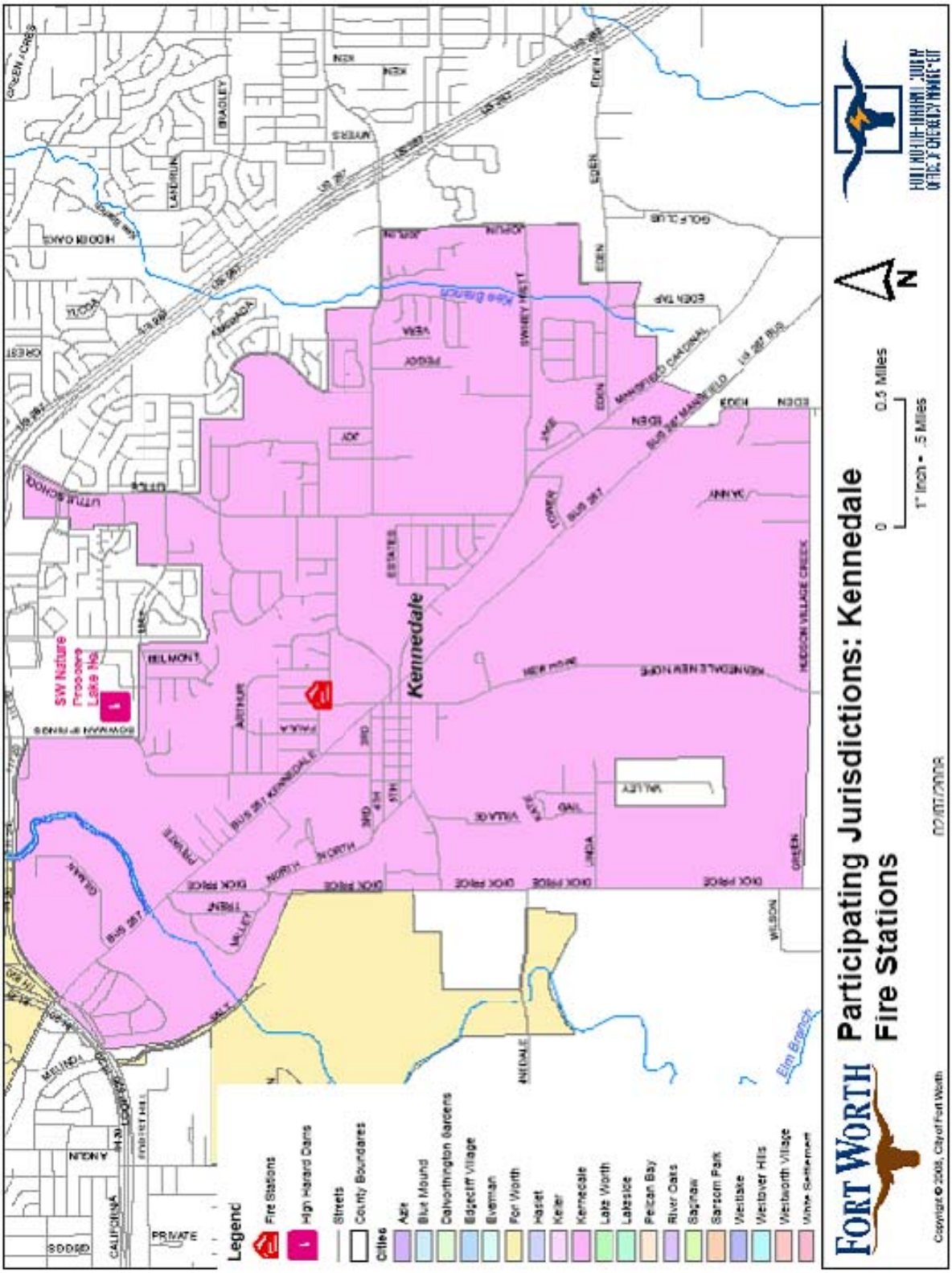
Jay Hinkle, Kennedale Fire Department

Land Use and Development Trends

Kennedale is experiencing slow to moderate residential growth and very slow commercial growth as developments fill in areas that were previously used for agriculture. Approximately 55% of Kennedale remains undeveloped.

Jurisdiction Unique Hazards

Hazards specific to Kennedale are discussed below.


Participating Jurisdictions: Kennedale
Fire Stations
FORT WORTH
Legend
Fire Stations
High Hazard Dams
Streets
County Boundaries
Cities
Azle
Blue Mound
Dalworthington Gardens
Edgecliff Village
Everman
Fort Worth
Haslet
Keller
Kennedale
Lake Worth
Lakeside
Pelican Bay
River Oaks
Saginaw
Sansom Park
Westlake
Westover Hills
Westworth Village
White Settlement
Kennedale
SW Nature Preserve Lake No.
Elm Branch
0
0.5 Miles
1" Inch = .5 Miles
N
Copyright © 2008, City of Fort Worth

**DAM FAILURE**

No Vulnerability – There are no high hazard dams located in Kennedale and none that would affect Kennedale if they failed. Based on the lack of vulnerability, dam failure will receive no further consideration in this plan for Kennedale.

**DROUGHT**

Low Vulnerability – Kennedale currently uses wells to provide water to its citizens. However, the City is planning on purchasing water from Fort Worth to meet growing needs for water to due growth. Fort Worth purchases water from the Tarrant Regional Water District (TRWD). TRWD water supply comes from three reservoirs on the West Fork of the Trinity River in northwest Tarrant County and from two reservoirs located well southeast of Tarrant County. These diverse supply locations help mitigate the effects of a local drought. An additional reservoir location well northeast of Tarrant County is being pursued. There has been some preliminary discussion of constructing a pipeline to carry water from southern Oklahoma. TRWD is installing pipelines to interconnect area water supply lakes with water treatment plants in order to provide maximum flexibility in water supply and treatment.

Location – Drought can affect all of Kennedale.

Current Extent – As of February 2008, Kennedale was at DO – Abnormally Dry on the Palmer Drought Severity Index.

Previous Occurrences – National Climatic Data Center records indicate that in the past ten years there have been three periods of drought in Kennedale, 1996 - 1998, 2000, and 2005 - 2006.

Probability of Future Events – Droughts are certain to occur again in Kennedale. Significant droughts significantly affecting water supply and resulting in mandatory restrictions traditionally occur on a twenty year cycle. Based on the previously cited National Climatic Data Center recent records, we can anticipate that drought conditions will occur approximately every three years.

Impact – Drought can lead to loss of water for basic needs such as drinking and fire-fighting. Droughts are associated with increased wildfire and damage from expansive soils. More common impacts are damage to landscaping and reduced recreation due to low lake levels.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Kennedale Drought Mitigation Action #1** | Participate in the design and implementation of the Tarrant County specific water conservation public education efforts to compliment existing programs. |
| **Mitigation Goal/Objective** | 2. Reduce loss of life and property damage resulting from severe weather events. |

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|---|---|
| **Priority** | Low |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • City Funds<br>• Water Suppliers |
| **Responsible Agency** | • Kennedale Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One year |
| **Effect on New Buildings** | This action will publicize water conservation efforts that can be incorporated into new construction. |
| **Effect on Existing Buildings** | This action will publicize water conservation efforts that can be incorporated into existing construction. |
| **Cost Effectiveness** | Cost Effective – Public education programs can provide significant results for relatively low costs. |
| **Discussion:** Most cities in the area have existing water conservation programs designed to educate the public and businesses on ways to conserve water. This action will develop a Tarrant County specific program that will compliment existing programs. Jurisdictional public education efforts have been very successful in attracting the attention of local citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Kennedale Drought Mitigation Action #2** | 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. Impacts identified in this plan will be included in updates to the Hazard Mitigation Action Plan. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • City Funds<br>• Water Suppliers |
| **Responsible Agency** | • Kennedale Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |

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| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will identify drought impacts in Kennedale thus providing specific information for builders of new structures to incorporate drought mitigation into the structures. |
| **Effect on Existing Buildings** | This action will identify drought impacts in Kennedale thus providing specific information for owners of existing structures to incorporate drought mitigation into the structures. |
| **Cost Effectiveness** | Cost Effective – This planning effort will have a low cost with the potential for significant benefits for the entire community. |
| **Discussion:** This planning effort will focus attention on the effects of drought on the community. Specific drought effects will be identified and efforts can be made to mitigate those effects. | |

**EXPANSIVE SOILS**

Low Vulnerability - Expansive soils have caused damage to some structures in some portions of Kennedale. However, damage has been limited to relatively small geographic areas and there are no reports of significant damage to commercial structures or infrastructure.

Location – Expansive soils are found in various areas of Kennedale. We could not locate a map of expansive soils in.

Extent – The extent of expansive soils in Kennedale is believed to be Very Low (0% - 20%) to Low (21% - 50%).

Previous Occurrences – We could find no empirical data on previous occurrences of damage from expansive soils, but it is believed that expansive soils have caused problems since the first buildings were constructed in this area.

Probability of Future Events – Due to the variability of soil types and construction quality, it is very difficult to predict future occurrences of problems with expansive soils. However, a study published in the fall 2003 issue of *Environmental Geology* cited in the September 19, 2003 *Dallas Business Journal* indicates that many new developments in the Metroplex are being built on soil that is more unstable than soils built on prior to 1990. This could lead to a higher incidence of expansive soil related damage in the future.

Impact – The impact of expansive soils ranges from cosmetic cracks in walls to substantial foundation and structural damage that can result in the need to demolish the building. Infrastructure such as pipelines can be damaged causing increased maintenance and repairs, damaged beyond repair requiring replacement, damaged to the point of failure.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Kennedale Expansive Soils Mitigation Action #1** | Improve construction techniques through building code enhancements. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined (Minimal – Staff Time Only) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building permit fees |
| **Potential Matching Funding Sources** | • City Funds<br>• Building permit fees |
| **Responsible Agency** | Kennedale Planning & Zoning Department |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will make new buildings more resistant to damage from expansive soils. |
| **Effect on Existing Buildings** | This action will require modifications to existing buildings to be more resistant to damage from expansive soils. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will improve construction quality and reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Kennedale Expansive Soils Mitigation Action #2** | Educate construction contractors, home owners, and business owners about mitigation techniques. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building Permit Fees |
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | • Kennedale Planning & Zoning Department<br>• Kennedale Emergency Management |
| **Estimated Completion Time Frame** | One Year |

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| **Effect on New Buildings** | This action will provide builders of new construction with expansive soil mitigation techniques that will reduce damage. |
| **Effect on Existing Buildings** | This action will provide owners of existing buildings with expansive soil mitigation techniques that will reduce damage. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will provide construction contractors and home/business owners with techniques designed to reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**EXTREME HEAT**

High Vulnerability - Summer heat and humidity can occur anytime from May through October. Community health services actively work with at risk populations to prevent heat related deaths and injuries. The elderly, very young people and people with poor health are most at risk from summer heat. People who work outside or in un-air-conditioned buildings are also at high risk to the direct effects of summer heat. Summer heat can also lead to electrical service outages if equipment fails or demand exceeds available supply. Most public safety and special facilities are equipped with emergency generators.

Location - Throughout the City.

Extent - Summer temperatures can reach as high as 113 degrees. Kennedale is also subject to high humidity.

Previous Occurrences - This is an annual occurrence. The summer of 1980 was a record year with 69 consecutive days of temperatures of 100 degrees or more. We were unable to find a reliable record of deaths or injuries related to heat.

Probability of Future Events - Hot summer temperatures are certain to continue to occur in Kennedale.

Impact - Summer heat can cause widespread electrical outages resulting in dangerous conditions, especially for at-risk populations. Occasionally "cooling centers" are opened at community centers to provide a safe place for citizens to seek refuge from the heat. Extreme heat can have economic impacts if construction work is curtailed or outdoor special events are cancelled.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Kennedale Extreme Heat Mitigation Action #1** | Determine feasibility of expanding monitoring of populations at risk from extreme heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |

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| **Priority** | Medium |
| **Estimated Cost** | Undetermined. Staff time and GIS resources |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Other State or Federal Public Health Grants |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Tarrant County Public Health<br>• Kennedale Emergency Management |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | None - This action is intended to expand monitoring of people only. |
| **Effect on Existing Buildings** | None - This action is intended to expand monitoring of people only. |
| **Cost Effectiveness** | Pending, but believed to be Cost Effective |
| **Discussion:** This action would determine the feasibility of expanding monitoring of populations at risk from extreme heat. Existing at risk population monitoring programs will be reviewed to ensure all known populations at risk from extreme heat are included. Any newly discovered at risk populations will be evaluated for inclusion in existing monitoring programs. Tarrant County Public Health provides public health services throughout the County. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Kennedale Extreme Heat Mitigation Action #2** | Increase public education programs on the dangers of excessive heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness |
| **Priority** | Medium |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Other State or Federal Public Health Grants |
| **Responsible Agency** | • Tarrant County Public Health<br>• Kennedale Emergency Management |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Effect on Existing Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits. |

**Discussion:** Public education on severe weather in Kennedale has traditionally focused on severe thunderstorms and associated hazards (tornadoes, lighting, flooding, high winds). This action would expand public education to include hazards from extreme heat.

**FLOOD**

High Vulnerability - The topography of Kennedale combined with the frequency of severe thunderstorms results in frequent flash flood events. FEMA records indicate only 39 Repetitive Loss Properties in all of Tarrant County. However, this is probably more a reflection of the low number of flood insurance polices than vulnerability to flooding. Further analysis using GIS and field verification can specifically identify vulnerable structures.

Location - The west end of Kennedale is particularly subject to flooding, especially along Village Creek.

Extent - Flash floods are the most common type of flooding in Kennedale which tend to occur and recede very quickly.

Previous Occurrences - Flooding in the summer of 2004 hit Kennedale around 8 am in the morning after several days of heavy rain fall. The areas most affected were on the west side of the City from Dick Price Road North to Mansfield Highway (US Highway Business 287) and west up to Oakcrest Drive East. A residential area was damaged with several single family homes with 1 to 2 feet of water in them. Several businesses in the area lost most of their products and suffered damage to machinery. Areas that are prone to flooding are located on the west end of the city. These areas are in high risk of flooding due to Village Creek that runs through the entire area. This flood affected:

- Areas of around 600 block Dick Price Road North to Mansfield Highway (US Highway Business 287)
- Streets of Grapevine Trail, Trent and Valley
- Area in the vicinity of 6801 Oakcrest Drive east north to Mansfield Highway

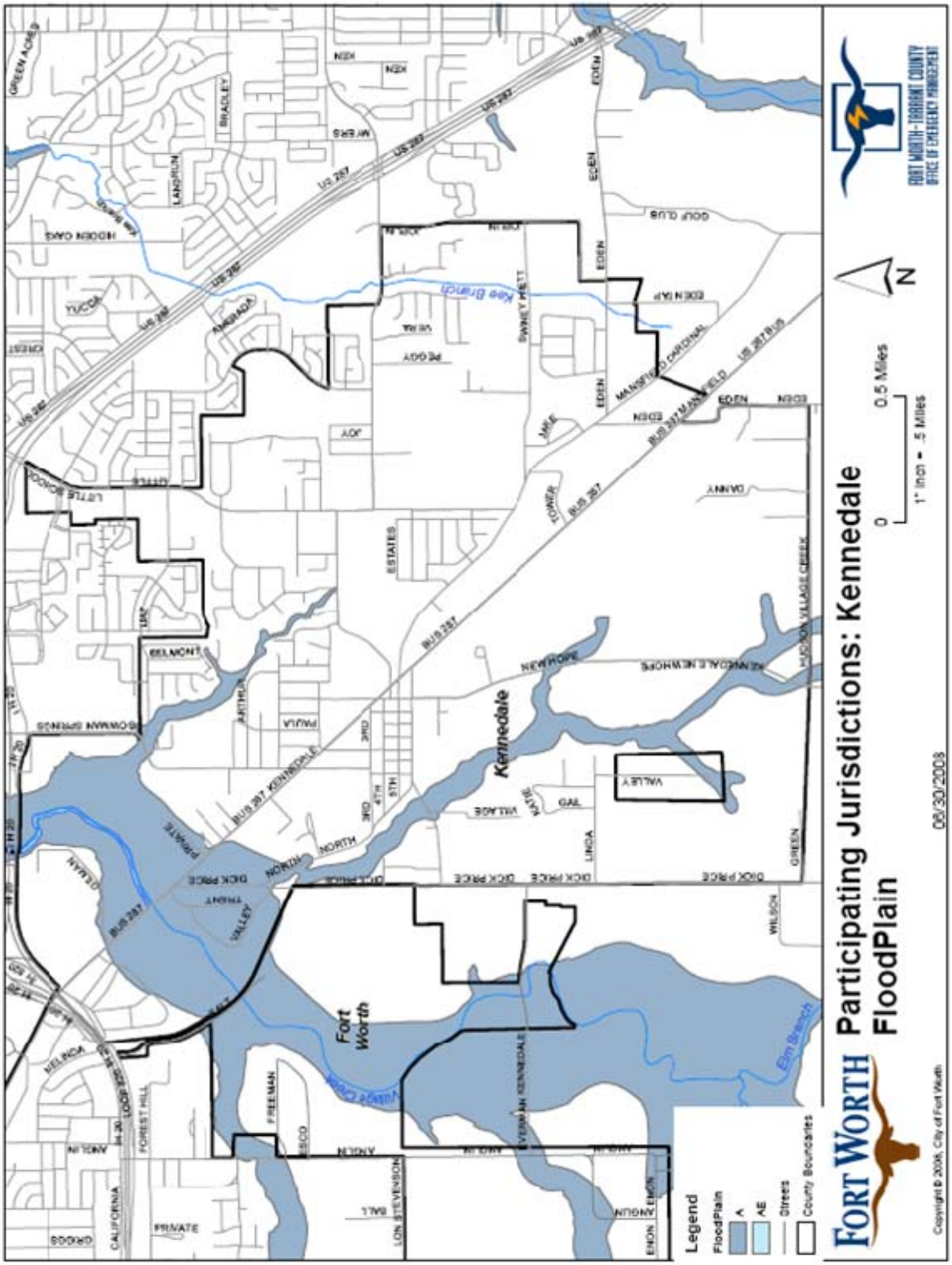
In 1997 Kennedale flooded due to heavy rains with most of the damage in the 600 block of West Mansfield Hwy (Business Hwy 287). The area is mostly single family manufactured housing with several commercial businesses. Several homes and businesses had approximately 6 – 8 inches of water in the buildings.

In the late 1980's Kennedale experienced a flood in the Bloxum Park area. This flood was from Hudson Village Creek north towards Mansfield Hwy. The homes that were most affected by the flood were single family manufactured homes, all were a total loss.

Probability of Future Events - Kennedale is certain to experience flood events in the future. Continued development, especially upstream on the Village Creek Watershed, and the resulting impervious cover will increase the likelihood and severity flooding.

Impact - Flash floods kill more people than any other hazard associated with thunderstorms. Property damage from flash flooding is seldom covered by insurance, which makes it very difficult for citizens to recover from the flood. Due to the very rapid

rate of development and growth throughout Tarrant County we are experiencing problems with determining actual building footprints within flood plains and will be using planimetric GIS data from the NCTCOG to resolve this issue when it becomes available. At that time we will be able to accurately identify the number and types of buildings vulnerable to flooding; as well as access other data associated with those locations such as appraised value, census data, and owner information.


Participating Jurisdictions: Kennedale
FloodPlain
Legend
FloodPlain
A
AE
Streets
County Boundaries
0
0.5 Miles
1" Inch = .5 Miles
N
Fort Worth
Kennedale
Elm Branch
Kee Branch
FORT WORTH
FORT WORTH-TARRANT COUNTY
OFFICE OF EMERGENCY MANAGEMENT
06/30/2008
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**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Kennedale Flood Mitigation Project #1** | Participate in the development of the Tarrant County specific "Flood Preparedness" brochure. |
| **Hazard Addressed** | Flooding |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of Flood events.<br>1. c. Develop effective flood mitigation public education materials. |
| **Priority** | High |
| **Estimated Cost** | Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Private Foundation Grants |
| **Responsible Agency** | • Kennedale Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This action will provide flood mitigation techniques for owners of new buildings. |
| **Effect on Existing Buildings** | This action will provide flood mitigation techniques for owners of existing buildings. |
| **Cost Effectiveness** | Cost Effective - This project will provide valuable information to the public in a relatively short time and with relatively low costs. It will also have the added benefit of increasing public awareness of mitigation. The estimated cost could easily be offset by reduced losses to the public in a single small flood event. |

**Discussion**: Develop Tarrant County specific "Flood Preparedness" brochure. Once developed, the brochure will be distributed County-Wide. Historically flood prone areas will be targeted for door-to-door distribution and neighborhood meetings to present the brochure and solicit input for *Fort Worth Hazard Mitigation Action Plan* revisions.

The brochure will include:

- Description of Tarrant County flood hazards
- "Case Studies" of previous flood events in Tarrant County
- Preparedness and "self-help" mitigation information
- Benefits of city participation in NFIP
- Advantages of flood insurance
- Risks of not having flood insurance
- Warnings that typical homeowner's insurance does not cover rising water
- Solicit input for the *Fort Worth Hazard Mitigation Action Plan*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Edgecliff Village Flood Mitigation Action #2** | Conduct hydrologic study of Village Creek to determine best means of mitigating flooding and implement findings. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |
| **Priority** | Medium |
| **Estimated Cost** | $50,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Kennedale Public Works<br>• Kennedale Emergency Management |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will provide guidance for locating new buildings away from flood prone areas on Village Creek. |
| **Effect on Existing Buildings** | This action will provide guidance for protection of existing buildings from flooding on Village Creek. |
| **Cost Effectiveness** | Cost Effective – This project will provide guidance to reduce the hazard to life and property from flooding. |
| **Discussion:** This action will develop a study of flooding along Village Creek and provide findings that can reduce the adverse effects of flooding on the creek. | |

**HAILSTORM**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of large hail are a hazard event in Kennedale. Tarrant County averages eleven significant thunderstorm events (large hail, high winds) per year according to National Weather Service records. Most structures in Kennedale can resist the effects of all but the most severe hailstorms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to hailstorms. Vehicles have proven to be vulnerable to hailstorms with widespread severe vehicle damage reported in 1980 and 1995.

Location - Throughout the City.

Extent - Tarrant County is subject to the hazards of severe thunderstorms, including large hail. Hail stones up to the size of grapefruit (H9 on the Combined NOAA/TORRO Hailstorm Intensity Scales) have been reported in Tarrant County.

Previous Occurrences – There are no reports of significant hailstorm events in Kennedale other than the 1980 and 1995 county-wide events.

Probability of Future Events - Thunderstorms with hail are certain to continue to occur in Kennedale. Hail falls on about two or three days per year, ordinarily with only slight and scattered damage (*National Weather Service*).

Impact – The impact from hailstorms can be significant in extreme events such as the hailstorms of 1980 and 1995. Thousands of homes and vehicles can be damaged in a single storm with millions of dollars in damages. Vehicles are especially impacted by large hails with windshields being the vulnerable part. A recurring problem following hailstorms is broken windshields in vehicles belonging to populations who do not have vehicle insurance and cannot afford the replacements costs, resulting in the owners having difficulty traveling to work, medical appointments, etc.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Kennedale Hailstorm Mitigation Action #1** | Develop a public education campaign to encourage "hail resistant" roofing in new construction and roof replacements. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• Building/Permit Fees<br>• City Funds |
| **Responsible Agency** | • Kennedale Emergency Management<br>• Kennedale Planning & Zoning Department |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will potentially decrease the damage caused by most hailstorms to new buildings. |
| **Effect on Existing Buildings** | This action will potentially decrease the damage caused by most hailstorms to existing buildings. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing hailstorm damage. One long term benefit will be reduced property insurance as claims related to hail damage are reduced. |
| **Discussion**: Public education has proven to be a low cost effective means to achieve changes public behavior. Encouraging hail resistant roofing can benefit citizens through reduced damage, business through reduced damage to their buildings and reduced claims against insurance companies, and government through reduced request for assistance. This campaign can be developed in conjunction with the Tarrant County effort. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Kennedale Hailstorm Mitigation Action #2** | Evaluate City buildings to determine feasibility of installing hail resistant roofing and window coverings with a focus on critical infrastructure. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $10,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• City Funds |
| **Responsible Agency** | • Kennedale Public Works<br>• Kennedale Emergency Management |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on new City buildings. |
| **Effect on Existing Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on existing City buildings. |
| **Cost Effectiveness** | Cost Effective – Although currently undetermined, this project is believed to be cost effective. |
| **Discussion:** Installing hail resistant roofing and window coverings on City buildings could prevent or limit damage to City buildings thus avoiding costs to the City as well as preventing or limiting loss of use of damaged facilities. | |

**HIGH WINDS**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of high winds are a hazard in Kennedale. Tarrant County averages ten reported significant thunderstorm events (large hail, high winds) per year. In addition, strong weather fronts can sometimes be accompanied by high winds which occasionally cause damage. Most structures in Kennedale can resist the effects of all but the most severe high wind events. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to high winds.

Location - Throughout the City.

Extent - Severe thunderstorms with high winds with speeds in excess of 90 mph have been reported in Kennedale.

Previous Occurrences – We could find no records of significant high wind damage in Kennedale.

Probability of Future Events – Based on previous experience Kennedale can expect to experience an average of ten significant thunderstorm events with high winds per year.

Impact – Records on high wind events are difficult to separate from severe thunderstorm records. High winds in Kennedale typically cause little damage to commercial buildings. More often high winds cause damage to roofs, trees, and signs.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Kennedale High Winds Mitigation Action #1** | Enact enhanced building codes to reduce damages from high winds. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined – Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Kennedale Planning & Zoning Department |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will potentially identify a means to reduce high wind damage on new buildings. |
| **Effect on Existing Buildings** | This action will potentially identify a means to reduce high wind damage on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Although costs are undetermined, this action is believed to be cost effective since the action will require staff time only. |
| **Discussion:** Enhanced building codes will reduce damages from high wind events. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Kennedale High Winds Mitigation Action #2** | Educate builders and residents about mitigating wind damage. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | $10,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |
| **Responsible Agency** | • Kennedale Planning & Zoning Department<br>• Kennedale Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |

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| **Effect on New Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on new buildings. |
| **Effect on Existing Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost of developing and providing high wind mitigation compared with savings to the community make this action cost effective. |
| **Discussion:** Public education has proven to be a low cost and effective means to achieve changes public behavior. High winds have not been a focus of severe weather preparedness. | |

**LANDSLIDES**

No Vulnerability – There are no areas in Kennedale subject to landslides. Based on the lack of vulnerability, landslides will receive no further consideration in this plan for Kennedale. However, landslide hazards will be reviewed during the annual review of this plan and we will continue looking for areas with landslide potential during hazard surveys.

**LEVEE FAILURE**

No Vulnerability – There are no levees or areas that would be affected by levee failure in Kennedale. Based on the lack of vulnerability, levee failure will receive no further consideration in this plan for Kennedale.

**LIGHTNING**

Moderate Vulnerability – Lightning is one of the most common hazards in Kennedale. Thunderstorms (and by definition, lightning) occur an average of 30 – 50 days per year (*Oklahoma Climatological Survey*). Lightning is the second most common cause of weather-related deaths in Texas (*National Weather Service*). Lightning information is available only for Tarrant County on a county-wide basis.

Location – Throughout the City.

Extent – We could find no references to the average number of strikes per storm in Kennedale. However, lightning is by definition associated with thunderstorms.

Previous Occurrences – Kennedale experiences 30 – 50 thunderstorm days per year. From 1995 – 2004 one person was killed and five were injured by lightning in Tarrant County (*National Weather Service*). Throughout Texas 34 people were killed by lightning, there were 184 injuries, and an estimated 23 million dollars in damages due to lightning from 1995 - 2004 (*National Weather Service*).

Probability of Future Events – Based on past experience Kennedale will experience 30 – 50 thunderstorm days each year. Some days will have more than one thunderstorm during a given thunderstorm day.

Impact – Although lightning is the second most common cause of storm related deaths in Texas, lightning deaths remain relatively rare. Lightning does cause property damage several times per year (we could not find statistical data to validate this observation).

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Kennedale Lightning Mitigation Action #1** | Provide lightning mitigation materials with building permit packets. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Kennedale Planning & Zoning Department |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will provide materials that will reduce the vulnerability of new buildings to lightning. |
| **Effect on Existing Buildings** | This action will provide materials that will reduce the vulnerability of existing buildings that are being remodeled to lightning. |
| **Cost Effectiveness** | Cost Effective – The low cost of this project would be offset by eliminating just one lightning caused building loss. |
| **Discussion:** Lightning mitigation materials will be included in all building permit packets distributed to builders or citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Kennedale Lightning Mitigation Action #2** | Ensure all City critical infrastructure has adequate lightning mitigation in place and upgrade protection as necessary. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | $20,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Kennedale Public Works |

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| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will ensure new City buildings that house critical infrastructure have adequate lightning mitigation. |
| **Effect on Existing Buildings** | This action will ensure existing critical infrastructure has adequate lightning mitigation. |
| **Cost Effectiveness** | Cost Effective – The destructive and sometimes capricious nature of lighting warrant the expense of this action compared with the benefits of avoiding damage to critical infrastructure. |
| **Discussion:** Review and confirmation of the adequacy of lightning protection systems in City buildings housing critical infrastructure is worthwhile considering the number of thunderstorms experienced in Kennedale. | |

**SEVERE THUNDERSTORM**

High Vulnerability - Severe thunderstorms are the most common hazard in Kennedale. From 1950 through August 2007 Tarrant County averaged eleven reported severe thunderstorm events county-wide per year. Most structures in Kennedale can resist the effects of all but the most severe thunderstorms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to thunderstorms.

Location - Throughout the City.

Extent - Tarrant County is subject to the hazards of severe thunderstorms of all magnitudes.

Previous Occurrences - Records are available only on a county-wide basis.

Probability of Future Events – Severe thunderstorms will occur in Kennedale an average of eleven times per year.

Impact – A single severe thunderstorm can cause damage from hail, high winds, lightning, and/or tornadoes to thousands of structures.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Kennedale Severe Thunderstorm Mitigation Project #1** | Conduct technical assessment to determine the feasibility of structurally hardening the Kennedale Fire Station located at 100 Cloverlane Drive against severe weather. |
| **Hazard Addressed** | Tornado/Severe Thunderstorm |
| **Mitigation Goal/Objective** | 2. Reduce loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |

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|---|---|
| **Priority** | High |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • Private Foundation Grants<br>• Other State or Federal Grants<br>• City Funds |
| **Responsible Agency** | Kennedale Emergency Management |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This project will determine the feasibility of structurally hardening the Kennedale Fire Station against severe weather. |
| **Effect on Existing Buildings** | This project will determine the feasibility of structurally hardening the Kennedale Fire Station against severe weather. |
| **Cost Effectiveness** | Cost Effective - This project will provide the basis for a realistic cost benefit analysis of the feasibility of hardening the Kennedale Fire Station against severe weather events. The relatively low cost of this project compared with the potential benefits of protecting a city's emergency response equipment against the jurisdiction's most likely hazard event result in a favorable cost benefit review. |

**Discussion:**
This project will provide for determining the feasibility of hardening the city's only fire station against severe weather. This project will contribute to protecting emergency response equipment so that it will be available to assist the citizens of Kennedale in responding to and recovering from severe weather or other events. Final project details will be developed in accordance with grant requirements at the time the project is funded.

The cost estimate is a conservative "best guess" based on a structural analysis of the existing fire station. That analysis would require:

- Structural analysis of the building by a Structural Engineer
- Analysis of electrical systems
- Analysis of HVAC systems
- Review of building codes

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Kennedale Severe Thunderstorm Mitigation Action #2** | Encourage builders to install storm resistant construction such as "hurricane clips". |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | High |
| **Estimated Cost** | $1,000 |

| | |
|---|---|
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |
| **Responsible Agency** | Kennedale Planning & Zoning Department |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will encourage storm resistant construction in new buildings. |
| **Effect on Existing Buildings** | This action will encourage storm resistant construction in existing buildings as they are remodeled. |
| **Cost Effectiveness** | Cost Effective – The low cost of this action will be offset by a reduction in damage from severe thunderstorms. |
| **Discussion:** Effective education on storm resistant construction can reduce damage from severe thunderstorms. Insurance companies may be willing to fund or provide educational materials and/or provide discounts to persons who install storm resistant devices. | |

**SEVERE WINTER STORMS**

Moderate Vulnerability - Since 2000 the National Weather Service has reported 14 Winter Storm/Ice events. Winter storms in Kennedale usually consist of short-lived icing events (ice on the roads for a few hours) that primarily affect traffic and cause numerous motor vehicle accidents. Occasionally an ice storm will cause widespread power outages for as long as several days. ONCOR Electric Delivery has an aggressive tree trimming program. Most structures in Kennedale can resist the effects of all but the most severe winter storms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to winter storms. Electrical service outages are usually the most serious threat in this area. Most public safety and special facilities are equipped with generators.

Location - Throughout the City.

Extent - Severe ice storms have resulted in accumulations in excess of two inches. Most storms leave only a light coating or glaze of ice.

Previous Occurrences – Severe Winter Storms are typically regional events. Kennedale has averaged two winter storms per year since 2000. Most winter storms resulting only minor inconveniences and a few motor vehicle accidents.

In 1978 up to an inch of ice coated area trees and roadways causing $14 million in damages region-wide and making travel almost impossible for two days.

In 1996 a winter storm dropped two to four inches of a mixture of sleet, freezing rain, and snow in Kennedale over Thanksgiving weekend causing many motor vehicle accidents and some electrical service outages.

In 2003 a winter storm dropped one inch of sleet across Kennedale resulting in numerous motor vehicle accidents and closing schools for two days.

Probability of Future Events - Kennedale can expect to experience two winter storms per year with a severe winter storm once each ten years.

Impact - Winter storms can cause widespread electrical and telephone service outages, make travel dangerous or impossible, and damage structures. Deaths and injuries due to vehicle accidents and slips/falls are common during ice storms. Occasional deaths and injuries from carbon monoxide poisoning due to improper heating have occurred. Economic losses due to lost production can be significant. Damage from frozen pipes can lead to significant expenses for homeowners.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Kennedale Severe Winter Storm Mitigation Action #1** | Increase public education concerning winter storm preparedness and mitigation. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | Medium |
| **Estimated Cost** | $10,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Kennedale Emergency Management<br>• Fort Worth – Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into new buildings. |
| **Effect on Existing Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost is effective when compared to benefits provided to citizens. |
| **Discussion:** Winter weather preparedness has not been emphasized in Kennedale as much as severe thunderstorms. This action will provide preparedness information to citizens during the fall. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Kennedale Severe Winter Storm Mitigation Action #2** | Purchase additional street sanding capacity |

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|---|---|
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Kennedale Emergency Management |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will have no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Sanding streets is essential to allow emergency vehicles to respond during severe winter events. |
| **Discussion:** Sanding equipment can be mounted on existing equipment to provide sanding capabilities. During severe winter weather events streets around hospitals, fire stations and other critical facilities are sanded along with major intersections and roadways. Additional sanding capacity would allow for quicker sanding of these areas and for more repeat sanding during prolonged winter weather events. This will improve public safety by facilitating emergency response as well as reducing motor vehicle accidents. | |

**STREAM BANK EROSION**

Moderate Vulnerability - Flash floods along Village Creek can cause stream bank erosion. Some homes, businesses, and roadways are vulnerable to stream bank erosion. Most buildings are a safe distance from the current path of the creek. Further analysis using GIS and field verification can specifically identify vulnerable structures.

Location - Along Village Creek on the northwest side of Kennedale.

Extent - Stream bank erosion along Village Creek has washed away several feet of bank during a single flash flood event.

Previous Occurrences - Minor flooding associated erosion occurs frequently, especially during the spring and early summer. In June of 2004 significant flooding on Village Creek caused some bank erosion.

Probability of Future Events - Kennedale is certain to experience stream bank erosion in the future. Continued development and the resulting impervious cover will increase the likelihood and severity flooding and associated erosion.

Impact - Extreme stream bank erosion could destroy homes, businesses, and/or roadways. Kennedale is a small city and any loss of business would have a noticeable impact. Roadway damage can restrict access for home/business owners and cause minor to major inconveniences to for drivers.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Kennedale Stream Bank Erosion Mitigation Action #1** | Conduct study to reduce flood impacts of Village Creek and implement findings. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |
| **Priority** | Medium |
| **Estimated Cost** | $100,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Kennedale Emergency Management |
| **Estimated Completion Time Frame** | 3 years |
| **Effect on New Buildings** | This action will not affect new buildings |
| **Effect on Existing Buildings** | This action may affect existing buildings if significant construction is required. |
| **Cost Effectiveness** | Cost Effective – The action will reduce the adverse effects of flooding. |
| **Discussion:** A hydrologic study and resulting mitigation actions will provide a plan to manage development along Village Creek. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Kennedale Stream Bank Erosion Mitigation Action #2** | Determine and implement expedient erosion control techniques along Village Creek. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Kennedale Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will not have an effect on new buildings. |
| **Effect on Existing Buildings** | This action will protect existing buildings along Village Creek. |
| **Cost Effectiveness** | Cost Effective – Although the final project cost is undetermined, it is believed the action will be cost effective. |
| **Discussion:** This action will review erosion control techniques and implement the most effective technique for controlling erosion along Village Creek. | |

**TORNADO**

High Vulnerability – All structures in Kennedale are vulnerable to tornadoes. Very few structures can withstand the effects of an F5 tornado. However, the March 28, 2000 F3 tornado that struck Fort Worth provided good evidence that well built structures can protect people who take appropriate shelter inside those buildings.

Location - Tornadoes can occur anywhere in Kennedale.

Extent - Kennedale is subject to tornadoes of all magnitudes, including F5 tornadoes.

Previous Occurrences – We found no reports of tornados causing damage in Kennedale. However, Tarrant County has an average of one tornado reported per year county-wide (Source: National Climatic Data Center). In 2007 there were eight tornadoes reported by storm spotters county-wide. Four of those tornados caused damage, all within incorporated areas.

Probability of Future Events - Tarrant County has averaged one reported tornado per year and can expect that average to continue. Kennedale, based on its relatively small size, will likely experience tornados very infrequently.

Impact - Tornadoes can cause deaths, injuries and property damage/destruction. Special facilities such as hospitals, fire stations, and utilities can be damaged or destroyed. Citizens who live in neighborhoods struck by tornadoes can experience disruption of their life styles and traditions. Areas struck by tornadoes can experience increased demand for mental health services as people deal with grief and stress.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Kennedale Tornado Mitigation Project #1** | Assist citizens with funding for building tornado safe rooms or in-ground shelters. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction |
| **Priority** | High |
| **Estimated Cost** | $100,000 (25 Safe Rooms at $4,000 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Community Development Block Grant Funds |
| **Potential Matching Funding Sources** | Home/Building Owner |
| **Responsible Agency** | • Kennedale Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This project will encourage new buildings to be constructed with tornado safe rooms as part of the construction process. The safe room will enhance the overall storm resistance of the building. |

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| **Effect on Existing Buildings** | This project will encourage homeowners to construct/install tornado safe rooms in their existing homes. A safe room will enhance the overall storm resistance of the building. |
| **Cost Effectiveness** | Cost Effective - Safe rooms and in-ground shelters have been proven to reduce deaths and injuries during tornadoes and severe thunderstorms. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of safe rooms and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

**Discussion:**

This project will reimburse costs associated with tornado safe room or in-ground shelter installation in new or existing homes. Safe rooms provide increased protection for citizens during severe thunderstorms and tornados. Safe rooms have been proven to save lives and reduce injuries from severe weather events. FEMA publication 320 (*Taking Shelter from the Storm, Building a Safe Room Inside Your House*) provides the standards for safe rooms. As stated on the FEMA website: Although a "*residence may be built "to code," that does not mean it can withstand winds from extreme events such as tornadoes and major hurricanes. The purpose of a safe room or a wind shelter is to provide a space where you and your family can seek refuge that provides a high level of protection. To protect its occupants, a safe room must be built to withstand high winds and flying debris, even if the rest of the residence is severely damaged or destroyed."*

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to home owners will be for no more than $3,000 or 75% of cost, whichever is less
- Eligibility will be limited to individuals who own their home at the time of application
- The safe room or in-ground shelter must be constructed/installed in the primary residence of the applicant
- Each eligible homeowner can only receive one reimbursement, regardless of the number of shelters he/she may purchase/install
- In-ground shelters must meet requirements established in the National Performance Criteria for Tornado Shelters dated May 28, 1999.
- Safe Rooms must meet the requirements of FEMA Publication 320
- Safe Rooms and shelters must meet all applicable city and/or county codes
- Previously owned or used shelters will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Kennedale Tornado Mitigation Project #2** | Assist citizens with funding for purchase of Weather Alert Radios |
| **Mitigation Goal/Objective** | 4. Increase the effectiveness of warning systems in Tarrant County.<br>4. a. Increase the number of homes and businesses with Weather Alert Radios. |
| **Priority** | High |
| **Estimated Cost** | $4,000 (100 Weather Alert Radios at $40 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Private Sector Donations<br>• City Funds |
| **Potential Matching Funding Sources** | Citizen/Business Owner |
| **Responsible Agency** | • Kennedale Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings except for providing additional warning time of severe weather events thus allowing citizens more time to secure their home or business against approaching severe weather. |
| **Cost Effectiveness** | Cost Effective – Weather Alert Radios are a proven means to alert and warn citizens about severe weather and civil emergencies. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of Weather Alert Radios and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

***NOTE**: We are aware that Weather Alert Radios are on the "2007 Ineligible Planning Activities" list. It is our opinion that Weather Alert Radios should be considered eligible due to their very high benefit and very low cost.*

This project will reimburse 75% of the cost for citizens to purchase Weather Alert Radios, with the citizen responsible for the remaining 25%. Weather Alert Radios provide the best means for citizens to receive emergency alerts when they are indoors. Severe weather is the primary hazard in our area. Early alert and warning has proven to be a significant factor in saving lives during severe weather events.

In addition, the Weather Alert Radios can be activated for civil emergencies such as hazardous materials incidents. Effective warning saves lives, especially during severe weather events. Weather alert radios provide a proven means of indoor warning to citizens any time of the day or night and compose the vital indoor portion of our emergency warning system.

Warning systems have been shown to have value beyond the initial warning. Persons receiving warning relay the information to family and friends to ensure they are aware of the hazard. The secondary and tertiary warning can greatly amplify the effectiveness of the warning system.

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to citizens will be for no more than $30 or 75% of cost of the radio, whichever is less
- Eligibility will be limited to residents of Kennedale
- The citizen must sign an agreement to keep the radio operational
- Each eligible homeowner can only receive one reimbursement, regardless of the number of radios purchased
- Previously purchased radios will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**WILDFIRE**

Moderate Vulnerability - Kennedale has a significant amount of rural-urban interface that is subject to wildfires.

Location - The areas of most concern are along Village Creek in the northwest portion of the City and the largely undeveloped southern part of the City. Access to fight wildfires is sometimes difficult due to thick trees and undergrowth, semi-swampy terrain, and lack of roads.

Extent - The effects of wildfire are deaths, injuries, loss of structures, loss of wildlands, and loss of wildlife habitat.

Previous Occurrences - Wildfires in Kennedale are typically associated with droughts. A number of wildfires occurred during the droughts from 1996 - 1998, 2000, and from 2005 - 2006. In December 2005 a wildfire destroyed several homes.

Probability of Future Events - Wildfires are likely to occur annually and increase in frequency and severity as the population continues to increase and formally rural areas are developed.

Impact - Wildfires can result in the need for rapid evacuations, casualties, loss of homes and businesses, and loss of wildlife habitat and recreational areas.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Kennedale Wildfire Mitigation Action #1** | Increase public education on how to reduce the risks from wildfires (construction, landscaping, etc.) |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | High |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Kennedale Emergency Management |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will reduce the effects of wildfire on new buildings through increased use of wildfire mitigation measures. |
| **Effect on Existing Buildings** | This action will reduce the effects of wildfire on existing buildings through increased use of wildfire mitigation measures. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing the effects of wildfire. |
| **Discussion:** Wildfire mitigation measures are not widely known in urban areas such as Kennedale. This action will increase that knowledge and reduce casualties and damages from wildfires. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Kennedale Wildfire Mitigation Action #2** | Enact building permit process that encourages wildfire resistant construction. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |

| | |
|---|---|
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | • Kennedale Planning & Zoning Department<br>• Kennedale Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will reduce the vulnerability of new structure to wildfire. |
| **Effect on Existing Buildings** | This action will reduce the vulnerability of existing buildings to wildfire if they are remodeled to the extent a building permit is required. |
| **Cost Effectiveness** | Cost Effective – This action will integrate wildfire mitigation into the building process at minimal cost. |
| **Discussion:** Integrating mitigation into building permitting provides a process to reduce vulnerability with few negative impacts. | |

**Existing Hazard Mitigation Efforts**

The City is currently making steps to lessen the impact of future flooding by enacting several codes. The first is to require concrete curbs and storm drains in any new residential subdivision. The next code is that the city requires any new development to have a drainage study done by an engineer to show water impact to the area.

**Texas Standards That Exceed 44 CFR Requirements: Local Capability Assessments**

MAP 1

Projects funded under the following programs. Address the type of project that was funded. If you did not receive money from one of the below grants programs, then state that.

1.1: Hazard Mitigation Grant Program - None
1.2: Pre-Disaster Mitigation Grant Program - None
1.3: Project Impact - None
1.4: Hurricane-Property Protection Mitigation - None
1.5: Flood Mitigation Assistance - None
1.6: 406 Mitigation (through the Public Assistance Program) - None

MAP 2

Current Building Codes. Include the following information:
2.1: Date and type of code: 2003 International Building Code
2.2: How is it being enforced? Plans submitted for review. Projects inspected on site.

MAP 3

Current Fire Codes. Include the following information:
3.1: Date and type of code: 1997 Uniform Fire Code
3.2: How is it being enforced?

- Plans are submitted for review
- Projects inspected on site
- Annual Fire Inspection

MAP 4

4.1: Any other codes, sub-division regulations, etc., that are in effect in your jurisdiction? No

4.2: How are they being enforced?

MAP 5

Floodplain Management. Include the following information:

5.1: Ordinance/Order Date: Ordinance #143.3 Adopted November 13, 1997

5.2: Do you have a Floodplain Administrator? Yes

5.3: Is the person a Certified Floodplain Manager (CFM)? Yes

5.4: Date of current floodplain maps. August 23, 2000

5.5: Any codes, regulations, etc. that prohibit development in the floodway and/or floodplain: Ordinance #143.3

MAP 6

Findings/results of Building Code Effectiveness Grading Report (BCEGS). Include date of report and score. Not applicable

MAP 7

Identify other plans that your jurisdiction has or have been done in your jurisdiction.

7.1: Capital Improvement Plans: None

7.2: Comprehensive Plans: Updated December 20, 2005

7.3: Storm Water Management Plans: None

7.4: Master Drainage Plans: None

7.5: Corps of Engineers: None

7.6: Flood Mitigation Plan: None

7.7: Any other plans, studies, etc. that may have been done in your jurisdiction:

- Drainage Plan for Southeast Kennedale due to be completed mid-2007
- Kennedale requires that any building has to be at least 2 - 3 feet above BFE
- No fences can erected with the floodplain area that will restrict water flow in the area

# City of Lakeside

Jurisdiction Profile
Lakeside has an area of 1.5 square miles and a NCTCOG 2007 population estimate of 1,250.

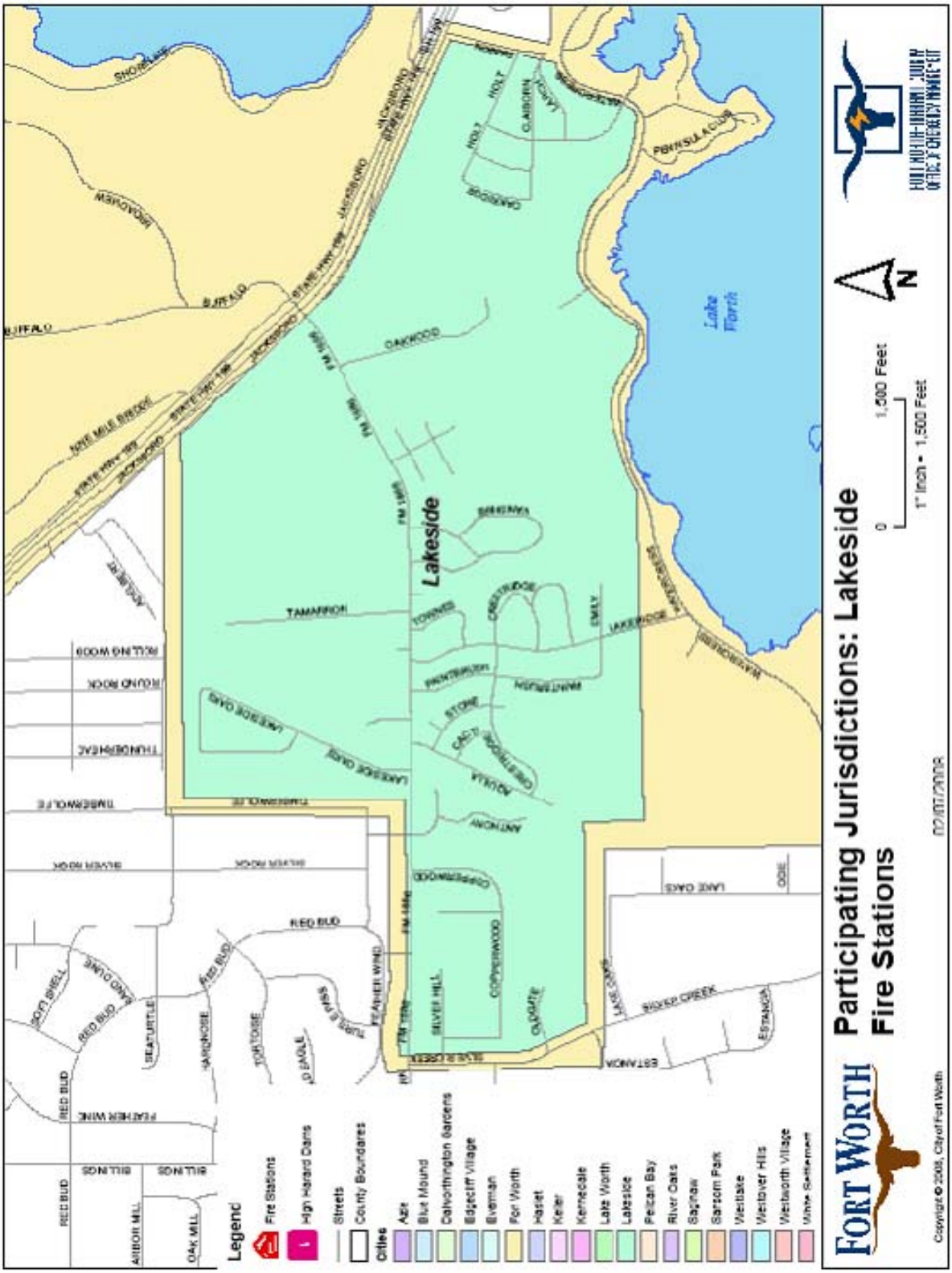
Lakeside is located on State Highway 199 about eleven miles northwest of downtown Fort Worth in western Tarrant County. This community was named for its geographic location on the shores of Lake Worth. The town had incorporated by 1960 and reported a population of 651. That figure increased to 988 in 1970 and then fluctuated in the 1980s and 1990s. Lakeside has a mayor and city council. In 2000 the population was 1,040.

| 1990 | 2000 | 2006 | 2007 |
|---|---|---|---|
| 816 | 1,040 | 1,250 | 1,250 |
| 2007 Population Density (persons per square mile): 784.83 | | | |

City Point-Of-Contact
Lakeside City Administrator Diana Buchanan

Land Use and Development Trends
Lakeside is predominantly a residential community with a few businesses. Lakeside is approximately 80% built-out and is growing. Residential development continues to be the dominant land use.

Jurisdiction Unique Hazards
Hazards in Lakeside are discussed below.


Participating Jurisdictions: Lakeside
Fire Stations
FORT WORTH
Lakeside
Lake Worth
0
1,500 Feet
1" Inch = 1,500 Feet
N
Legend
Fire Stations
High Hazard Dams
Streets
County Boundaries
Cities
Azle
Blue Mound
Dalworthington Gardens
Edgecliff Village
Everman
Fort Worth
Haslet
Keller
Kennedale
Lake Worth
Lakeside
Pelican Bay
River Oaks
Saginaw
Sansom Park
Westlake
Westover Hills
Westworth Village
White Settlement
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**DAM FAILURE**

No Vulnerability – There are no high hazard dams located in Lakeside and none that would affect Lakeside if they failed. Based on the lack of vulnerability, dam failure will receive no further consideration in this plan for Lakeside.

**DROUGHT**

Moderate Vulnerability – Lakeside purchases water from Fort Worth who purchases water from the Tarrant Regional Water District (TRWD). TRWD water supply comes from three reservoirs on the West Fork of the Trinity River in northwest Tarrant County and from two reservoirs located well southeast of Tarrant County. These diverse supply locations help mitigate the effects of a local drought. An additional reservoir location well northeast of Tarrant County is being pursued. There has been some preliminary discussion of constructing a pipeline to carry water from southern Oklahoma. TRWD is installing pipelines to interconnect area water supply lakes with water treatment plants in order to provide maximum flexibility in water supply and treatment.

Location – Drought can affect all of Lakeside.

Current Extent – As of February 2008, Lakeside was at DO – Abnormally Dry on the Palmer Drought Severity Index.

Previous Occurrences – National Climatic Data Center records indicate that in the past ten years there have been three periods of drought in Lakeside, 1996 - 1998, 2000, and 2005 - 2006.

Probability of Future Events – Droughts are certain to occur again in Lakeside. Significant droughts significantly affecting water supply and resulting in mandatory restrictions traditionally occur on a twenty year cycle. Based on the previously cited National Climatic Data Center recent records, we can anticipate that drought conditions will occur approximately every three years.

Impact – Drought can lead to loss of water for basic needs such as drinking and fire-fighting. Droughts are associated with increased wildfire and damage from expansive soils. More common impacts are damage to landscaping and reduced recreation due to low lake levels.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Lakeside Drought Mitigation Action #1** | Participate in the design and implementation of the Tarrant County specific water conservation public education efforts to compliment existing programs. |
| **Mitigation Goal/Objective** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $1,000 |

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|---|---|
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • City Funds<br>• Water Suppliers |
| **Responsible Agency** | • Lakeside Water & Sewer Department<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One year |
| **Effect on New Buildings** | This action will publicize water conservation efforts that can be incorporated into new construction. |
| **Effect on Existing Buildings** | This action will publicize water conservation efforts that can be incorporated into existing construction. |
| **Cost Effectiveness** | Cost Effective – Public education programs can provide significant results for relatively low costs. |
| **Discussion:** Most cities in the area have existing water conservation programs designed to educate the public and businesses on ways to conserve water. This action will develop a Tarrant County specific program that will compliment existing programs. Jurisdictional public education efforts have been very successful in attracting the attention of local citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Lakeside Drought Mitigation Action #2** | 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. Impacts identified in this plan will be included in updates to the Hazard Mitigation Action Plan. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $2,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • City Funds<br>• Water Suppliers |
| **Responsible Agency** | • Lakeside Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One Year |

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|---|---|
| **Effect on New Buildings** | This action will identify drought impacts in Lakeside thus providing specific information for builders of new structures to incorporate drought mitigation into the structures. |
| **Effect on Existing Buildings** | This action will identify drought impacts in Lakeside thus providing specific information for owners of existing structures to incorporate drought mitigation into the structures. |
| **Cost Effectiveness** | Cost Effective – This planning effort will have a low cost with the potential for significant benefits for the entire community. |
| **Discussion:** This planning effort will focus attention on the effects of drought on the community. Specific drought effects will be identified and efforts can be made to mitigate those effects. | |

**EXPANSIVE SOILS**

Low Vulnerability - Expansive soils have caused damage to some structures in Lakeside. However, damage has been limited to relatively small geographic areas and there are no reports of significant damage to commercial structures or infrastructure.

Location – Expansive soils are found in various areas of Lakeside. We could not locate a map of expansive soils in Lakeside.

Extent – The extent of expansive soils in Lakeside is believed to be Very Low (0% - 20%) to Low (21% - 50%).

Previous Occurrences – We could find no empirical data on previous occurrences of damage from expansive soils, but it is believed that expansive soils have caused problems since the first buildings were constructed in this area.

Probability of Future Events – Due to the variability of soil types and construction quality, it is very difficult to predict future occurrences of problems with expansive soils. However, a study published in the fall 2003 issue of *Environmental Geology* cited in the September 19, 2003 *Dallas Business Journal* indicates that many new developments in the Metroplex are being built on soil that is more unstable than soils built on prior to 1990. This could lead to a higher incidence of expansive soil related damage in the future.

Impact – The impact of expansive soils ranges from cosmetic cracks in walls to substantial foundation and structural damage that can result in the need to demolish the building. Infrastructure such as pipelines can be damaged causing increased maintenance and repairs, damaged beyond repair requiring replacement, damaged to the point of failure.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Lakeside Expansive Soils Mitigation Action #1** | Improve construction techniques through building code enhancements. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined (Minimal – Staff Time Only) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building permit fees |
| **Potential Matching Funding Sources** | • City Funds<br>• Building permit fees |
| **Responsible Agency** | • Lakeside Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will make new buildings more resistant to damage from expansive soils. |
| **Effect on Existing Buildings** | This action will require modifications to existing buildings to be more resistant to damage from expansive soils. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will improve construction quality and reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Lakeside Expansive Soils Mitigation Action #2** | Educate construction contractors, home owners, and business owners about mitigation techniques. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building Permit Fees |
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | • Lakeside Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will provide builders of new construction with expansive soil mitigation techniques that will reduce damage. |

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| **Effect on Existing Buildings** | This action will provide owners of existing buildings with expansive soil mitigation techniques that will reduce damage. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will provide construction contractors and home/business owners with techniques designed to reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**EXTREME HEAT**

High Vulnerability - Summer heat and humidity can occur anytime from May through October. Community health services actively work with at risk populations to prevent heat related deaths and injuries. The elderly, very young people and people with poor health are most at risk from summer heat. People who work outside or in un-air-conditioned buildings are also at high risk to the direct effects of summer heat. Summer heat can also lead to electrical service outages if equipment fails or demand exceeds available supply. Most public safety and special facilities are equipped with emergency generators.

Location - Throughout the City.

Extent - Summer temperatures can reach as high as 113 degrees. Lakeside is also subject to high humidity.

Previous Occurrences - This is an annual occurrence. The summer of 1980 was a record year with 69 consecutive days of temperatures of 100 degrees or more. We were unable to find a reliable record of deaths or injuries related to heat.

Probability of Future Events - Hot summer temperatures are certain to continue to occur in Lakeside.

Impact - Summer heat can cause widespread electrical outages resulting in dangerous conditions, especially for at-risk populations. Occasionally "cooling centers" are opened at community centers to provide a safe place for citizens to seek refuge from the heat. Extreme heat can have economic impacts if construction work is curtailed or outdoor special events are cancelled.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Lakeside Extreme Heat Mitigation Action #1** | Determine feasibility of expanding monitoring of populations at risk from extreme heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined. Staff time and GIS resources |

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| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Other State or Federal Public Health Grants |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Tarrant County Public Health<br>• Lakeside Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | None - This action is intended to expand monitoring of people only. |
| **Effect on Existing Buildings** | None - This action is intended to expand monitoring of people only. |
| **Cost Effectiveness** | Pending, but believed to be Cost Effective |
| **Discussion:** This action would determine the feasibility of expanding monitoring of populations at risk from extreme heat. Existing at risk population monitoring programs will be reviewed to ensure all known populations at risk from extreme heat are included. Any newly discovered at risk populations will be evaluated for inclusion in existing monitoring programs. Tarrant County Public Health provides public health services throughout the County. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Lakeside Extreme Heat Mitigation Action #2** | Increase public education programs on the dangers of excessive heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness |
| **Priority** | Medium |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Other State or Federal Public Health Grants |
| **Responsible Agency** | • Tarrant County Public Health<br>• Lakeside Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Effect on Existing Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits. |

**Discussion:** Public education on severe weather in Lakeside has traditionally focused on severe thunderstorms and associated hazards (tornadoes, lighting, flooding, high winds). This action would expand public education to include hazards from extreme heat.

**FLOOD**

High Vulnerability - The topography of Lakeside combined with the frequency of severe thunderstorms results in frequent flash flood events. FEMA records indicate only 39 Repetitive Loss Properties in all of Tarrant County. However, this is probably more a reflection of the low number of flood insurance polices than vulnerability to flooding. Further analysis using GIS and field verification can specifically identify vulnerable structures.

Location - The south part of the city is hilly with small ravines and is more prone to experience flooding.

Extent - Flash floods are the most common type of flooding in Lakeside which tend to occur and recede very quickly.

Previous Occurrences - Minor flooding occurs frequently, especially during the spring and early summer. In June of 2004 some flooding occurred in the south part of the city along roadways.

Probability of Future Events – Based on previous experience Lakeside is certain to suffer flash flood events every year. National Weather Service records indicate an average of 11 flash flood events per year in Tarrant County. Continued development throughout the County and the resulting increase in impervious cover will increase the likelihood and severity of flooding.

Impact - Flash floods kill more people than any other hazard associated with thunderstorms. Property damage from flash flooding is seldom covered by insurance, which makes it very difficult for citizens to recover from the flood. Due to the very rapid rate of development and growth throughout Tarrant County we are experiencing problems with determining actual building footprints within flood plains and will be using planimetric GIS data from the NCTCOG to resolve this issue when it becomes available. At that time we will be able to accurately identify the number and types of buildings vulnerable to flooding; as well as access other data associated with those locations such as appraised value, census data, and owner information.

Participating Jurisdictions: Lakeside
FloodPlain
FORT WORTH
FORT WORTH-TARRANT COUNTY
OFFICE OF EMERGENCY MANAGEMENT
Lake Worth
Lakeside
Fort Worth
N
0
1,500 Feet
1" inch = 1,500 Feet
Legend
FloodPlain
A
AE
Streets
County Boundaries
06/30/2008
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**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Lakeside Flood Mitigation Project #1** | Participate in the development of the Tarrant County specific "Flood Preparedness" brochure. |
| **Hazard Addressed** | Flooding |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of Flood events.<br>1. c. Develop effective flood mitigation public education materials. |
| **Priority** | High |
| **Estimated Cost** | Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Private Foundation Grants |
| **Responsible Agency** | • Lakeside Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This action will provide flood mitigation techniques for owners of new buildings. |
| **Effect on Existing Buildings** | This action will provide flood mitigation techniques for owners of existing buildings. |
| **Cost Effectiveness** | Cost Effective - This project will provide valuable information to the public in a relatively short time and with relatively low costs. It will also have the added benefit of increasing public awareness of mitigation. The estimated cost could easily be offset by reduced losses to the public in a single small flood event. |

**Discussion**: Develop Tarrant County specific "Flood Preparedness" brochure. Once developed, the brochure will be distributed County-Wide. Historically flood prone areas will be targeted for door-to-door distribution and neighborhood meetings to present the brochure and solicit input for *Fort Worth Hazard Mitigation Action Plan* revisions.

The brochure will include:

- Description of Tarrant County flood hazards
- "Case Studies" of previous flood events in Tarrant County
- Preparedness and "self-help" mitigation information
- Benefits of city participation in NFIP
- Advantages of flood insurance
- Risks of not having flood insurance
- Warnings that typical homeowner's insurance does not cover rising water
- Solicit input for the *Fort Worth Hazard Mitigation Action Plan*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Lakeside Flood Mitigation Action #3** | Improve drainage structure driveway from Watercress Drive to City wastewater treatment plant. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined pending engineering analysis |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Lakeside Water & Sewer<br>• Lakeside Emergency Management |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will no effect on new buildings. |
| **Effect on Existing Buildings** | This action will improve drainage on a roadway and have little or no effect on existing buildings. |
| **Cost Effectiveness** | Cost Effective – This action will help ensure access to the City wastewater treatment plant during fold events |
| **Discussion:** Access to the Lakeside wastewater treatment plant is via driveway in a ravine that sometimes becomes impassable during heavy rain and flood events. | |

**HAILSTORM**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of large hail are a hazard event in Lakeside. Tarrant County averages eleven significant thunderstorm events (large hail, high winds) per year according to National Weather Service records. Most structures in Lakeside can resist the effects of all but the most severe hailstorms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to hailstorms. Vehicles have proven to be vulnerable to hailstorms with widespread severe vehicle damage reported in 1980 and 1995.

Location - Throughout the City.

Extent - Lakeside is subject to the hazards of severe thunderstorms, including large hail. Hail stones up to the size of grapefruit (H9 on the Combined NOAA/TORRO Hailstorm Intensity Scales) have been reported in Tarrant County.

Previous Occurrences – There are no reports of significant hailstorm events in Lakeside other than the 1980 and 1995 county-wide events.

Probability of Future Events - Thunderstorms with hail are certain to continue to occur in Lakeside. Hail falls on about two or three days per year, ordinarily with only slight and scattered damage (*National Weather Service*).

Impact – The impact from hailstorms can be significant in extreme events such as the hailstorms of 1980 and 1995. Thousands of homes and vehicles can be damaged in a single storm with millions of dollars in damages. Vehicles are especially impacted by

large hails with windshields being the vulnerable part. A recurring problem following hailstorms is broken windshields in vehicles belonging to populations who do not have vehicle insurance and cannot afford the replacements costs, resulting in the owners having difficulty traveling to work, medical appointments, etc.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Lakeside Hailstorm Mitigation Action #1** | Develop a public education campaign to encourage "hail resistant" roofing in new construction and roof replacements. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• Building/Permit Fees<br>• City Funds |
| **Responsible Agency** | • Lakeside Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will potentially decrease the damage caused by most hailstorms to new buildings. |
| **Effect on Existing Buildings** | This action will potentially decrease the damage caused by most hailstorms to existing buildings. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing hailstorm damage. One long term benefit will be reduced property insurance as claims related to hail damage are reduced. |
| **Discussion**: Public education has proven to be a low cost effective means to achieve changes public behavior. Encouraging hail resistant roofing can benefit citizens through reduced damage, business through reduced damage to their buildings and reduced claims against insurance companies, and government through reduced request for assistance. This campaign can be developed in conjunction with the Tarrant County effort. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Lakeside Hailstorm Mitigation Action #2** | Evaluate City buildings to determine feasibility of installing hail resistant roofing and window coverings with a focus on critical infrastructure. |

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| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• City Funds |
| **Responsible Agency** | Lakeside Town Engineer |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on new City buildings. |
| **Effect on Existing Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on existing City buildings. |
| **Cost Effectiveness** | Cost Effective – Although currently undetermined, this project is believed to be cost effective. |
| **Discussion:** Installing hail resistant roofing and window coverings on City buildings could prevent or limit damage to City buildings thus avoiding costs to the City as well as preventing or limiting loss of use of damaged facilities. | |

**HIGH WINDS**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of high winds are a hazard in Lakeside. Tarrant County averages ten reported significant thunderstorm events (large hail, high winds) per year. In addition, strong weather fronts can sometimes be accompanied by high winds which occasionally cause damage. Most structures in Tarrant County can resist the effects of all but the most severe high wind events. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to high winds.

Location - Throughout the City.

Extent - Severe thunderstorms with high winds with speeds in excess of 90 mph have been reported in Lakeside.

Previous Occurrences – In June 2004 winds from a thunderstorm caused parts of the City to be without electrical service for as long as five days.

Probability of Future Events – Based on previous experience Lakeside can expect to experience an average of ten significant thunderstorm events with high winds per year.

Impact – Records on high wind events are difficult to separate from severe thunderstorm records. High winds in Lakeside typically cause little damage to commercial. More often high winds cause damage to roofs, trees, and signs.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Lakeside High Winds Mitigation Action #1** | Enact enhanced building codes to reduce damages from high winds. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined – Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Lakeside Building Official |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will potentially identify a means to reduce high wind damage on new buildings. |
| **Effect on Existing Buildings** | This action will potentially identify a means to reduce high wind damage on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Although costs are undetermined, this action is believed to be cost effective since the action will require staff time only. |
| **Discussion:** Enhanced building codes will reduce damages from high wind events. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Lakeside High Winds Mitigation Action #2** | Educate builders and residents about mitigating wind damage. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | $10,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |
| **Responsible Agency** | • Lakeside Building Official<br>• Lakeside Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on new buildings. |

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| **Effect on Existing Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost of developing and providing high wind mitigation compared with savings to the community make this action cost effective. |
| **Discussion:** Public education has proven to be a low cost and effective means to achieve changes public behavior. High winds have not been a focus of severe weather preparedness. | |

**LANDSLIDES**

No Vulnerability - Although there is some relatively steep terrain in portions of Lakeside, the relief is associated with rocky outcrops and not susceptible to landslides. There is no history of landslides in Lakeside. Based on the lack of vulnerability, landslides will receive no further consideration in this plan for Lakeside. However, landslide hazards will be reviewed during the annual review of this plan and we will continue looking for areas with landslide potential during hazard surveys.

**LEVEE FAILURE**

No Vulnerability – There are no levees or areas that would be affected by levee failure in Lakeside. Based on the lack of vulnerability, levee failure will receive no further consideration in this plan for Lakeside.

**LIGHTNING**

Moderate Vulnerability – Lightning is one of the most common hazards in Lakeside. Thunderstorms (and by definition, lightning) occur an average of 30 – 50 days per year (*Oklahoma Climatological Survey*). Lightning is the second most common cause of weather-related deaths in Texas (*National Weather Service*). Lightning information is available only for Tarrant County on a county-wide basis.

Location – Throughout the City.

Extent – We could find no references to the average number of strikes per storm in Tarrant County. However, lightning is by definition associated with thunderstorms.

Previous Occurrences – Lakeside experiences 30 – 50 thunderstorm days per year. From 1995 – 2004 one person was killed and five were injured by lightning in Tarrant County (*National Weather Service*). Throughout Texas 34 people were killed by lightning, there were 184 injuries, and an estimated 23 million dollars in damages due to lightning from 1995 - 2004 (*National Weather Service*).

Probability of Future Events – Based on past experience Lakeside will experience 30 – 50 thunderstorm days each year. Some days will have more than one thunderstorm during a given thunderstorm day.

Impact – Although lightning is the second most common cause of storm related deaths in Texas, lightning deaths remain relatively rare. Lightning does cause property damage several times per year (we could not find statistical data to validate this observation).

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Lakeside Lightning Mitigation Action #1** | Provide lightning mitigation materials with building permit packets. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Lakeside Building Official |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will provide materials that will reduce the vulnerability of new buildings to lightning. |
| **Effect on Existing Buildings** | This action will provide materials that will reduce the vulnerability of existing buildings that are being remodeled to lightning. |
| **Cost Effectiveness** | Cost Effective – The low cost of this project would be offset by eliminating just one lightning caused building loss. |
| **Discussion:** Lightning mitigation materials will be included in all building permit packets distributed to builders or citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Lakeside Lightning Mitigation Action #2** | Ensure all City critical infrastructure has adequate lightning mitigation in place and upgrade protection as necessary. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Lakeside Town Engineer<br>• Lakeside Emergency Management |

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| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will ensure new City buildings that house critical infrastructure have adequate lightning mitigation. |
| **Effect on Existing Buildings** | This action will ensure existing critical infrastructure has adequate lightning mitigation. |
| **Cost Effectiveness** | Cost Effective – The destructive and sometimes capricious nature of lighting warrant the expense of this action compared with the benefits of avoiding damage to critical infrastructure. |
| **Discussion:** Review and confirmation of the adequacy of lightning protection systems in City buildings housing critical infrastructure is worthwhile considering the number of thunderstorms experienced in Lakeside. | |

**SEVERE THUNDERSTORM**

High Vulnerability - Severe thunderstorms are the most common hazard in Lakeside. From 1950 through August 2007 Tarrant County averaged eleven reported severe thunderstorm events county-wide per year. Most structures in Lakeside can resist the effects of all but the most severe thunderstorms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to thunderstorms.

Location - Throughout the City.

Extent - Lakeside is subject to the hazards of severe thunderstorms of all magnitudes.

Previous Occurrences - Severe storms and heavy rain in June of 2004 caused some flooding, erosion, power outages, and blocked access to the Water Treatment Plant.

Probability of Future Events – Severe thunderstorms will occur in Lakeside an average of eleven times per year.

Impact – A single severe thunderstorm can cause damage from hail, high winds, lightning, and/or tornadoes to thousands of structures.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Lakeside Severe Thunderstorm Mitigation Project #1** | Conduct technical assessment to determine the feasibility of structurally hardening the Lakeside City Hall located at 9830 Confederate Park Road against severe weather. |
| **Hazard Addressed** | Tornado/Severe Thunderstorm |
| **Mitigation Goal/Objective** | 2. Reduce loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | High |
| **Estimated Cost** | $5,000 |

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| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • Private Foundation Grants<br>• Other State or Federal Grants<br>• City Funds |
| **Responsible Agency** | • Lakeside Town Engineer<br>• Lakeside Emergency Management |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This project will determine the feasibility of structurally hardening the Lakeside City Hall against severe weather. |
| **Effect on Existing Buildings** | This project will determine the feasibility of structurally hardening the Lakeside City Hall against severe weather. |
| **Cost Effectiveness** | Cost Effective - This project will provide the basis for a realistic cost benefit analysis of the feasibility of hardening the Lakeside City Hall against severe weather events. The relatively low cost of this project compared with the potential benefits of protecting City Hall against the jurisdiction's most likely hazard event result in a favorable cost benefit review. |

**Discussion:**
This project will provide for determining the feasibility of hardening City Hall against severe weather. This project will contribute to protecting emergency response equipment so that it will be available to assist the citizens of Lakeside in responding to and recovering from severe weather or other events. Final project details will be developed in accordance with grant requirements at the time the project is funded.

The cost estimate is a conservative "best guess" based on a structural analysis of the existing fire station. That analysis would require:

- Structural analysis of the building by a Structural Engineer
- Analysis of electrical systems
- Analysis of HVAC systems
- Review of building codes

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Lakeside Severe Thunderstorm Mitigation Action #2** | Encourage builders to install storm resistant construction such as "hurricane clips". |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | High |
| **Estimated Cost** | $500 |

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| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |
| **Responsible Agency** | Lakeside Building Official |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will encourage storm resistant construction in new buildings. |
| **Effect on Existing Buildings** | This action will encourage storm resistant construction in existing buildings as they are remodeled. |
| **Cost Effectiveness** | Cost Effective – The low cost of this action will be offset by a reduction in damage from severe thunderstorms. |
| **Discussion:** Effective education on storm resistant construction can reduce damage from severe thunderstorms. Insurance companies may be willing to fund or provide educational materials and/or provide discounts to persons who install storm resistant devices. | |

**SEVERE WINTER STORMS**

Moderate Vulnerability - Since 2000 the National Weather Service has reported 14 Winter Storm/Ice events. Winter storms in Lakeside usually consist of short-lived icing events (ice on the roads for a few hours) that primarily affect traffic and cause numerous motor vehicle accidents. Occasionally an ice storm will cause widespread power outages for as long as several days. ONCOR Electric Delivery has an aggressive tree trimming program. Most structures in Lakeside can resist the effects of all but the most severe winter storms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to winter storms. Electrical service outages are usually the most serious threat in this area. Most public safety and special facilities are equipped with generators.

Location - Throughout the City.

Extent - Severe ice storms have resulted in accumulations in excess of two inches. Most storms leave only a light coating or glaze of ice.

Previous Occurrences – Severe Winter Storms are typically regional events. Lakeside averaged two winter storms per year since 2000. Most winter storms resulting only minor inconveniences and a few motor vehicle accidents.

In 1978 up to an inch of ice coated area trees and roadways causing $14 million in damages region-wide and making travel almost impossible for two days.

In 1996 a winter storm dropped two to four inches of a mixture of sleet, freezing rain, and snow in Lakeside over Thanksgiving weekend causing many motor vehicle accidents and some electrical service outages.

In 2003 a winter storm dropped one inch of sleet across Lakeside resulting in numerous motor vehicle accidents and closing schools for two days.

Probability of Future Events - Lakeside can expect to experience two winter storms per year with a severe winter storm once each ten years.

Impact - Winter storms can cause widespread electrical and telephone service outages, make travel dangerous or impossible, and damage structures. Deaths and injuries due to vehicle accidents and slips/falls are common during ice storms. Occasional deaths and injuries from carbon monoxide poisoning due to improper heating have occurred. Economic losses due to lost production can be significant. Damage from frozen pipes can lead to significant expenses for homeowners.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Lakeside Severe Winter Storm Mitigation Action #1** | Increase public education concerning winter storm preparedness and mitigation. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | Medium |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Lakeside Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into new buildings. |
| **Effect on Existing Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost is effective when compared to benefits provided to citizens. |
| **Discussion:** Winter weather preparedness has not been emphasized in Lakeside as much as severe thunderstorms. This action will provide preparedness information to citizens during the fall. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Lakeside Severe Winter Storm Mitigation Action #2** | Purchase additional street sanding capacity |

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| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | City Funds |
| **Responsible Agency** | Lakeside Water & Sewer |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will have no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Sanding streets is essential to allow emergency vehicles to respond during severe winter events. |
| **Discussion:** Sanding equipment can be mounted on existing equipment to provide sanding capabilities. During severe winter weather events streets around hospitals, fire stations and other critical facilities are sanded along with major intersections and roadways. Additional sanding capacity would allow for quicker sanding of these areas and for more repeat sanding during prolonged winter weather events. This will improve public safety by facilitating emergency response as well as reducing motor vehicle accidents. | |

**STREAM BANK EROSION**

No Vulnerability - The predominantly low rolling topography of Lakeside prevents stream bank erosion from causing a hazard except in a few locations. No vulnerability to stream bank erosion has been identified in Lakeside. Further analysis using GIS and field verification will continue to search for vulnerable structures or facilities.

**TORNADO**

High Vulnerability – All structures in Lakeside are vulnerable to tornadoes. Very few structures can withstand the effects of an F5 tornado. However, the March 28, 2000 F3 tornado that struck Fort Worth provided good evidence that well built structures can protect people who take appropriate shelter inside those buildings.

Location - Tornadoes can occur anywhere in Lakeside.

Extent - Lakeside is subject to tornadoes of all magnitudes, including F5 tornadoes.

Previous Occurrences – We found no reports of tornados causing damage in Lakeside. However, Tarrant County has an average of one tornado reported per year county-wide (Source: National Climatic Data Center). In 2007 there were eight tornadoes reported by storm spotters county-wide. Four of those tornados caused damage, all within incorporated areas. Since 2000 tornadoes have caused damage in Arlington, Benbrook, Euless, Everman, Fort Worth, Grand Prairie, Haltom City, Mansfield, North Richland Hills, and River Oaks.

Probability of Future Events - Tarrant County has averaged one reported tornado per year and can expect that average to continue. Lakeside, based on its relatively small size, will likely experience tornados very infrequently.

Impact - Tornadoes can cause deaths, injuries and property damage/destruction. Special facilities such as hospitals, fire stations, and utilities can be damaged or destroyed. Citizens who live in neighborhoods struck by tornadoes can experience disruption of their life styles and traditions. Areas struck by tornadoes can experience increased demand for mental health services as people deal with grief and stress.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Lakeside Tornado Mitigation Project #1** | Assist citizens with funding for building tornado safe rooms or in-ground shelters. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction |
| **Priority** | High |
| **Estimated Cost** | $60,000 (15 Safe Rooms at $4,000 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Community Development Block Grant Funds |
| **Potential Matching Funding Sources** | Home/Building Owner |
| **Responsible Agency** | • Lakeside Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This project will encourage new buildings to be constructed with tornado safe rooms as part of the construction process. The safe room will enhance the overall storm resistance of the building. |
| **Effect on Existing Buildings** | This project will encourage homeowners to construct/install tornado safe rooms in their existing homes. A safe room will enhance the overall storm resistance of the building. |
| **Cost Effectiveness** | Cost Effective - Safe rooms and in-ground shelters have been proven to reduce deaths and injuries during tornadoes and severe thunderstorms. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of safe rooms and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

**Discussion:**
This project will reimburse costs associated with tornado safe room or in-ground shelter installation in new or existing homes. Safe rooms provide increased protection for citizens during severe thunderstorms and tornados. Safe rooms have been proven to save lives and reduce injuries from severe weather events. FEMA publication 320 (*Taking Shelter from the Storm, Building a Safe Room Inside Your House*) provides the standards for safe rooms. As stated on the FEMA website: Although a *"residence may be built "to code," that does not mean it can withstand winds from extreme events such as tornadoes and major hurricanes. The purpose of a safe room or a wind shelter is to provide a space where you and your family can seek refuge that provides a high level of protection. To protect its occupants, a safe room must be built to withstand high winds and flying debris, even if the rest of the residence is severely damaged or destroyed."*

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to home owners will be for no more than $3,000 or 75% of cost, whichever is less
- Eligibility will be limited to individuals who own their home at the time of application
- The safe room or in-ground shelter must be constructed/installed in the primary residence of the applicant
- Each eligible homeowner can only receive one reimbursement, regardless of the number of shelters he/she may purchase/install
- In-ground shelters must meet requirements established in the National Performance Criteria for Tornado Shelters dated May 28, 1999.
- Safe Rooms must meet the requirements of FEMA Publication 320
- Safe Rooms and shelters must meet all applicable city and/or county codes
- Previously owned or used shelters will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Lakeside Tornado Mitigation Project #2** | Assist citizens with funding for purchase of Weather Alert Radios |
| **Mitigation Goal/Objective** | 4. Increase the effectiveness of warning systems in Tarrant County.<br>4. a. Increase the number of homes and businesses with Weather Alert Radios. |
| **Priority** | High |
| **Estimated Cost** | $2,000 (50 Weather Alert Radios at $40 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Private Sector Donations<br>• City Funds |
| **Potential Matching Funding Sources** | Citizen/Business Owner |

| | |
|---|---|
| **Responsible Agency** | • Lakeside Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings except for providing additional warning time of severe weather events thus allowing citizens more time to secure their home or business against approaching severe weather. |
| **Cost Effectiveness** | Cost Effective – Weather Alert Radios are a proven means to alert and warn citizens about severe weather and civil emergencies. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of Weather Alert Radios and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

***NOTE**: We are aware that Weather Alert Radios are on the "2007 Ineligible Planning Activities" list. It is our opinion that Weather Alert Radios should be considered eligible due to their very high benefit and very low cost.*

This project will reimburse 75% of the cost for citizens to purchase Weather Alert Radios, with the citizen responsible for the remaining 25%. Weather Alert Radios provide the best means for citizens to receive emergency alerts when they are indoors. Severe weather is the primary hazard in our area. Early alert and warning has proven to be a significant factor in saving lives during severe weather events.

In addition, the Weather Alert Radios can be activated for civil emergencies such as hazardous materials incidents. Effective warning saves lives, especially during severe weather events. Weather alert radios provide a proven means of indoor warning to citizens any time of the day or night and compose the vital indoor portion of our emergency warning system.

Warning systems have been shown to have value beyond the initial warning. Persons receiving warning relay the information to family and friends to ensure they are aware of the hazard. The secondary and tertiary warning can greatly amplify the effectiveness of the warning system.

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to citizens will be for no more than $30 or 75% of cost of the radio, whichever is less
- Eligibility will be limited to residents of Lakeside
- The citizen must sign an agreement to keep the radio operational
- Each eligible homeowner can only receive one reimbursement, regardless of the number of radios purchased
- Previously purchased radios will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**WILDFIRE**

Moderate Vulnerability - Tarrant County has been cited as having more undeveloped land than any other urban county in the United States. The relatively large rural-urban interface has resulted in significant wildfires. Area fire departments are working to educate home and business owners on means to reduce their exposure to wildfires such as keeping grass mowed, planting fire resistant vegetation, removing wood roofing shingles, etc.

Location - Areas in the east and west parts of Lakeside are subject to wildfires. Lakeside still has many open undeveloped areas with significant brush and tree cover. The areas of most concern are the northwest, southwest, and southeast portions of the county.

Extent - The effects of wildfire are deaths, injuries, loss of structures, loss of wildlands, and loss of wildlife habitat.

Previous Occurrences – There are no reports of wildfire in Lakeside.

Probability of Future Events - Wildfires are likely to occur annually and increase in frequency and severity as the population continues to increase and formally rural areas are developed.

Impact - Wildfires can result in the need for rapid evacuations, casualties, loss of homes and businesses, and loss of wildlife habitat and recreational areas.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Lakeside Wildfire Mitigation Action #1** | Increase public education on how to reduce the risks from wildfires (construction, landscaping, etc.) |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | High |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Lakeside Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will reduce the effects of wildfire on new buildings through increased use of wildfire mitigation measures. |
| **Effect on Existing Buildings** | This action will reduce the effects of wildfire on existing buildings through increased use of wildfire mitigation measures. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing the effects of wildfire. |
| **Discussion:** Wildfire mitigation measures are not widely known in urban areas such as Tarrant County. This action will increase that knowledge and reduce casualties and damages from wildfires. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Lakeside Wildfire Mitigation Action #2** | Enact building permit process that encourages wildfire resistant construction. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |

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|---|---|
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | Lakeside Building Official |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will reduce the vulnerability of new structure to wildfire. |
| **Effect on Existing Buildings** | This action will reduce the vulnerability of existing buildings to wildfire if they are remodeled to the extent a building permit is required. |
| **Cost Effectiveness** | Cost Effective – This action will integrate wildfire mitigation into the building process at minimal cost. |
| **Discussion:** Integrating mitigation into building permitting provides a process to reduce vulnerability with few negative impacts. | |

**Texas Standards That Exceed 44 CFR Requirements: Local Capability Assessments**

MAP 1

Projects funded under the following programs. Address the type of project that was funded. If you did not receive money from one of the below grants programs, then state that.

1.1: Hazard Mitigation Grant Program - None
1.2: Pre-Disaster Mitigation Grant Program - None
1.3: Project Impact - None
1.4: Hurricane-Property Protection Mitigation - None
1.5: Flood Mitigation Assistance - None
1.6: 406 Mitigation (through the Public Assistance Program) - None

MAP 2

Current Building Codes. Include the following information:

2.1: Date and type of code: 2003 International Building Code/2002 national Electrical Code
2.2: How is it being enforced? Plans submitted for review. Projects inspected on site.

MAP 3

Current Fire Codes. Include the following information:

3.1: Date and type of code: 2003 International Building Code
3.2: How is it being enforced?

- Plans are submitted for review
- Projects inspected on site
- Annual Fire Inspection

MAP 4

4.1: Any other codes, sub-division regulations, etc., that are in effect in your jurisdiction? No
4.2: How are they being enforced?

MAP 5

Floodplain Management. Include the following information:

5.1: Ordinance/Order Date: No

5.2: Do you have a Floodplain Administrator? No

5.3: Is the person a Certified Floodplain Manager (CFM)? No

5.4: Date of current floodplain maps. August 23, 2000

5.5: Any codes, regulations, etc. that prohibit development in the floodway and/or floodplain: No

MAP 6

Findings/results of Building Code Effectiveness Grading Report (BCEGS). Include date of report and score. No Report

MAP 7

Identify other plans that your jurisdiction has or have been done in your jurisdiction.

7.1: Capital Improvement Plans: None

7.2: Comprehensive Plans: None

7.3: Storm Water Management Plans: None

7.4: Master Drainage Plans: None

7.5: Corps of Engineers: None

7.6: Flood Mitigation Plan: None

7.7: Any other plans, studies, etc. that may have been done in your jurisdiction.

# City of Lake Worth

Jurisdiction Profile

Lake Worth has an area of 2.5 square miles and a NCTCOG 2007 Population Estimate of 4,850.

Lake Worth previously called Indian Oaks, is an incorporated residential community near the banks of Lake Worth on the outskirts of northwest Fort Worth on State Highway 199 in northwestern Tarrant County. In the mid-1920s the property of George T. Reynolds was sold by his widow, Lucinda, as a subdivision named Indian Oaks. Adjacent to Lake Worth, Indian Oaks became a popular residential and recreational spot during the late 1920s and early 1930s, offering casino play, a dance hall, a boardwalk, and a popular club called the Showboat. The Great Depression ended the recreational nature of Indian Oaks, but after World War II the residential neighborhood grew. In the early 1950s residents decided to incorporate and changed the name of the community to Lake Worth. The majority of the 2,000 residents worked in nearby Fort Worth. The population steadily increased with business growth in Tarrant County. In 1990 Lake Worth had a population of 4,591. In 2000 the population increased to 4,618. The estimated 2007 population is 4,850. With two new shopping centers and more than 700,000 square feet of new retail space announced or under construction, Lake Worth is one of the fastest growing commercial areas for its size in Tarrant County, Texas.

| 1990 | 2000 | 2006 | 2007 |
|---|---|---|---|
| 4,591 | 4,618 | 4,800 | 4,850 |
| 2007 Population Density (persons per square mile): 1,928.51 | | | |

City Point-Of-Contact

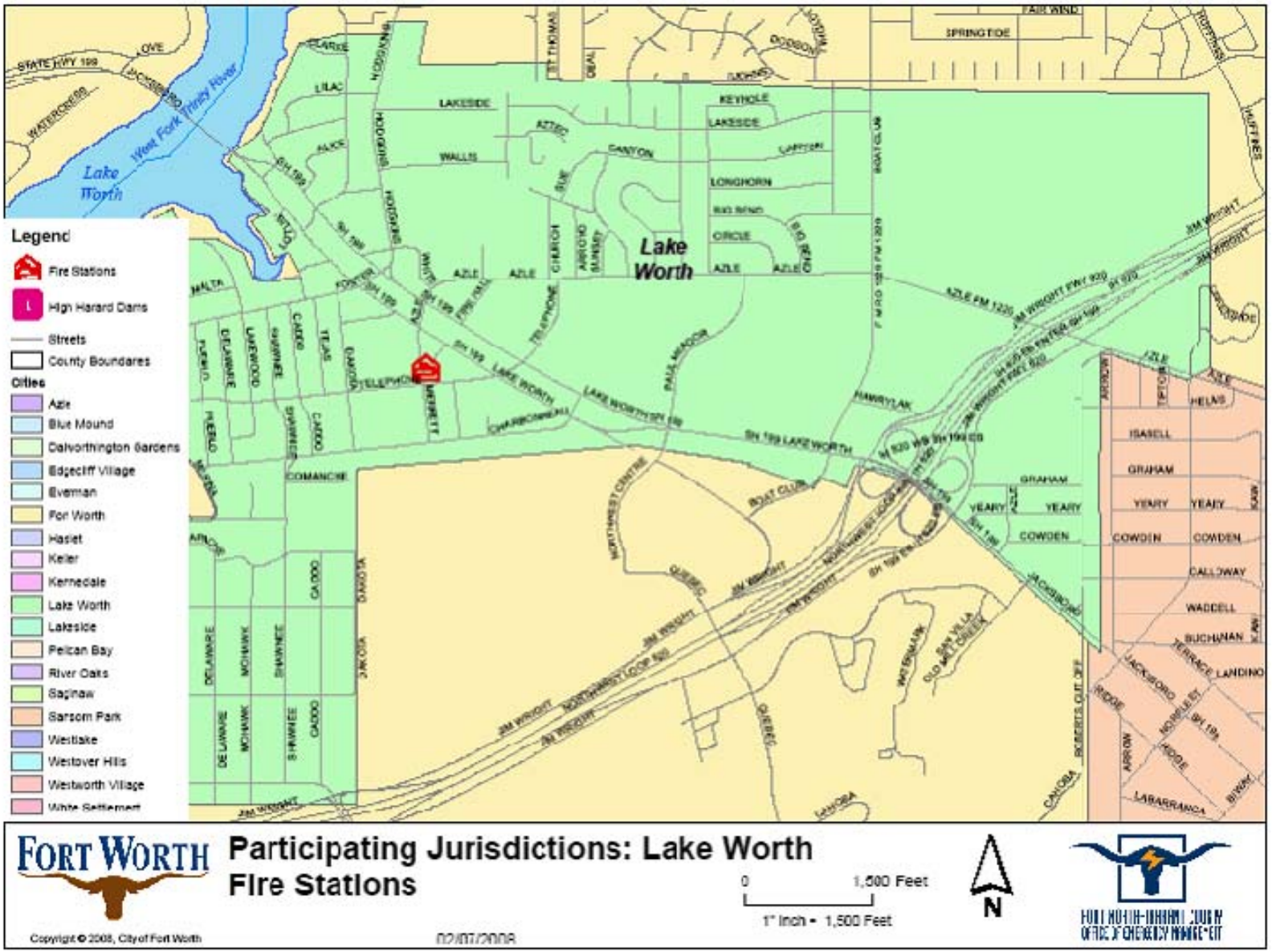
Mike Voorhies; Fire Marshal/Emergency Management Coordinator

Land Use and Development Trends

Lake Worth is a residential community with a growing retail/commercial sector. The City is land-locked and approximately 80% built-out (about 22 acres are still undeveloped). Commercial development along Texas Highway 199 has grown significantly over the past few years as the highway was re-routed at accommodate conversion to a limited access highway.

Jurisdiction Unique Hazards

Hazards specific to Lake Worth are discussed below.


Legend
Fire Stations
High Hazard Dams
Streets
County Boundaries
Cities
Azle
Blue Mound
Dalworthington Gardens
Edgecliff Village
Everman
Fort Worth
Haslet
Keller
Kennedale
Lake Worth
Lakeside
Pelican Bay
River Oaks
Saginaw
Sansom Park
Westlake
Westover Hills
Westworth Village
White Settlement
Lake Worth
West Fork Trinity River
FORT WORTH
Participating Jurisdictions: Lake Worth
Fire Stations
0
1,500 Feet
1" Inch = 1,500 Feet
N
Copyright © 2008, City of Fort Worth
02/07/2008

**DAM FAILURE**

Undetermined Vulnerability –There are no high hazard dams in Lake Worth. The nearest upstream high hazard dam is at Eagle Mountain Lake, approximately four miles from Lake Worth. Completion of inundation studies for all high-hazard dams in Tarrant County will determine whether Lake Worth is vulnerable to a failure of the Eagle Mountain Lake Dam.

**DROUGHT**

Low Vulnerability – Lake Worth provides water to its residents from five underground wells. These wells make Lake Worth less vulnerable to the effects of a drought than cities who rely on surface water supplies; however they are still vulnerable to drought.

Location – Drought can affect all of Lake Worth.

Current Extent – As of February 2008, Lake Worth was at DO – Abnormally Dry on the Palmer Drought Severity Index.

Previous Occurrences – National Climatic Data Center records indicate that in the past ten years there have been three periods of drought in Lake Worth, 1996 - 1998, 2000, and 2005 - 2006.

Probability of Future Events – Droughts are certain to occur again in Lake Worth. Significant droughts significantly affecting water supply and resulting in mandatory restrictions traditionally occur on a twenty year cycle. Based on the previously cited National Climatic Data Center recent records, we can anticipate that drought conditions will occur approximately every three years.

Impact – Drought can lead to loss of water for basic needs such as drinking and fire-fighting. Droughts are associated with increased wildfire and damage from expansive soils. More common impacts are damage to landscaping and reduced recreation due to low lake levels.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Lake Worth Drought Mitigation Action #1** | Participate in the design and implementation of the Tarrant County specific water conservation public education efforts to compliment existing programs. |
| **Mitigation Goal/Objective** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |

| | |
|---|---|
| **Potential Matching Funding Sources** | • City Funds<br>• Water Suppliers |
| **Responsible Agency** | • Lake Worth Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One year |
| **Effect on New Buildings** | This action will publicize water conservation efforts that can be incorporated into new construction. |
| **Effect on Existing Buildings** | This action will publicize water conservation efforts that can be incorporated into existing construction. |
| **Cost Effectiveness** | Cost Effective – Public education programs can provide significant results for relatively low costs. |
| **Discussion:** Most cities in the area have existing water conservation programs designed to educate the public and businesses on ways to conserve water. This action will develop a Tarrant County specific program that will compliment existing programs. Jurisdictional public education efforts have been very successful in attracting the attention of local citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Lake Worth Drought Mitigation Action #2** | 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. Impacts identified in this plan will be included in updates to the Hazard Mitigation Action Plan. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • City Funds<br>• Water Suppliers |
| **Responsible Agency** | Lake Worth Fire/Emergency Management |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will identify drought impacts in Lake Worth thus providing specific information for builders of new structures to incorporate drought mitigation into the structures. |

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| **Effect on Existing Buildings** | This action will identify drought impacts in Lake Worth thus providing specific information for owners of existing structures to incorporate drought mitigation into the structures. |
| **Cost Effectiveness** | Cost Effective – This planning effort will have a low cost with the potential for significant benefits for the entire community. |
| **Discussion:** This planning effort will focus attention on the effects of drought on the community. Specific drought effects will be identified and efforts can be made to mitigate those effects. | |

**EXPANSIVE SOILS**

Low Vulnerability - Expansive soils have caused damage to some structures in Lake Worth. However, damage has been limited to relatively small geographic areas and there are no reports of significant damage to commercial structures or infrastructure.

Location – Expansive soils are found in various areas of Lake Worth. We could not locate a map of expansive soils in Lake.

Extent – The extent of expansive soils in Lake Worth is believed to be Very Low (0% - 20%) to Low (21% - 50%).

Previous Occurrences – We could find no empirical data on previous occurrences of damage from expansive soils, but it is believed that expansive soils have caused problems since the first buildings were constructed in this area.

Probability of Future Events – Due to the variability of soil types and construction quality, it is very difficult to predict future occurrences of problems with expansive soils. However, a study published in the fall 2003 issue of *Environmental Geology* cited in the September 19, 2003 *Dallas Business Journal* indicates that many new developments in the Metroplex are being built on soil that is more unstable than soils built on prior to 1990. This could lead to a higher incidence of expansive soil related damage in the future.

Impact – The impact of expansive soils ranges from cosmetic cracks in walls to substantial foundation and structural damage that can result in the need to demolish the building. Infrastructure such as pipelines can be damaged causing increased maintenance and repairs, damaged beyond repair requiring replacement, damaged to the point of failure.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Lake Worth Expansive Soils Mitigation Action #1** | Improve construction techniques through building code enhancements. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |

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| **Priority** | Low |
| **Estimated Cost** | Undetermined (Minimal – Staff Time Only) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building permit fees |
| **Potential Matching Funding Sources** | • City Funds<br>• Building permit fees |
| **Responsible Agency** | Lake Worth Building Official |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will make new buildings more resistant to damage from expansive soils. |
| **Effect on Existing Buildings** | This action will require modifications to existing buildings to be more resistant to damage from expansive soils. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will improve construction quality and reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Lake Worth Expansive Soils Mitigation Action #2** | Educate construction contractors, home owners, and business owners about mitigation techniques. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building Permit Fees |
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | • Lake Worth building Official<br>• Lake Worth Fire/Emergency Management |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will provide builders of new construction with expansive soil mitigation techniques that will reduce damage. |
| **Effect on Existing Buildings** | This action will provide owners of existing buildings with expansive soil mitigation techniques that will reduce damage. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |

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| **Discussion:** This project will provide construction contractors and home/business owners with techniques designed to reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. |

**EXTREME HEAT**

High Vulnerability - Summer heat and humidity can occur anytime from May through October. Community health services actively work with at risk populations to prevent heat related deaths and injuries. The elderly, very young people and people with poor health are most at risk from summer heat. People who work outside or in un-air-conditioned buildings are also at high risk to the direct effects of summer heat. Summer heat can also lead to electrical service outages if equipment fails or demand exceeds available supply. Most public safety and special facilities are equipped with emergency generators.

Location - Throughout the City.

Extent - Summer temperatures can reach as high as 113 degrees. Lake Worth is also subject to high humidity.

Previous Occurrences - This is an annual occurrence. The summer of 1980 was a record year with 69 consecutive days of temperatures of 100 degrees or more. We were unable to find a reliable record of deaths or injuries related to heat.

Probability of Future Events - Hot summer temperatures are certain to continue to occur in Lake Worth.

Impact - Summer heat can cause widespread electrical outages resulting in dangerous conditions, especially for at-risk populations. Occasionally "cooling centers" are opened at community centers to provide a safe place for citizens to seek refuge from the heat. Extreme heat can have economic impacts if construction work is curtailed or outdoor special events are cancelled.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Lake Worth Extreme Heat Mitigation Action #1** | Determine feasibility of expanding monitoring of populations at risk from extreme heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined. Staff time and GIS resources |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Other State or Federal Public Health Grants |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Tarrant County Public Health<br>• Lake Worth Fire/Emergency Management |

| | |
|---|---|
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | None - This action is intended to expand monitoring of people only. |
| **Effect on Existing Buildings** | None - This action is intended to expand monitoring of people only. |
| **Cost Effectiveness** | Pending, but believed to be Cost Effective |
| **Discussion:** This action would determine the feasibility of expanding monitoring of populations at risk from extreme heat. Existing at risk population monitoring programs will be reviewed to ensure all known populations at risk from extreme heat are included. Any newly discovered at risk populations will be evaluated for inclusion in existing monitoring programs. Tarrant County Public Health provides public health services throughout the County. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Lake Worth Extreme Heat Mitigation Action #2** | Increase public education programs on the dangers of excessive heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness |
| **Priority** | Medium |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Other State or Federal Public Health Grants |
| **Responsible Agency** | • Tarrant County Public Health<br>• Lake Worth Fire/Emergency Management |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Effect on Existing Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits. |
| **Discussion:** Public education on severe weather in Lake Worth has traditionally focused on severe thunderstorms and associated hazards (tornadoes, lighting, flooding, high winds). This action would expand public education to include hazards from extreme heat. | |

**FLOOD**

High Vulnerability - The topography of Lake Worth combined with the frequency of severe thunderstorms results in frequent flash flood events. Homes and businesses near creeks and the lake are more vulnerable to flood events. FEMA records indicate only 39 Repetitive Loss Properties in all of Tarrant County. However, this is probably more a reflection of the low number of flood insurance polices than vulnerability to flooding.

Further analysis using GIS and field verification can specifically identify vulnerable structures.

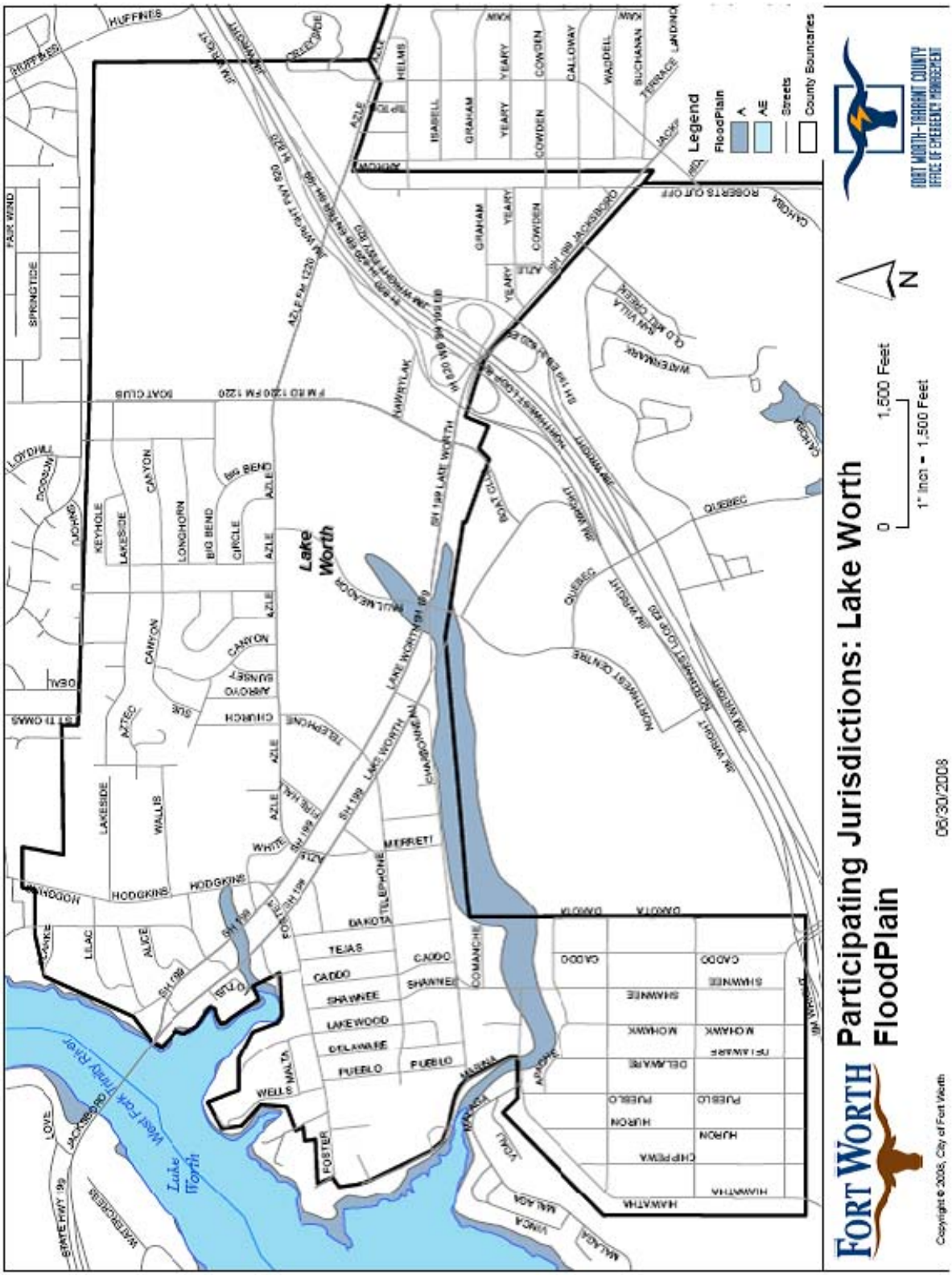
Location - Throughout the City along several small un-named creeks and drainage structures as well as flooding of lakefront property on Lake Worth (the lake, not the City).

Extent - Flash floods are the most common type of flooding in Lake Worth. The flash floods tend to occur and recede very quickly. Flooding along Lake Worth (the lake, not the City) can reach a depth of several feet in homes and businesses.

Previous Occurrences - Minor flooding occurs frequently, especially during the spring and early summer. In June of 2004 significant flooding occurred on several small un-named creeks, streets, and drainage structures.

Probability of Future Events – Based on previous experience Lake Worth is certain to suffer flash flood events every year. National Weather Service records indicate an average of 11 flash flood events per year in Tarrant County. Continued development throughout the County and the resulting increase in impervious cover will increase the likelihood and severity of flooding.

Impact - Flash floods kill more people than any other hazard associated with thunderstorms. Property damage from flash flooding is seldom covered by insurance, which makes it very difficult for citizens to recover from the flood. Due to the very rapid rate of development and growth throughout Tarrant County we are experiencing problems with determining actual building footprints within flood plains and will be using planimetric GIS data from the NCTCOG to resolve this issue when it becomes available. At that time we will be able to accurately identify the number and types of buildings vulnerable to flooding; as well as access other data associated with those locations such as appraised value, census data, and owner information.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FORT WORTH
FORT WORTH-TARRANT COUNTY
OFFICE OF EMERGENCY MANAGEMENT
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**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Lake Worth Flood Mitigation Project #1** | Participate in the development of the Tarrant County specific "Flood Preparedness" brochure. |
| **Hazard Addressed** | Flooding |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of Flood events.<br>1. c. Develop effective flood mitigation public education materials. |
| **Priority** | High |
| **Estimated Cost** | Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Private Foundation Grants |
| **Responsible Agency** | • Lake Worth Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This action will provide flood mitigation techniques for owners of new buildings. |
| **Effect on Existing Buildings** | This action will provide flood mitigation techniques for owners of existing buildings. |
| **Cost Effectiveness** | Cost Effective - This project will provide valuable information to the public in a relatively short time and with relatively low costs. It will also have the added benefit of increasing public awareness of mitigation. The estimated cost could easily be offset by reduced losses to the public in a single small flood event. |

**Discussion**: Develop Tarrant County specific "Flood Preparedness" brochure. Once developed, the brochure will be distributed County-Wide. Historically flood prone areas will be targeted for door-to-door distribution and neighborhood meetings to present the brochure and solicit input for *Fort Worth Hazard Mitigation Action Plan* revisions.

The brochure will include:

- Description of Tarrant County flood hazards
- "Case Studies" of previous flood events in Tarrant County
- Preparedness and "self-help" mitigation information
- Benefits of city participation in NFIP
- Advantages of flood insurance
- Risks of not having flood insurance
- Warnings that typical homeowner's insurance does not cover rising water
- Solicit input for the *Fort Worth Hazard Mitigation Action Plan*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Lake Worth Flood Mitigation Action #2** | Conduct city-wide drainage study and implement results. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Lake Worth Public Works<br>• Lake Worth Fire/Emergency Management |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will provide a basis for locating new buildings away from flood prone areas. |
| **Effect on Existing Buildings** | This action will provide guidance for protection of existing buildings from flooding. |
| **Cost Effectiveness** | Cost Effective – This project will provide guidance to reduce the hazard to life and property from flooding. |
| **Discussion:** This action will study drainage throughout Lake Worth and provide results that can reduce the adverse effects of flooding. | |

**HAILSTORM**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of large hail are a hazard event in Lake Worth. Tarrant County averages eleven significant thunderstorm events (large hail, high winds) per year according to National Weather Service records. Most structures in Lake Worth can resist the effects of all but the most severe hailstorms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to hailstorms. Vehicles have proven to be vulnerable to hailstorms with widespread severe vehicle damage reported in 1980 and 1995.

Location - Throughout the City.

Extent - Lake Worth is subject to the hazards of severe thunderstorms, including large hail. Hail stones up to the size of grapefruit (H9 on the Combined NOAA/TORRO Hailstorm Intensity Scales) have been reported in Tarrant County.

Previous Occurrences – May 5, 1995 - A severe thunderstorm produced baseball size hail that caused significant widespread roof and window damage.

March 28, 2000 - The thunderstorm that produced the F3 tornado that struck downtown Fort Worth passed directly over the City of Lake Worth just prior to the tornado forming. That storm produced grapefruit size hail that killed one person in Lake Worth.

Probability of Future Events - Thunderstorms with hail are certain to continue to occur in Lake Worth. Hail falls on about two or three days per year, ordinarily with only slight and scattered damage (*National Weather Service*).

Impact – The impact from hailstorms can be significant in extreme events such as the hailstorms of 1980 and 1995. Thousands of homes and vehicles can be damaged in a single storm with millions of dollars in damages. Vehicles are especially impacted by large hails with windshields being the vulnerable part. A recurring problem following hailstorms is broken windshields in vehicles belonging to populations who do not have vehicle insurance and cannot afford the replacements costs, resulting in the owners having difficulty traveling to work, medical appointments, etc.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Lake Worth Hailstorm Mitigation Action #1** | Develop a public education campaign to encourage "hail resistant" roofing in new construction and roof replacements. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• Building/Permit Fees<br>• City Funds |
| **Responsible Agency** | • Lake Worth Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will potentially decrease the damage caused by most hailstorms to new buildings. |
| **Effect on Existing Buildings** | This action will potentially decrease the damage caused by most hailstorms to existing buildings. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing hailstorm damage. One long term benefit will be reduced property insurance as claims related to hail damage are reduced. |
| **Discussion**: Public education has proven to be a low cost effective means to achieve changes public behavior. Encouraging hail resistant roofing can benefit citizens through reduced damage, business through reduced damage to their buildings and reduced claims against insurance companies, and government through reduced request for assistance. This campaign can be developed in conjunction with the Tarrant County effort. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Lake Worth Hailstorm Mitigation Action #2** | Evaluate City buildings to determine feasibility of installing hail resistant roofing and window coverings with a focus on critical infrastructure. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• City Funds |
| **Responsible Agency** | Lake Worth Building Official |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on new City buildings. |
| **Effect on Existing Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on existing City buildings. |
| **Cost Effectiveness** | Cost Effective – Although currently undetermined, this project is believed to be cost effective. |
| **Discussion:** Installing hail resistant roofing and window coverings on City buildings could prevent or limit damage to City buildings thus avoiding costs to the City as well as preventing or limiting loss of use of damaged facilities. | |

**HIGH WINDS**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of high winds are a hazard in Lake Worth. Tarrant County averages ten reported significant thunderstorm events (large hail, high winds) per year. In addition, strong weather fronts can sometimes be accompanied by high winds which occasionally cause damage. Most structures in Lake Worth can resist the effects of all but the most severe high wind events. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to high winds.

Location - Throughout the City.

Extent - Severe thunderstorms with high winds with speeds in excess of 90 mph have been reported in Lake Worth.

Previous Occurrences – We could find no records of significant high wind damage in Lake Worth.

Probability of Future Events – Based on previous experience Lake Worth can expect to experience an average of ten significant thunderstorm events with high winds per year.

Impact – Records on high wind events are difficult to separate from severe thunderstorm records. High winds in Lake Worth typically cause little damage to commercial buildings. More often high winds cause damage to roofs, trees, and signs.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Lake Worth High Winds Mitigation Action #1** | Enact enhanced building codes to reduce damages from high winds. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined – Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Lake Worth Building Official |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will potentially identify a means to reduce high wind damage on new buildings. |
| **Effect on Existing Buildings** | This action will potentially identify a means to reduce high wind damage on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Although costs are undetermined, this action is believed to be cost effective since the action will require staff time only. |
| **Discussion:** Enhanced building codes will reduce damages from high wind events. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Lake Worth High Winds Mitigation Action #2** | Educate builders and residents about mitigating wind damage. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |
| **Responsible Agency** | • Lake Worth Building Official<br>• Lake Worth Fire/Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |

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| **Effect on New Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on new buildings. |
| **Effect on Existing Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost of developing and providing high wind mitigation compared with savings to the community make this action cost effective. |
| **Discussion:** Public education has proven to be a low cost and effective means to achieve changes public behavior. High winds have not been a focus of severe weather preparedness. | |

**LANDSLIDES**

No Vulnerability - Although there is some relatively steep terrain in portions of Lake Worth, the relief is associated with rocky outcrops and not susceptible to landslides. There is no history of landslides in Lake Worth. Based on the lack of vulnerability, landslides will receive no further consideration in this plan for Lake Worth. However, landslide hazards will be reviewed during the annual review of this plan and we will continue looking for areas with landslide potential during hazard surveys.

**LEVEE FAILURE**

No Vulnerability – There are no levees or areas that would be affected by levee failure in Lake Worth. Based on the lack of vulnerability, levee failure will receive no further consideration in this plan for Lake Worth.

**LIGHTNING**

Moderate Vulnerability – Lightning is one of the most common hazards in Lake Worth. Thunderstorms (and by definition, lightning) occur an average of 30 – 50 days per year (*Oklahoma Climatological Survey*). Lightning is the second most common cause of weather-related deaths in Texas (*National Weather Service*). Lightning information is available only for Tarrant County on a county-wide basis.

Location – Throughout the City.

Extent – We could find no references to the average number of strikes per storm in Tarrant County. However, lightning is by definition associated with thunderstorms.

Previous Occurrences – Lake Worth experiences 30 – 50 thunderstorm days per year. From 1995 – 2004 one person was killed and five were injured by lightning in Tarrant County (*National Weather Service*). Throughout Texas 34 people were killed by lightning, there were 184 injuries, and an estimated 23 million dollars in damages due to lightning from 1995 - 2004 (*National Weather Service*).

Probability of Future Events – Based on past experience Lake Worth will experience 30 – 50 thunderstorm days each year. Some days will have more than one thunderstorm during a given thunderstorm day.

Impact – Although lightning is the second most common cause of storm related deaths in Texas, lightning deaths remain relatively rare. Lightning does cause property damage several times per year (we could not find statistical data to validate this observation).

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Lake Worth Lightning Mitigation Action #1** | Provide lightning mitigation materials with building permit packets. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Lake Worth Building Official |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will provide materials that will reduce the vulnerability of new buildings to lightning. |
| **Effect on Existing Buildings** | This action will provide materials that will reduce the vulnerability of existing buildings that are being remodeled to lightning. |
| **Cost Effectiveness** | Cost Effective – The low cost of this project would be offset by eliminating just one lightning caused building loss. |
| **Discussion:** Lightning mitigation materials will be included in all building permit packets distributed to builders or citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Lake Worth Lightning Mitigation Action #2** | Ensure all City critical infrastructure has adequate lightning mitigation in place and upgrade protection as necessary. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | $2,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |

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| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Lake Worth Building Official<br>• Lake Worth Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will ensure new City buildings that house critical infrastructure have adequate lightning mitigation. |
| **Effect on Existing Buildings** | This action will ensure existing critical infrastructure has adequate lightning mitigation. |
| **Cost Effectiveness** | Cost Effective – The destructive and sometimes capricious nature of lighting warrant the expense of this action compared with the benefits of avoiding damage to critical infrastructure. |
| **Discussion:** Review and confirmation of the adequacy of lightning protection systems in City buildings housing critical infrastructure is worthwhile considering the number of thunderstorms experienced in Lake Worth. | |

**SEVERE THUNDERSTORM**

High Vulnerability - Severe thunderstorms are the most common hazard in Lake Worth. From 1950 through August 2007 Tarrant County averaged eleven reported severe thunderstorm events county-wide per year. Most structures in Lake Worth can resist the effects of all but the most severe thunderstorms. Lake Worth has a number of mobile and manufactured home parks that are more vulnerable to the effects of thunderstorms than site built structures. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to thunderstorms.

Location - Throughout the City.

Extent - Lake Worth is subject to the hazards of severe thunderstorms including flash flooding, hail, high winds, lightning, and tornadoes.

Previous Occurrences - On May 5, 1995 a hail storm produced baseball size hail that caused significant roof and window damage. The storm that produced the F3 tornado that struck downtown Fort Worth on March 28, 2000 produced grapefruit sized hail in Lake Worth killing one person. On June 1, 2004 a line of severe thunderstorms produced high winds and torrential rains. Electrical service was lost over much of the City and several areas suffered flash flooding with some damages to homes and businesses..

Probability of Future Events – Severe thunderstorms will occur in Lake Worth an average of eleven times per year.

Impact – A single severe thunderstorm can cause damage from hail, high winds, lightning, and/or tornadoes to thousands of structures.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Lake Worth Severe Thunderstorm Mitigation Project #1** | Conduct technical assessment to determine the feasibility of structurally hardening the Lake Worth Fire Station located at 3801 Fire Hall Drive against severe weather. |
| **Hazard Addressed** | Tornado/Severe Thunderstorm |
| **Mitigation Goal/Objective** | 2. Reduce loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | High |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • Private Foundation Grants<br>• Other State or Federal Grants<br>• City Funds |
| **Responsible Agency** | • Lake Worth Building Official<br>• Lake Worth Fire/Emergency Management |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This project will determine the feasibility of structurally hardening the Lake Worth Fire Station against severe weather. |
| **Effect on Existing Buildings** | This project will determine the feasibility of structurally hardening the Lake Worth Fire Station against severe weather. |
| **Cost Effectiveness** | Cost Effective - This project will provide the basis for a realistic cost benefit analysis of the feasibility of hardening the Lake Worth Fire Station against severe weather events. The relatively low cost of this project compared with the potential benefits of protecting a city's emergency response equipment against the jurisdiction's most likely hazard event result in a favorable cost benefit review. |

**Discussion:**
This project will provide for determining the feasibility of hardening the city's only fire station against severe weather. This project will contribute to protecting emergency response equipment so that it will be available to assist the citizens of Lake Worth in responding to and recovering from severe weather or other events. Final project details will be developed in accordance with grant requirements at the time the project is funded.

The cost estimate is a conservative "best guess" based on a structural analysis of the existing fire station. That analysis would require:

- Structural analysis of the building by a Structural Engineer
- Analysis of electrical systems
- Analysis of HVAC systems
- Review of building codes

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Lake Worth Severe Thunderstorm Mitigation Action #2** | Encourage builders to install storm resistant construction such as "hurricane clips". |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | High |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |
| **Responsible Agency** | Lake Worth Building Official |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will encourage storm resistant construction in new buildings. |
| **Effect on Existing Buildings** | This action will encourage storm resistant construction in existing buildings as they are remodeled. |
| **Cost Effectiveness** | Cost Effective – The low cost of this action will be offset by a reduction in damage from severe thunderstorms. |
| **Discussion:** Effective education on storm resistant construction can reduce damage from severe thunderstorms. Insurance companies may be willing to fund or provide educational materials and/or provide discounts to persons who install storm resistant devices. | |

**SEVERE WINTER STORMS**

Moderate Vulnerability - Since 2000 the National Weather Service has reported 14 Winter Storm/Ice events. Winter storms in Lake Worth usually consist of short-lived icing events (ice on the roads for a few hours) that primarily affect traffic and cause numerous motor vehicle accidents. Occasionally an ice storm will cause widespread

power outages for as long as several days. ONCOR Electric Delivery has an aggressive tree trimming program. Most structures in Lake Worth can resist the effects of all but the most severe winter storms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to winter storms. Electrical service outages are usually the most serious threat in this area. Most public safety and special facilities are equipped with generators.

Location - Throughout the City.

Extent - Severe ice storms have resulted in accumulations in excess of two inches. Most storms leave only a light coating or glaze of ice.

Previous Occurrences – Severe Winter Storms are typically regional events. Lake Worth averaged two winter storms per year since 2000. Most winter storms resulting only minor inconveniences and a few motor vehicle accidents.

In 1978 up to an inch of ice coated area trees and roadways causing $14 million in damages region-wide and making travel almost impossible for two days.

In 1996 a winter storm dropped two to four inches of a mixture of sleet, freezing rain, and snow in Lake Worth over Thanksgiving weekend causing many motor vehicle accidents and some electrical service outages.

In 2003 a winter storm dropped one inch of sleet across Lake Worth resulting in numerous motor vehicle accidents and closing schools for two days.

Probability of Future Events - Lake Worth can expect to experience two winter storms per year with a severe winter storm once each ten years.

Impact - Winter storms can cause widespread electrical and telephone service outages, make travel dangerous or impossible, and damage structures. Deaths and injuries due to vehicle accidents and slips/falls are common during ice storms. Occasional deaths and injuries from carbon monoxide poisoning due to improper heating have occurred. Economic losses due to lost production can be significant. Damage from frozen pipes can lead to significant expenses for homeowners.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Lake Worth Severe Winter Storm Mitigation Action #1** | Increase public education concerning winter storm preparedness and mitigation. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | Medium |
| **Estimated Cost** | $1,000 |

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| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Lake Worth Fire/Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into new buildings. |
| **Effect on Existing Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost is effective when compared to benefits provided to citizens. |
| **Discussion:** Winter weather preparedness has not been emphasized in Lake Worth as much as severe thunderstorms. This action will provide preparedness information to citizens during the fall. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Lake Worth Severe Winter Storm Mitigation Action #2** | Purchase additional street sanding capacity |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Lake Worth Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will have no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Sanding streets is essential to allow emergency vehicles to respond during severe winter events. |
| **Discussion:** Sanding equipment can be mounted on existing equipment to provide sanding capabilities. During severe winter weather events streets around hospitals, fire stations and other critical facilities are sanded along with major intersections and roadways. Additional sanding capacity would allow for quicker sanding of these areas and for more repeat sanding during prolonged winter weather events. This will improve public safety by facilitating emergency response as well as reducing motor vehicle accidents. | |

**STREAM BANK EROSION**

No Vulnerability - The predominantly low rolling topography of Lake Worth prevents stream bank erosion from causing a hazard except in a few locations. No vulnerability to stream bank erosion has been identified in Lake Worth. Further analysis using GIS and field verification will continue to search for vulnerable structures or facilities.

**TORNADO**

High Vulnerability – All structures in Lake Worth are vulnerable to tornadoes. Lake Worth has a number of mobile and manufactured home parks that are particularly vulnerable to tornadoes. Very few structures can withstand the effects of an F5 tornado. However, the March 28, 2000 F3 tornado that struck Fort Worth provided good evidence that well built structures can protect people who take appropriate shelter inside those buildings.

Location - Tornadoes can occur anywhere in Lake Worth.

Extent – Lake Worth is subject to tornadoes of all magnitudes, including F5 tornadoes.

Previous Occurrences - Lake Worth has not experienced significant damage from a tornado. The storm that produced the F3 tornado that struck downtown Fort Worth on March 28, 2000 passed directly over Lake Worth just before the tornado formed.

Probability of Future Events - Tarrant County has averaged one reported tornado per year and can expect that average to continue. Lake Worth, based on its relatively small size, will likely experience tornados very infrequently.

Impact - Tornadoes can cause deaths, injuries and property damage/destruction. Special facilities such as hospitals, fire stations, and utilities can be damaged or destroyed. Citizens who live in neighborhoods struck by tornadoes can experience disruption of their life styles and traditions. Areas struck by tornadoes can experience increased demand for mental health services as people deal with grief and stress.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Lake Worth Tornado Mitigation Project #1** | Assist citizens with funding for building tornado safe rooms or in-ground shelters. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction |
| **Priority** | High |
| **Estimated Cost** | $140,000 (35 Safe Rooms at $4,000 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Community Development Block Grant Funds |
| **Potential Matching Funding Sources** | Home/Building Owner |
| **Responsible Agency** | • Lake Worth Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |

| | |
|---|---|
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This project will encourage new buildings to be constructed with tornado safe rooms as part of the construction process. The safe room will enhance the overall storm resistance of the building. |
| **Effect on Existing Buildings** | This project will encourage homeowners to construct/install tornado safe rooms in their existing homes. A safe room will enhance the overall storm resistance of the building. |
| **Cost Effectiveness** | Cost Effective - Safe rooms and in-ground shelters have been proven to reduce deaths and injuries during tornadoes and severe thunderstorms. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of safe rooms and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

**Discussion:**
This project will reimburse costs associated with tornado safe room or in-ground shelter installation in new or existing homes. Safe rooms provide increased protection for citizens during severe thunderstorms and tornados. Safe rooms have been proven to save lives and reduce injuries from severe weather events. FEMA publication 320 (*Taking Shelter from the Storm, Building a Safe Room Inside Your House*) provides the standards for safe rooms. As stated on the FEMA website: Although a *"residence may be built "to code," that does not mean it can withstand winds from extreme events such as tornadoes and major hurricanes. The purpose of a safe room or a wind shelter is to provide a space where you and your family can seek refuge that provides a high level of protection. To protect its occupants, a safe room must be built to withstand high winds and flying debris, even if the rest of the residence is severely damaged or destroyed."*

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to home owners will be for no more than $3,000 or 75% of cost, whichever is less
- Eligibility will be limited to individuals who own their home at the time of application
- The safe room or in-ground shelter must be constructed/installed in the primary residence of the applicant
- Each eligible homeowner can only receive one reimbursement, regardless of the number of shelters he/she may purchase/install
- In-ground shelters must meet requirements established in the National Performance Criteria for Tornado Shelters dated May 28, 1999.
- Safe Rooms must meet the requirements of FEMA Publication 320
- Safe Rooms and shelters must meet all applicable city and/or county codes
- Previously owned or used shelters will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Lake Worth Tornado Mitigation Project #2** | Assist citizens with funding for purchase of Weather Alert Radios |
| **Mitigation Goal/Objective** | 4. Increase the effectiveness of warning systems in Tarrant County.<br>4. a. Increase the number of homes and businesses with Weather Alert Radios. |
| **Priority** | High |
| **Estimated Cost** | $4,000 (100 Weather Alert Radios at $40 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Private Sector Donations<br>• City Funds |
| **Potential Matching Funding Sources** | Citizen/Business Owner |

| | |
|---|---|
| **Responsible Agency** | • Lake Worth Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings except for providing additional warning time of severe weather events thus allowing citizens more time to secure their home or business against approaching severe weather. |
| **Cost Effectiveness** | Cost Effective – Weather Alert Radios are a proven means to alert and warn citizens about severe weather and civil emergencies. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of Weather Alert Radios and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

***NOTE**: We are aware that Weather Alert Radios are on the "2007 Ineligible Planning Activities" list. It is our opinion that Weather Alert Radios should be considered eligible due to their very high benefit and very low cost.*

This project will reimburse 75% of the cost for citizens to purchase Weather Alert Radios, with the citizen responsible for the remaining 25%. Weather Alert Radios provide the best means for citizens to receive emergency alerts when they are indoors. Severe weather is the primary hazard in our area. Early alert and warning has proven to be a significant factor in saving lives during severe weather events.

In addition, the Weather Alert Radios can be activated for civil emergencies such as hazardous materials incidents. Effective warning saves lives, especially during severe weather events. Weather alert radios provide a proven means of indoor warning to citizens any time of the day or night and compose the vital indoor portion of our emergency warning system.

Warning systems have been shown to have value beyond the initial warning. Persons receiving warning relay the information to family and friends to ensure they are aware of the hazard. The secondary and tertiary warning can greatly amplify the effectiveness of the warning system.

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to citizens will be for no more than $30 or 75% of cost of the radio, whichever is less
- Eligibility will be limited to residents of Lake Worth
- The citizen must sign an agreement to keep the radio operational
- Each eligible homeowner can only receive one reimbursement, regardless of the number of radios purchased
- Previously purchased radios will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**WILDFIRE**

Moderate Vulnerability - Lake Worth has a significant amount of rural-urban interface that is subject to wildfires.

Location - The areas of most concern are along several small un-named creeks and around Lake Worth (the lake, not the City). These areas have areas of rural-urban interface. Access to fight wildfires is often difficult due to thick trees and undergrowth, semi-swampy terrain, and lack of roads.

Extent - The effects of wildfire are deaths, injuries, loss of structures, loss of wildlands, and loss of wildlife habitat.

Previous Occurrences - Wildfires in Lake Worth are typically associated with droughts. A number of wildfires occurred during the droughts from 1996 - 1998, 2000, and from 2005 - 2006.

Probability of Future Events - Wildfires are likely to occur annually and increase in frequency and severity as the population continues to increase and formally rural areas are developed.

Vulnerability - Homes are most vulnerable to wildfires. The tendency to locate homes on tree covered lots and lack of fire breaks (such as parking lots around businesses) can enable fires to spread more easily to homes. Special facilities tend to be less vulnerable due to construction type (brick or metal).

Impact - Wildfires can result in the need for rapid evacuations, casualties, loss of homes and businesses, and loss of wildlife habitat and recreational areas.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Lake Worth Wildfire Mitigation Action #1** | Increase public education on how to reduce the risks from wildfires (construction, landscaping, etc.) |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | High |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Lake Worth Fire/Emergency Management |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will reduce the effects of wildfire on new buildings through increased use of wildfire mitigation measures. |
| **Effect on Existing Buildings** | This action will reduce the effects of wildfire on existing buildings through increased use of wildfire mitigation measures. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing the effects of wildfire. |
| **Discussion:** Wildfire mitigation measures are not widely known in urban areas such as Tarrant County. This action will increase that knowledge and reduce casualties and damages from wildfires. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
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| **Lake Worth Wildfire Mitigation Action #2** | Enact building permit process that encourages wildfire resistant construction. |

| | |
|---|---|
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | • Lake Worth Building Official<br>• Lake Worth Fire/Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will reduce the vulnerability of new structure to wildfire. |
| **Effect on Existing Buildings** | This action will reduce the vulnerability of existing buildings to wildfire if they are remodeled to the extent a building permit is required. |
| **Cost Effectiveness** | Cost Effective – This action will integrate wildfire mitigation into the building process at minimal cost. |
| **Discussion:** Integrating mitigation into building permitting provides a process to reduce vulnerability with few negative impacts. | |

**Existing Hazard Mitigation Efforts**
Lake Worth has an outdoor warning system (sirens).

**Texas Standards That Exceed 44 CFR Requirements: Local Capability Assessments**
MAP 1
Projects funded under the following programs. Address the type of project that was funded. If you did not receive money from one of the below grants programs, then state that.
1.1: Hazard Mitigation Grant Program - None
1.2: Pre-Disaster Mitigation Grant Program - None
1.3: Project Impact - None
1.4: Hurricane-Property Protection Mitigation - None
1.5: Flood Mitigation Assistance - None
1.6: 406 Mitigation (through the Public Assistance Program) - None

MAP 2
Current Building Codes. Include the following information:
2.1: Date and type of code: 2003 International Building Code/2002 national Electrical Code
2.2: How is it being enforced? Plans submitted for review. Projects inspected on site.

MAP 3
Current Fire Codes. Include the following information:

3.1: Date and type of code: 2003 International Building Code
3.2: How is it being enforced?

- Plans are submitted for review
- Projects inspected on site
- Annual Fire Inspection

MAP 4

4.1: Any other codes, sub-division regulations, etc., that are in effect in your jurisdiction? No
4.2: How are they being enforced?

MAP 5

Floodplain Management. Include the following information:
5.1: Ordinance/Order Date: Ordinance #1985-358, Adopted 1985
5.2: Do you have a Floodplain Administrator? Yes
5.3: Is the person a Certified Floodplain Manager (CFM)? Yes
5.4: Date of current floodplain maps. August 23, 2000
5.5: Any codes, regulations, etc. that prohibit development in the floodway and/or floodplain: Ordinance 1985-358

MAP 6

Findings/results of Building Code Effectiveness Grading Report (BCEGS). Include date of report and score. Not applicable

MAP 7

Identify other plans that your jurisdiction has or have been done in your jurisdiction.
7.1: Capital Improvement Plans: None
7.2: Comprehensive Plans: Adopted in 2005
7.3: Storm Water Management Plans: Partial Plan
7.4: Master Drainage Plans: Partial Plan
7.5: Corps of Engineers: USACE Evaluation of Comanche Creek Re-Channelization Plan
7.6: Flood Mitigation Plan: None
7.7: Any other plans, studies, etc. that may have been done in your jurisdiction.
USACE Evaluation of Comanche Creek Re-Channel Plan

# City of Pelican Bay

Jurisdiction Profile

Pelican Bay has an area of 0.6 square miles and 2007 NCTCOG population estimate of 1,800.

Pelican Bay is a small resort community that developed along Eagle Mountain Lake in the northwestern corner of Tarrant County and about seventeen miles northwest of Fort Worth. The town existed in the 1970s and incorporated in 1981. Local government consisted of a mayor and city council. In the 1980s Pelican Bay had a Baptist church and a store. A boat ramp served fishermen in the area. In 1990 the community had a population of 1,271. That figure increased to 1,505 in 2000 (*The Handbook of Texas Online*).

| 1990 | 2000 | 2006 | 2007 |
|---|---|---|---|
| 1,271 | 1,505 | 1,750 | 1,800 |
| 2007 Population Density (persons per square mile): 2,621.50 | | | |

City Point-Of-Contact

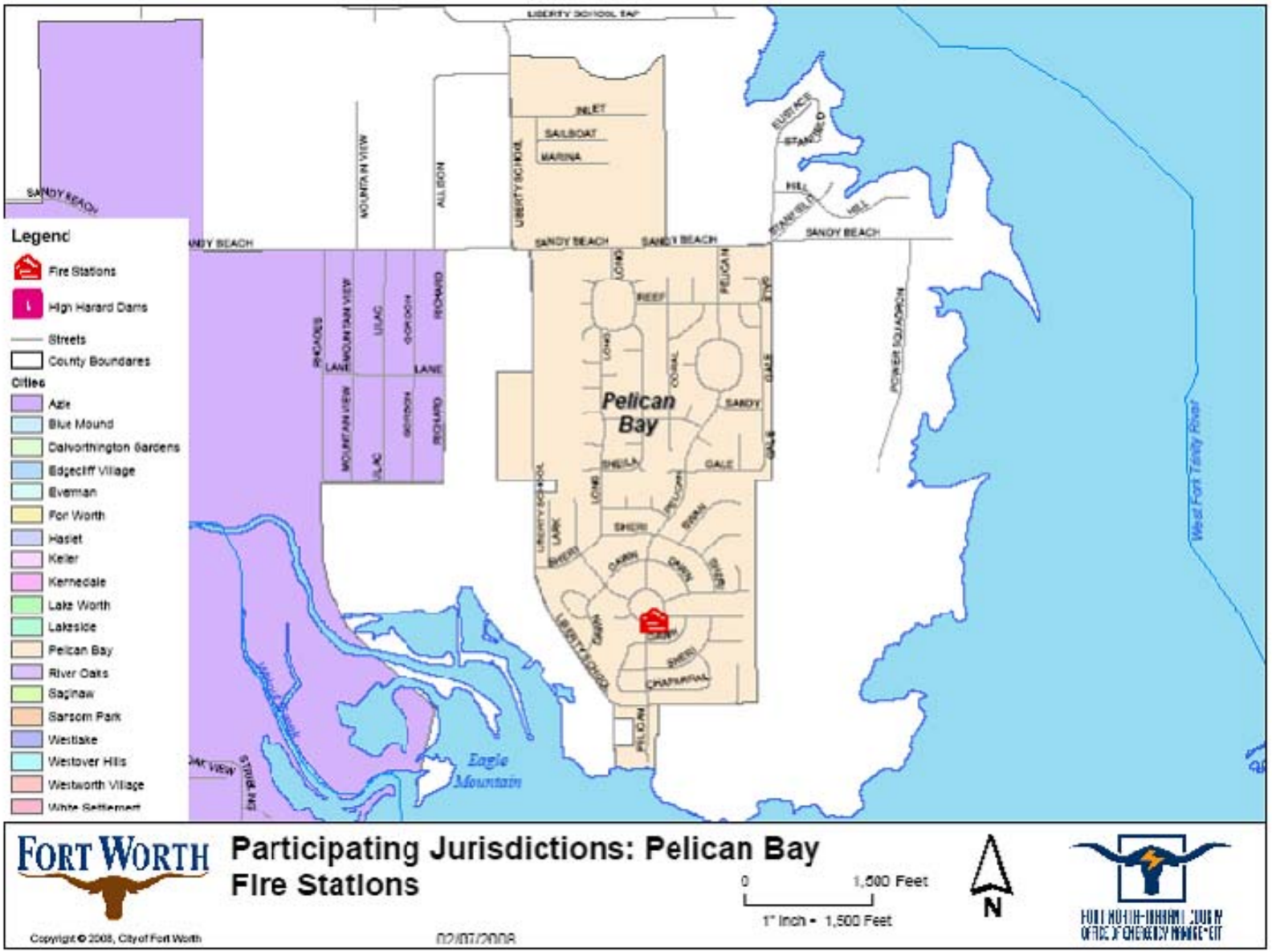
Paul Steetzel; Assistant Chief, Pelican Bay Fire Department

Land Use and Development Trends

Pelican Bay is mostly residential with few commercial buildings. It is growing slowly and is approximately 80% built-out.

Jurisdiction Unique Hazards

Hazards specific to Pelican Bay are discussed below.


Legend
Fire Stations
High Hazard Dams
Streets
County Boundaries
Cities
Azle
Blue Mound
Dalworthington Gardens
Edgecliff Village
Everman
Fort Worth
Haslet
Keller
Kennedale
Lake Worth
Lakeside
Pelican Bay
River Oaks
Saginaw
Sansom Park
Westlake
Westover Hills
Westworth Village
White Settlement
Pelican Bay
Eagle Mountain
West Fork Trinity River
SANDY BEACH
INLET
SAILBOAT
MARINA
FORT WORTH
Participating Jurisdictions: Pelican Bay
Fire Stations
0
1,500 Feet
1" Inch = 1,500 Feet
N
Copyright © 2008, City of Fort Worth
02/07/2008

**DAM FAILURE**

No Vulnerability – There are no high hazard dams located in Pelican Bay and none that would affect Pelican Bay if they failed. Based on the lack of vulnerability, dam failure will receive no further consideration in this plan for Pelican Bay.

**DROUGHT**

Low Vulnerability – Pelican Bay provides water to its residents from five underground wells. These wells make Pelican Bay less vulnerable to the effects of a drought than cities who rely on surface water supplies

Location – Drought can affect all of Pelican Bay.

Current Extent – As of February 2008, Pelican Bay was at DO – Abnormally Dry on the Palmer Drought Severity Index.

Previous Occurrences – National Climatic Data Center records indicate that in the past ten years there have been three periods of drought in Pelican Bay, 1996 - 1998, 2000, and 2005 - 2006.

Probability of Future Events – Droughts are certain to occur again in Pelican Bay. Significant droughts significantly affecting water supply and resulting in mandatory restrictions traditionally occur on a twenty year cycle. Based on the previously cited National Climatic Data Center recent records, we can anticipate that drought conditions will occur approximately every three years.

Impact – Drought can lead to loss of water for basic needs such as drinking and fire-fighting. Droughts are associated with increased wildfire and damage from expansive soils. More common impacts are damage to landscaping and reduced recreation due to low lake levels.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Pelican Bay Drought Mitigation Action #1** | Participate in the design and implementation of the Tarrant County specific water conservation public education efforts to compliment existing programs. |
| **Mitigation Goal/Objective** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • City Funds<br>• Water Suppliers |

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|---|---|
| **Responsible Agency** | • Pelican Bay Fire Department<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One year |
| **Effect on New Buildings** | This action will publicize water conservation efforts that can be incorporated into new construction. |
| **Effect on Existing Buildings** | This action will publicize water conservation efforts that can be incorporated into existing construction. |
| **Cost Effectiveness** | Cost Effective – Public education programs can provide significant results for relatively low costs. |
| **Discussion:** Most cities in the area have existing water conservation programs designed to educate the public and businesses on ways to conserve water. This action will develop a Tarrant County specific program that will compliment existing programs. Jurisdictional public education efforts have been very successful in attracting the attention of local citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Pelican Bay Drought Mitigation Action #2** | 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. Impacts identified in this plan will be included in updates to the Hazard Mitigation Action Plan. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $2,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • City Funds<br>• Water Suppliers |
| **Responsible Agency** | • Pelican Bay Fire Department<br>• Fort Worth - Tarrant County OEM |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will identify drought impacts in Pelican Bay thus providing specific information for builders of new structures to incorporate drought mitigation into the structures. |

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|---|---|
| **Effect on Existing Buildings** | This action will identify drought impacts in Pelican Bay thus providing specific information for owners of existing structures to incorporate drought mitigation into the structures. |
| **Cost Effectiveness** | Cost Effective – This planning effort will have a low cost with the potential for significant benefits for the entire community. |
| **Discussion:** This planning effort will focus attention on the effects of drought on the community. Specific drought effects will be identified and efforts can be made to mitigate those effects. | |

**EXPANSIVE SOILS**

Low Vulnerability - Expansive soils have caused damage to some structures in Pelican Bay. However, damage has been limited to relatively small geographic areas and there are no reports of significant damage to commercial structures or infrastructure.

Location – Expansive soils are found in various areas of Pelican Bay. We could not locate a map of expansive soils in Pelican Bay.

Extent – The extent of expansive soils in Pelican Bay is believed to be Very Low (0% - 20%) to Low (21% - 50%).

Previous Occurrences – We could find no empirical data on previous occurrences of damage from expansive soils, but it is believed that expansive soils have caused problems since the first buildings were constructed in this area.

Probability of Future Events – Due to the variability of soil types and construction quality, it is very difficult to predict future occurrences of problems with expansive soils. However, a study published in the fall 2003 issue of *Environmental Geology* cited in the September 19, 2003 *Dallas Business Journal* indicates that many new developments in the Metroplex are being built on soil that is more unstable than soils built on prior to 1990. This could lead to a higher incidence of expansive soil related damage in the future.

Impact – The impact of expansive soils ranges from cosmetic cracks in walls to substantial foundation and structural damage that can result in the need to demolish the building. Infrastructure such as pipelines can be damaged causing increased maintenance and repairs, damaged beyond repair requiring replacement, damaged to the point of failure.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
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| **Pelican Bay Expansive Soils Mitigation Action #1** | Improve construction techniques through building code enhancements. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |

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| **Priority** | Low |
| **Estimated Cost** | Undetermined (Minimal – Staff Time Only) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building permit fees |
| **Potential Matching Funding Sources** | • City Funds<br>• Building permit fees |
| **Responsible Agency** | • Pelican Bay Building Inspector<br>• Pelican Bay Fire Department |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will make new buildings more resistant to damage from expansive soils. |
| **Effect on Existing Buildings** | This action will require modifications to existing buildings to be more resistant to damage from expansive soils. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will improve construction quality and reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Pelican Bay Expansive Soils Mitigation Action #2** | Educate construction contractors, home owners, and business owners about mitigation techniques. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building Permit Fees |
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | • Pelican bay Building Inspector |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will provide builders of new construction with expansive soil mitigation techniques that will reduce damage. |
| **Effect on Existing Buildings** | This action will provide owners of existing buildings with expansive soil mitigation techniques that will reduce damage. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |

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|---|
| **Discussion:** This project will provide construction contractors and home/business owners with techniques designed to reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. |

**EXTREME HEAT**

High Vulnerability - Summer heat and humidity can occur anytime from May through October. Community health services actively work with at risk populations to prevent heat related deaths and injuries. The elderly, very young people and people with poor health are most at risk from summer heat. People who work outside or in un-air-conditioned buildings are also at high risk to the direct effects of summer heat. Summer heat can also lead to electrical service outages if equipment fails or demand exceeds available supply. Most public safety and special facilities are equipped with emergency generators.

Location - Throughout the City.

Extent - Summer temperatures can reach as high as 113 degrees. Pelican Bay is also subject to high humidity.

Previous Occurrences - This is an annual occurrence. The summer of 1980 was a record year with 69 consecutive days of temperatures of 100 degrees or more. We were unable to find a reliable record of deaths or injuries related to heat.

Probability of Future Events - Hot summer temperatures are certain to continue to occur in Pelican Bay.

Impact - Summer heat can cause widespread electrical outages resulting in dangerous conditions, especially for at-risk populations. Occasionally "cooling centers" are opened at community centers to provide a safe place for citizens to seek refuge from the heat. Extreme heat can have economic impacts if construction work is curtailed or outdoor special events are cancelled.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Pelican Bay Extreme Heat Mitigation Action #1** | Determine feasibility of expanding monitoring of populations at risk from extreme heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined. Staff time and GIS resources |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Other State or Federal Public Health Grants |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Tarrant County Public Health<br>• Pelican Bay Fire Department |

| | |
|---|---|
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | None - This action is intended to expand monitoring of people only. |
| **Effect on Existing Buildings** | None - This action is intended to expand monitoring of people only. |
| **Cost Effectiveness** | Pending, but believed to be Cost Effective |
| **Discussion:** This action would determine the feasibility of expanding monitoring of populations at risk from extreme heat. Existing at risk population monitoring programs will be reviewed to ensure all known populations at risk from extreme heat are included. Any newly discovered at risk populations will be evaluated for inclusion in existing monitoring programs. Tarrant County Public Health provides public health services throughout the County. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Pelican Bay Extreme Heat Mitigation Action #2** | Increase public education programs on the dangers of excessive heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness |
| **Priority** | Medium |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Other State or Federal Public Health Grants |
| **Responsible Agency** | • Tarrant County Public Health<br>• Pelican Bay Fire Department |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Effect on Existing Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits. |
| **Discussion:** Public education on severe weather in Pelican Bay has traditionally focused on severe thunderstorms and associated hazards (tornadoes, lighting, flooding, high winds). This action would expand public education to include hazards from extreme heat. | |

**FLOOD**

High Vulnerability - The topography of Pelican Bay combined with the frequency of severe thunderstorms results in frequent flash flood events. Homes and businesses along creeks and on the lake shore are especially vulnerable. Homes in Pelican Bay are mostly mobile and manufactured homes which are more easily damaged by flood waters.

Further analysis using GIS and field verification can specifically identify vulnerable structures.

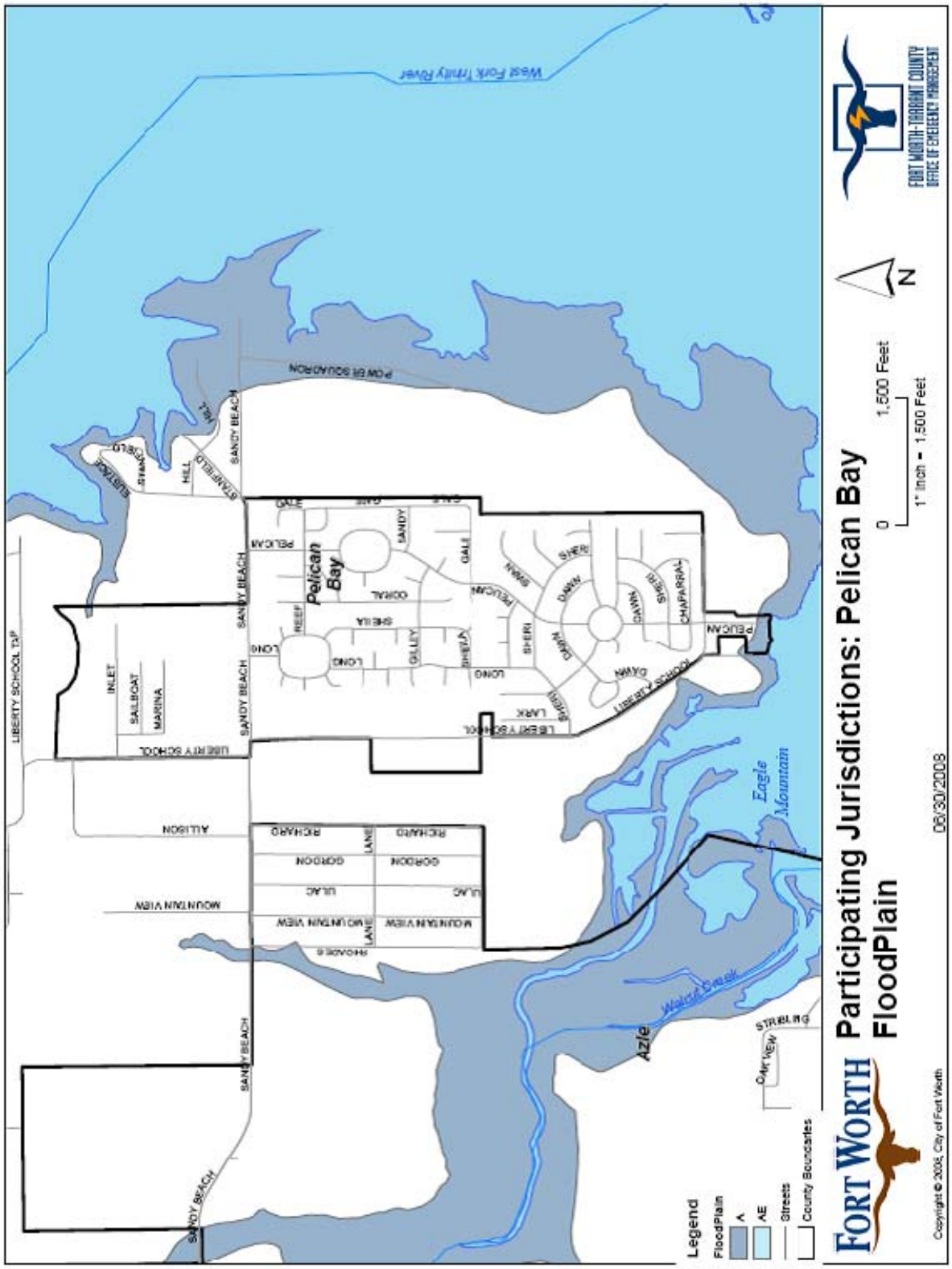
Location - Throughout the City along creeks and drainage structures as well as flooding of lakefront property on Eagle Mountain Lake. In addition, there have been isolated instances of overland flooding on high ground due to intense rainfall on saturated soil.

Extent - Flash floods are the most common type of flooding in Pelican Bay. The flash floods tend to occur and recede very quickly. Flooding along Eagle Mountain Lake can reach a depth of several feet in homes and businesses.

Previous Occurrences - Minor flooding occurs frequently, especially during the spring and early summer. In June of 2004 significant flooding occurred on creeks and around the lake causing minor damage.

Probability of Future Events – Based on previous experience Pelican Bay is certain to suffer flash flood events every year. National Weather Service records indicate an average of 11 flash flood events per year in Tarrant County. Continued development throughout the County and the resulting increase in impervious cover will increase the likelihood and severity of flooding.

Impact - Flash floods kill more people than any other hazard associated with thunderstorms. Property damage from flash flooding is seldom covered by insurance, which makes it very difficult for citizens to recover from the flood. Due to the very rapid rate of development and growth throughout Tarrant County we are experiencing problems with determining actual building footprints within flood plains and will be using planimetric GIS data from the NCTCOG to resolve this issue when it becomes available. At that time we will be able to accurately identify the number and types of buildings vulnerable to flooding; as well as access other data associated with those locations such as appraised value, census data, and owner information.


Participating Jurisdictions: Pelican Bay
FloodPlain
FORT WORTH
FORT WORTH-TARRANT COUNTY
OFFICE OF EMERGENCY MANAGEMENT
0
1,500 Feet
1" Inch = 1,500 Feet
N
06/30/2008
Copyright © 2008, City of Fort Worth
Legend
FloodPlain
A
AE
Streets
County Boundaries
West Fork Trinity River
Pelican Bay
Eagle Mountain
Walnut Creek
Azle
POWER SQUADRON
SANDY BEACH
LIBERTY SCHOOL
LIBERTY SCHOOL TAP
ALLISON
MOUNTAIN VIEW
INLET
SAILBOAT
MARINA
PELICAN
CORAL
SHEILA
GILLEY
LONG
REEF
GALE
SANDY
SHERI
DAWN
CHAPARRAL
LARK
RICHARD
GORDON
ULAC
LANE
STRIBLING
OAK VIEW

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Pelican Bay Flood Mitigation Project #1** | Participate in the development of the Tarrant County specific "Flood Preparedness" brochure. |
| **Hazard Addressed** | Flooding |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of Flood events.<br>1. c. Develop effective flood mitigation public education materials. |
| **Priority** | High |
| **Estimated Cost** | Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Private Foundation Grants |
| **Responsible Agency** | • Pelican Bay Fire Department<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This action will provide flood mitigation techniques for owners of new buildings. |
| **Effect on Existing Buildings** | This action will provide flood mitigation techniques for owners of existing buildings. |
| **Cost Effectiveness** | Cost Effective - This project will provide valuable information to the public in a relatively short time and with relatively low costs. It will also have the added benefit of increasing public awareness of mitigation. The estimated cost could easily be offset by reduced losses to the public in a single small flood event. |

**Discussion**: Develop Tarrant County specific "Flood Preparedness" brochure. Once developed, the brochure will be distributed County-Wide. Historically flood prone areas will be targeted for door-to-door distribution and neighborhood meetings to present the brochure and solicit input for *Fort Worth Hazard Mitigation Action Plan* revisions.

The brochure will include:

- Description of Tarrant County flood hazards
- "Case Studies" of previous flood events in Tarrant County
- Preparedness and "self-help" mitigation information
- Benefits of city participation in NFIP
- Advantages of flood insurance
- Risks of not having flood insurance
- Warnings that typical homeowner's insurance does not cover rising water
- Solicit input for the *Fort Worth Hazard Mitigation Action Plan*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Pelican Bay Flood Mitigation Action #2** | Conduct City wide drainage study and implement results. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined pending engineering analysis |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Pelican Bay Fire Department |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will provide guidance for locating new buildings away from flood prone areas. |
| **Effect on Existing Buildings** | This action will provide guidance for protection of existing buildings from flooding. |
| **Cost Effectiveness** | Cost Effective – This project will provide guidance to reduce the hazard to life and property from flooding. |
| **Discussion:** This action will develop a study of throughout Pelican Bay and provide findings that can reduce the adverse effects of flooding. | |

**HAILSTORM**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of large hail are a hazard event in Pelican Bay. Tarrant County averages eleven significant thunderstorm events (large hail, high winds) per year according to National Weather Service records. Hail stones up to the size of golf balls, high winds, and intense lightning have been reported in Pelican Bay. Most structures are mobile homes and more vulnerable to the effects of a hailstorm than site built structures. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to hailstorms. Vehicles have proven to be vulnerable to hailstorms with widespread severe vehicle damage reported in 1980 and 1995.

Location - Throughout the City.

Extent – Pelican Bay is subject to the hazards of severe thunderstorms, including large hail. Hail stones up to the size of golf balls (H5 on the Combined NOAA/TORRO Hailstorm Intensity Scales) have been reported in Tarrant County.

Previous Occurrences – There are no reports of significant hailstorm events in Pelican Bay other than the 1980 and 1995 county-wide events.

Probability of Future Events - Thunderstorms with hail are certain to continue to occur in Pelican Bay. Hail falls on about two or three days per year, ordinarily with only slight and scattered damage (*National Weather Service*).

Impact – The impact from hailstorms can be significant in extreme events such as the hailstorms of 1980 and 1995. Thousands of homes and vehicles can be damaged in a single storm with millions of dollars in damages. Vehicles are especially impacted by large hails with windshields being the vulnerable part. A recurring problem following hailstorms is broken windshields in vehicles belonging to populations who do not have vehicle insurance and cannot afford the replacements costs, resulting in the owners having difficulty traveling to work, medical appointments, etc.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Pelican Bay Hailstorm Mitigation Action #1** | Develop a public education campaign to encourage "hail resistant" roofing in new construction and roof replacements. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• Building/Permit Fees<br>• City Funds |
| **Responsible Agency** | • Pelican Bay Building Official<br>• Pelican Bay Fire Department |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will potentially decrease the damage caused by most hailstorms to new buildings. |
| **Effect on Existing Buildings** | This action will potentially decrease the damage caused by most hailstorms to existing buildings. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing hailstorm damage. One long term benefit will be reduced property insurance as claims related to hail damage are reduced. |
| **Discussion**: Public education has proven to be a low cost effective means to achieve changes public behavior. Encouraging hail resistant roofing can benefit citizens through reduced damage, business through reduced damage to their buildings and reduced claims against insurance companies, and government through reduced request for assistance. This campaign can be developed in conjunction with the Tarrant County effort. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Pelican Bay Hailstorm Mitigation Action #2** | Evaluate City buildings to determine feasibility of installing hail resistant roofing and window coverings with a focus on critical infrastructure. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• City Funds |
| **Responsible Agency** | Pelican Bay Building Official |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on new City buildings. |
| **Effect on Existing Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on existing City buildings. |
| **Cost Effectiveness** | Cost Effective – Although currently undetermined, this project is believed to be cost effective. |
| **Discussion:** Installing hail resistant roofing and window coverings on City buildings could prevent or limit damage to City buildings thus avoiding costs to the City as well as preventing or limiting loss of use of damaged facilities. | |

**HIGH WINDS**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of high winds are a hazard in Pelican Bay. Tarrant County averages ten reported significant thunderstorm events (large hail, high winds) per year. In addition, strong weather fronts can sometimes be accompanied by high winds which occasionally cause damage. Most structures in Pelican Bay are mobile homes and are more vulnerable to the effects of high winds than site built structures. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to high winds.

Location - Throughout the City.

Extent - Severe thunderstorms with high winds with speeds in excess of 60 mph have been reported in Pelican Bay.

Previous Occurrences – We could find no records of significant high wind damage in Pelican Bay.

Probability of Future Events – Based on previous experience Pelican Bay can expect to experience an average of ten significant thunderstorm events with high winds per year.

Impact – Records on high wind events are difficult to separate from severe thunderstorm records. High winds in Pelican Bay typically cause little damage to commercial buildings. More often high winds cause damage to roofs, trees, and signs.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Pelican Bay High Winds Mitigation Action #1** | Enact enhanced building codes to reduce damages from high winds. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined – Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Pelican bay Building Official |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will potentially identify a means to reduce high wind damage on new buildings. |
| **Effect on Existing Buildings** | This action will potentially identify a means to reduce high wind damage on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Although costs are undetermined, this action is believed to be cost effective since the action will require staff time only. |
| **Discussion:** Enhanced building codes will reduce damages from high wind events. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Pelican Bay High Winds Mitigation Action #2** | Educate builders and residents about mitigating wind damage. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |
| **Responsible Agency** | • Pelican Bay Building Official<br>• Pelican Bay Fire Department |
| **Estimated Completion Time Frame** | 9 Months |

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| **Effect on New Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on new buildings. |
| **Effect on Existing Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost of developing and providing high wind mitigation compared with savings to the community make this action cost effective. |
| **Discussion:** Public education has proven to be a low cost and effective means to achieve changes public behavior. High winds have not been a focus of severe weather preparedness. | |

**LANDSLIDES**

No Vulnerability - There is no history of landslides in Pelican Bay. Based on the lack of vulnerability, landslides will receive no further consideration in this plan for Pelican Bay. However, landslide hazards will be reviewed during the annual review of this plan and we will continue looking for areas with landslide potential during hazard surveys.

**LEVEE FAILURE**

No Vulnerability – There are no levees or areas that would be affected by levee failure in Pelican Bay. Based on the lack of vulnerability, levee failure will receive no further consideration in this plan for Pelican Bay.

**LIGHTNING**

Moderate Vulnerability – Lightning is one of the most common hazards in Pelican Bay. Thunderstorms (and by definition, lightning) occur an average of 30 – 50 days per year (*Oklahoma Climatological Survey*). Lightning is the second most common cause of weather-related deaths in Texas (*National Weather Service*). Lightning information is available only for Tarrant County on a county-wide basis.

Location – Throughout the City.

Extent – We could find no references to the average number of strikes per storm in Tarrant County. However, lightning is by definition associated with thunderstorms.

Previous Occurrences – Pelican Bay experiences 30 – 50 thunderstorm days per year. From 1995 – 2004 one person was killed and five were injured by lightning in Tarrant County (*National Weather Service*). Throughout Texas 34 people were killed by lightning, there were 184 injuries, and an estimated 23 million dollars in damages due to lightning from 1995 - 2004 (*National Weather Service*).

Probability of Future Events – Based on past experience Pelican Bay will experience 30 – 50 thunderstorm days each year. Some days will have more than one thunderstorm during a given thunderstorm day.

Impact – Although lightning is the second most common cause of storm related deaths in Texas, lightning deaths remain relatively rare. Lightning does cause property damage several times per year (we could not find statistical data to validate this observation).

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Pelican Bay Lightning Mitigation Action #1** | Provide lightning mitigation materials with building permit packets. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Pelican Bay Building Official |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will provide materials that will reduce the vulnerability of new buildings to lightning. |
| **Effect on Existing Buildings** | This action will provide materials that will reduce the vulnerability of existing buildings that are being remodeled to lightning. |
| **Cost Effectiveness** | Cost Effective – The low cost of this project would be offset by eliminating just one lightning caused building loss. |
| **Discussion:** Lightning mitigation materials will be included in all building permit packets distributed to builders or citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Pelican Bay Lightning Mitigation Action #2** | Ensure all City critical infrastructure has adequate lightning mitigation in place and upgrade protection as necessary. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | $2,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Pelican Bay Building Official |
| **Estimated Completion Time Frame** | One Year |

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| **Effect on New Buildings** | This action will ensure new City buildings that house critical infrastructure have adequate lightning mitigation. |
| **Effect on Existing Buildings** | This action will ensure existing critical infrastructure has adequate lightning mitigation. |
| **Cost Effectiveness** | Cost Effective – The destructive and sometimes capricious nature of lighting warrant the expense of this action compared with the benefits of avoiding damage to critical infrastructure. |
| **Discussion:** Review and confirmation of the adequacy of lightning protection systems in City buildings housing critical infrastructure is worthwhile considering the number of thunderstorms experienced in Pelican Bay. | |

**SEVERE THUNDERSTORM**

High Vulnerability - Severe thunderstorms are the most common hazard in Pelican Bay. From 1950 through August 2007 Tarrant County averaged eleven reported severe thunderstorm events county-wide per year. Most structures in Pelican Bay are mobile homes and are more vulnerable to severe thunderstorms than site built structures. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to thunderstorms.

Location - Throughout the City.

Extent - Pelican Bay is subject to the hazards of severe thunderstorms of all magnitudes.

Previous Occurrences - Severe thunderstorms on June 1, 2004 caused electrical power outages and some flooding with minor damage to homes.

Probability of Future Events – Severe thunderstorms will occur in Pelican Bay an average of eleven times per year.

Impact – A single severe thunderstorm can cause damage from hail, high winds, lightning, and/or tornadoes to thousands of structures.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Pelican Bay Severe Thunderstorm Mitigation Project #1** | Conduct technical assessment to determine the feasibility of structurally hardening the Pelican Bay Fire Station located at 1300 Pelican Circle against severe weather. |
| **Hazard Addressed** | Tornado/Severe Thunderstorm |
| **Mitigation Goal/Objective** | 2. Reduce loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | High |
| **Estimated Cost** | $5,000 |

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| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • Private Foundation Grants<br>• Other State or Federal Grants<br>• City Funds |
| **Responsible Agency** | • Pelican bay Building Official<br>• Pelican Bay Fire Department |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This project will determine the feasibility of structurally hardening the Pelican Bay Fire Station against severe weather. |
| **Effect on Existing Buildings** | This project will determine the feasibility of structurally hardening the Pelican Bay Fire Station against severe weather. |
| **Cost Effectiveness** | Cost Effective - This project will provide the basis for a realistic cost benefit analysis of the feasibility of hardening the Pelican Bay Fire Station against severe weather events. The relatively low cost of this project compared with the potential benefits of protecting a city's emergency response equipment against the jurisdiction's most likely hazard event result in a favorable cost benefit review. |

**Discussion:**
This project will provide for determining the feasibility of hardening the city's only fire station against severe weather. This project will contribute to protecting emergency response equipment so that it will be available to assist the citizens of Pelican Bay in responding to and recovering from severe weather or other events. Final project details will be developed in accordance with grant requirements at the time the project is funded.

The cost estimate is a conservative "best guess" based on a structural analysis of the existing fire station. That analysis would require:

- Structural analysis of the building by a Structural Engineer
- Analysis of electrical systems
- Analysis of HVAC systems
- Review of building codes

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Pelican Bay Severe Thunderstorm Mitigation Action #2** | Encourage builders to install storm resistant construction such as "hurricane clips". |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | High |
| **Estimated Cost** | $500 |

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| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |
| **Responsible Agency** | Pelican Bay Building Official |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will encourage storm resistant construction in new buildings. |
| **Effect on Existing Buildings** | This action will encourage storm resistant construction in existing buildings as they are remodeled. |
| **Cost Effectiveness** | Cost Effective – The low cost of this action will be offset by a reduction in damage from severe thunderstorms. |
| **Discussion:** Effective education on storm resistant construction can reduce damage from severe thunderstorms. Insurance companies may be willing to fund or provide educational materials and/or provide discounts to persons who install storm resistant devices. | |

**SEVERE WINTER STORMS**

Moderate Vulnerability - Since 2000 the National Weather Service has reported 14 Winter Storm/Ice events. Winter storms in Pelican Bay usually consist of short-lived icing events (ice on the roads for a few hours) that primarily affect traffic and cause numerous motor vehicle accidents. Occasionally an ice storm will cause widespread power outages for as long as several days. ONCOR Electric Delivery has an aggressive tree trimming program. Most structures in Pelican Bay can resist the effects of all but the most severe winter storms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to winter storms. Electrical service outages are usually the most serious threat in this area. Most public safety and special facilities are equipped with generators.

Location - Throughout the City.

Extent - Severe ice storms have resulted in accumulations in excess of two inches. Most storms leave only a light coating or glaze of ice.

Previous Occurrences – Severe Winter Storms are typically regional events. Pelican Bay averaged two winter storms per year since 2000. Most winter storms resulting only minor inconveniences and a few motor vehicle accidents.

In 1978 up to an inch of ice coated area trees and roadways causing $14 million in damages region-wide and making travel almost impossible for two days.

In 1996 a winter storm dropped two to four inches of a mixture of sleet, freezing rain, and snow in Pelican Bay over Thanksgiving weekend causing many motor vehicle accidents and some electrical service outages.

In 2003 a winter storm dropped one inch of sleet across Pelican Bay resulting in numerous motor vehicle accidents and closing schools for two days.

Probability of Future Events - Pelican Bay can expect to experience two winter storms per year with a severe winter storm once each ten years.

Impact - Winter storms can cause widespread electrical and telephone service outages, make travel dangerous or impossible, and damage structures. Deaths and injuries due to vehicle accidents and slips/falls are common during ice storms. Occasional deaths and injuries from carbon monoxide poisoning due to improper heating have occurred. Economic losses due to lost production can be significant. Damage from frozen pipes can lead to significant expenses for homeowners.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Pelican Bay Severe Winter Storm Mitigation Action #1** | Increase public education concerning winter storm preparedness and mitigation. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | Medium |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Pelican Bay Fire Department |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into new buildings. |
| **Effect on Existing Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost is effective when compared to benefits provided to citizens. |
| **Discussion:** Winter weather preparedness has not been emphasized in Pelican Bay as much as severe thunderstorms. This action will provide preparedness information to citizens during the fall. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Pelican Bay Severe Winter Storm Mitigation Action #2** | Purchase additional street sanding capacity |

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| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Pelican Bay Fire Department |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will have no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Sanding streets is essential to allow emergency vehicles to respond during severe winter events. |
| **Discussion:** Sanding equipment can be mounted on existing equipment to provide sanding capabilities. During severe winter weather events streets around hospitals, fire stations and other critical facilities are sanded along with major intersections and roadways. Additional sanding capacity would allow for quicker sanding of these areas and for more repeat sanding during prolonged winter weather events. This will improve public safety by facilitating emergency response as well as reducing motor vehicle accidents. | |

**STREAM BANK EROSION**

No Vulnerability - The predominantly low rolling topography of Pelican Bay prevents stream bank erosion from causing a hazard except in a few locations. No vulnerability to stream bank erosion has been identified in Pelican Bay. Further analysis using GIS and field verification will continue to search for vulnerable structures or facilities.

**TORNADO**

High Vulnerability – All structures in Pelican Bay are vulnerable to tornadoes. Most structures in Pelican Bay are mobile homes and are more vulnerable to tornadoes than site built structures. Very few structures can withstand the effects of an F5 tornado. However, the March 28, 2000 F3 tornado that struck Fort Worth provided good evidence that well built structures can protect people who take appropriate shelter inside those buildings.

Location - Tornadoes can occur anywhere in Pelican Bay.

Extent – Pelican Bay is subject to tornadoes of all magnitudes, including F5 tornadoes.

Previous Occurrences – We found no reports of tornados causing damage in Pelican Bay. However, Tarrant County has an average of one tornado reported per year county-wide (Source: National Climatic Data Center). In 2007 there were eight tornadoes reported by storm spotters county-wide. Four of those tornados caused damage, all within incorporated areas.

Probability of Future Events - Tarrant County has averaged one reported tornado per year and can expect that average to continue Pelican Bay, based on its relatively small size, will likely experience tornados very infrequently.

Impact - Tornadoes can cause deaths, injuries and property damage/destruction. Special facilities such as hospitals, fire stations, and utilities can be damaged or destroyed. Citizens who live in neighborhoods struck by tornadoes can experience disruption of their life styles and traditions. Areas struck by tornadoes can experience increased demand for mental health services as people deal with grief and stress.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Pelican Bay Tornado Mitigation Project #1** | Assist citizens with funding for building tornado safe rooms or in-ground shelters. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction |
| **Priority** | High |
| **Estimated Cost** | $60,000 (15 Safe Rooms at $4,000 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Community Development Block Grant Funds |
| **Potential Matching Funding Sources** | Home/Building Owner |
| **Responsible Agency** | • Pelican Bay Fire Department<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This project will encourage new buildings to be constructed with tornado safe rooms as part of the construction process. The safe room will enhance the overall storm resistance of the building. |
| **Effect on Existing Buildings** | This project will encourage homeowners to construct/install tornado safe rooms in their existing homes. A safe room will enhance the overall storm resistance of the building. |
| **Cost Effectiveness** | Cost Effective - Safe rooms and in-ground shelters have been proven to reduce deaths and injuries during tornadoes and severe thunderstorms. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of safe rooms and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

**Discussion:**
This project will reimburse costs associated with tornado safe room or in-ground shelter installation in new or existing homes. Safe rooms provide increased protection for citizens during severe thunderstorms and tornados. Safe rooms have been proven to save lives and reduce injuries from severe weather events. FEMA publication 320 (*Taking Shelter from the Storm, Building a Safe Room Inside Your House*) provides the standards for safe rooms. As stated on the FEMA website: Although a *"residence may be built "to code," that does not mean it can withstand winds from extreme events such as tornadoes and major hurricanes. The purpose of a safe room or a wind shelter is to provide a space where you and your family can seek refuge that provides a high level of protection. To protect its occupants, a safe room must be built to withstand high winds and flying debris, even if the rest of the residence is severely damaged or destroyed."*

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to home owners will be for no more than $3,000 or 75% of cost, whichever is less
- Eligibility will be limited to individuals who own their home at the time of application
- The safe room or in-ground shelter must be constructed/installed in the primary residence of the applicant
- Each eligible homeowner can only receive one reimbursement, regardless of the number of shelters he/she may purchase/install
- In-ground shelters must meet requirements established in the National Performance Criteria for Tornado Shelters dated May 28, 1999.
- Safe Rooms must meet the requirements of FEMA Publication 320
- Safe Rooms and shelters must meet all applicable city and/or county codes
- Previously owned or used shelters will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Pelican Bay Tornado Mitigation Project #2** | Assist citizens with funding for purchase of Weather Alert Radios |
| **Mitigation Goal/Objective** | 4. Increase the effectiveness of warning systems in Tarrant County.<br>4. a. Increase the number of homes and businesses with Weather Alert Radios. |
| **Priority** | High |
| **Estimated Cost** | $2,000 (50 Weather Alert Radios at $40 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Private Sector Donations<br>• City Funds |
| **Potential Matching Funding Sources** | Citizen/Business Owner |

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| **Responsible Agency** | • Pelican bay Fire Department<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings except for providing additional warning time of severe weather events thus allowing citizens more time to secure their home or business against approaching severe weather. |
| **Cost Effectiveness** | Cost Effective – Weather Alert Radios are a proven means to alert and warn citizens about severe weather and civil emergencies. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of Weather Alert Radios and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

***NOTE**: We are aware that Weather Alert Radios are on the "2007 Ineligible Planning Activities" list. It is our opinion that Weather Alert Radios should be considered eligible due to their very high benefit and very low cost.*

This project will reimburse 75% of the cost for citizens to purchase Weather Alert Radios, with the citizen responsible for the remaining 25%. Weather Alert Radios provide the best means for citizens to receive emergency alerts when they are indoors. Severe weather is the primary hazard in our area. Early alert and warning has proven to be a significant factor in saving lives during severe weather events.

In addition, the Weather Alert Radios can be activated for civil emergencies such as hazardous materials incidents. Effective warning saves lives, especially during severe weather events. Weather alert radios provide a proven means of indoor warning to citizens any time of the day or night and compose the vital indoor portion of our emergency warning system.

Warning systems have been shown to have value beyond the initial warning. Persons receiving warning relay the information to family and friends to ensure they are aware of the hazard. The secondary and tertiary warning can greatly amplify the effectiveness of the warning system.

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to citizens will be for no more than $30 or 75% of cost of the radio, whichever is less
- Eligibility will be limited to residents of Pelican Bay
- The citizen must sign an agreement to keep the radio operational
- Each eligible homeowner can only receive one reimbursement, regardless of the number of radios purchased
- Previously purchased radios will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**WILDFIRE**

Moderate Vulnerability – Pelican Bay has extensive areas of rural-urban interface. Most structures in Pelican bay are mobile homes which are more vulnerable to wildfire than typical site built structures.

Location - The areas of most concern are heavily wooded areas along creeks on the southern and western edges of Pelican Bay and around Eagle Mountain Lake. These areas have an extensive rural-urban interface. Access to fight wildfires is often difficult due to thick trees and undergrowth, semi-swampy terrain, and lack of roads.

Extent - The effects of wildfire are deaths, injuries, loss of structures, loss of wildlands, and loss of wildlife habitat.

Previous Occurrences - Wildfires in Pelican Bay are typically associated with droughts. A number of wildfires occurred in the area during droughts from 1996 - 1998, 2000, and from 2005 - 2006.

Probability of Future Events - Wildfires are likely to occur annually and increase in frequency and severity as the population continues to increase and formally rural areas are developed.

Impact - Wildfires can result in the need for rapid evacuations, casualties, loss of homes and businesses, and loss of wildlife habitat and recreational areas.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Pelican Bay Wildfire Mitigation Action #1** | Increase public education on how to reduce the risks from wildfires (construction, landscaping, etc.) |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | High |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Pelican Bay Fire Department |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will reduce the effects of wildfire on new buildings through increased use of wildfire mitigation measures. |
| **Effect on Existing Buildings** | This action will reduce the effects of wildfire on existing buildings through increased use of wildfire mitigation measures. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing the effects of wildfire. |
| **Discussion:** Wildfire mitigation measures are not widely known in urban areas such as Tarrant County. This action will increase that knowledge and reduce casualties and damages from wildfires. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Pelican Bay Wildfire Mitigation Action #2** | Enact building permit process that encourages wildfire resistant construction. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |

| | |
|---|---|
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | Pelican Bay Building Official |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will reduce the vulnerability of new structure to wildfire. |
| **Effect on Existing Buildings** | This action will reduce the vulnerability of existing buildings to wildfire if they are remodeled to the extent a building permit is required. |
| **Cost Effectiveness** | Cost Effective – This action will integrate wildfire mitigation into the building process at minimal cost. |
| **Discussion:** Integrating mitigation into building permitting provides a process to reduce vulnerability with few negative impacts. | |

**Texas Standards That Exceed 44 CFR Requirements: Local Capability Assessments**

MAP 1

Projects funded under the following programs. Address the type of project that was funded. If you did not receive money from one of the below grants programs, then state that.

1.1: Hazard Mitigation Grant Program - None
1.2: Pre-Disaster Mitigation Grant Program - None
1.3: Project Impact - None
1.4: Hurricane-Property Protection Mitigation - None
1.5: Flood Mitigation Assistance - None
1.6: 406 Mitigation (through the Public Assistance Program) - None

MAP 2

Current Building Codes. Include the following information:
2.1: Date and type of code: 2000 International Building Code
2.2: How is it being enforced? Plans submitted for review. Projects inspected on site.

MAP 3

Current Fire Codes. Include the following information:
3.1: Date and type of code: 2000 International Building Code
3.2: How is it being enforced?

- Plans are submitted for review
- Projects inspected on site
- Annual Fire Inspection

MAP 4

4.1: Any other codes, sub-division regulations, etc., that are in effect in your jurisdiction? No
4.2: How are they being enforced?

MAP 5

Floodplain Management. Include the following information:

5.1: Ordinance/Order Date: No
5.2: Do you have a Floodplain Administrator? No
5.3: Is the person a Certified Floodplain Manager (CFM)? No
5.4: Date of current floodplain maps. August 23, 2000
5.5: Any codes, regulations, etc. that prohibit development in the floodway and/or floodplain: No

MAP 6

Findings/results of Building Code Effectiveness Grading Report (BCEGS). Include date of report and score. Not applicable

MAP 7

Identify other plans that your jurisdiction has or have been done in your jurisdiction.
7.1: Capital Improvement Plans: None
7.2: Comprehensive Plans: None
7.3: Storm Water Management Plans: None
7.4: Master Drainage Plans: None
7.5: Corps of Engineers: None
7.6: Flood Mitigation Plan: None
7.7: Any other plans, studies, etc. that may have been done in your jurisdiction: None

# City of River Oaks

**Jurisdictional Profile**
River Oaks has an area of 2 square miles and a NCTCOG 2007 Population Estimate of 7,200,

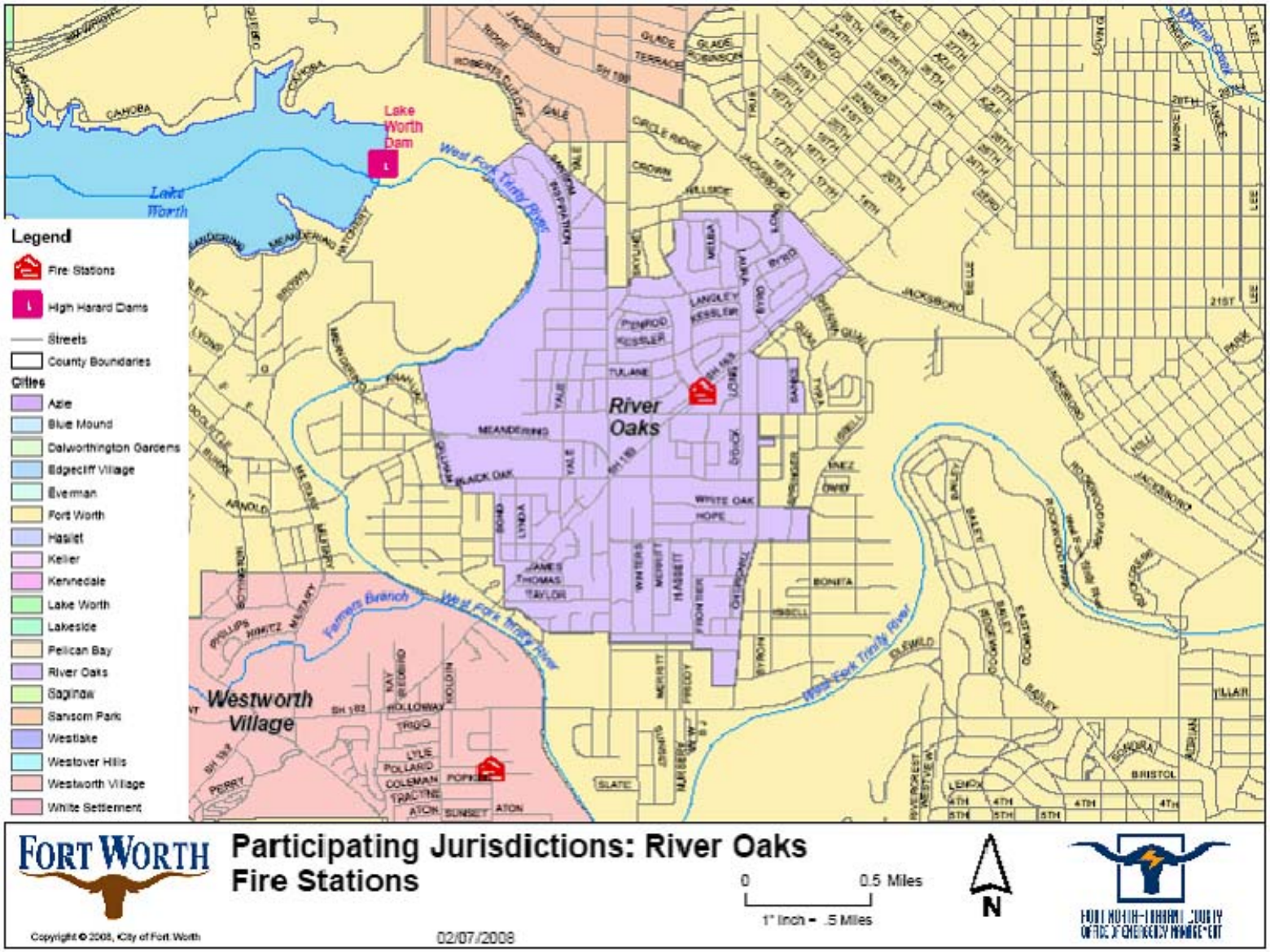
River Oaks is an incorporated residential community on State Highway 183 within the western boundary of Fort Worth in west central Tarrant County. In 1941 the Fort Worth Chamber of Commerce deeded to the federal government 1,450 acres to construct a plant in which to build B-24 bombers, and to build a landing field, which would become Carswell Air Force Base and eventually Naval Air Station Fort Worth, Joint Reserve Base. Construction began in April of that year; also that year local residents voted to incorporate their community. The construction of the air base, which was activated by the Army in 1942, became the catalyst for community development. River Oaks had a population of 2,000 by the end of the 1940s. During the 1950s water and sewer systems were completed, streets were paved, and a library was built. In 1960 the population of River Oaks surpassed 8,000. The dramatic population increase was due to the increased activity at Carswell and to the arrival of the General Dynamics Corporation in the Fort Worth area. For the next few decades the population level remained above 8,000. During the 1980s, however, the number of residents dropped, probably as a result of decreased activity at the air base and the decline in defense contracts received by General Dynamics. In 1989 River Oaks had an estimated 7,740 residents, in 1990 it reported 6,580, and a 2000 census population of 6,985.

| 1990 | 2000 | 2006 | 2007 |
|---|---|---|---|
| 6,580 | 6,985 | 7,050 | 7,200 |
| 2007 Population Density (persons per square mile): 3,547.41 | | | |

**City Point of Contact**
Chief Bill Crews, River Oaks Fire Department

**Land Use and Development Trends**
River Oaks is a bedroom community with some commercial property, mostly on Texas Highway 183. It is about 90% built-out with very slow growth. Areas in and around River Oaks are experiencing a re-building cycle due to its proximity to downtown Fort Worth.

**Jurisdiction Unique Hazards**
Hazards specific to River Oaks are discussed below.


Lake Worth Dam
Lake Worth
West Fork Trinity River
River Oaks
Westworth Village
Farmers Branch
Legend
Fire Stations
High Hazard Dams
Streets
County Boundaries
Cities
Azle
Blue Mound
Dalworthington Gardens
Edgecliff Village
Everman
Fort Worth
Haslet
Keller
Kennedale
Lake Worth
Lakeside
Pelican Bay
River Oaks
Sagindaw
Sansom Park
Westlake
Westover Hills
Westworth Village
White Settlement
FORT WORTH
Participating Jurisdictions: River Oaks
Fire Stations
0
0.5 Miles
1" Inch = .5 Miles
N
Copyright © 2008, City of Fort Worth
02/07/2008

**DAM FAILURE**

Undetermined Vulnerability –There are no high hazard dams in River Oaks. The nearest upstream high hazard dam is Lake Worth Dam, approximately one-half mile from the River Oaks water treatment plant. No other structures in River Oaks appear to be vulnerable to a failure of the Lake Worth dam. Completion of inundation studies for all high-hazard dams in Tarrant County will determine whether River Oaks is vulnerable to a failure of the Lake Worth Dam.

**DROUGHT**

Moderate Vulnerability – River Oaks treats water from Lake Worth on the West Fork of the Trinity River. Lake Worth is also a water supply lake for the City of Fort Worth and is the lowest of three lakes on the West Fork of the Trinity. This surface water source is subject to drought.

Location – Drought can affect all of River Oaks.

Current Extent – As of February 2008, River Oaks was at DO – Abnormally Dry on the Palmer Drought Severity Index.

Previous Occurrences – National Climatic Data Center records indicate that in the past ten years there have been three periods of drought in River Oaks, 1996 - 1998, 2000, and 2005 - 2006.

Probability of Future Events – Droughts are certain to occur again in River Oaks. Significant droughts significantly affecting water supply and resulting in mandatory restrictions traditionally occur on a twenty year cycle. Based on the previously cited National Climatic Data Center recent records, we can anticipate that drought conditions will occur approximately every three years.

Impact – Drought can lead to loss of water for basic needs such as drinking and fire-fighting. Droughts are associated with increased wildfire and damage from expansive soils. More common impacts are damage to landscaping and reduced recreation due to low lake levels.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **River Oaks Drought Mitigation Action #1** | Participate in the design and implementation of the Tarrant County specific water conservation public education efforts to compliment existing programs. |
| **Mitigation Goal/Objective** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $1,000 |

| | |
|---|---|
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • City Funds<br>• Water Suppliers |
| **Responsible Agency** | • River Oaks Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One year |
| **Effect on New Buildings** | This action will publicize water conservation efforts that can be incorporated into new construction. |
| **Effect on Existing Buildings** | This action will publicize water conservation efforts that can be incorporated into existing construction. |
| **Cost Effectiveness** | Cost Effective – Public education programs can provide significant results for relatively low costs. |
| **Discussion:** Most cities in the area have existing water conservation programs designed to educate the public and businesses on ways to conserve water. This action will develop a Tarrant County specific program that will compliment existing programs. Jurisdictional public education efforts have been very successful in attracting the attention of local citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **River Oaks Drought Mitigation Action #2** | 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. Impacts identified in this plan will be included in updates to the Hazard Mitigation Action Plan. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • City Funds<br>• Water Suppliers |
| **Responsible Agency** | River Oaks Emergency Management |
| **Estimated Completion Time Frame** | One Year |

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|---|---|
| **Effect on New Buildings** | This action will identify drought impacts in River Oaks thus providing specific information for builders of new structures to incorporate drought mitigation into the structures. |
| **Effect on Existing Buildings** | This action will identify drought impacts in River Oaks thus providing specific information for owners of existing structures to incorporate drought mitigation into the structures. |
| **Cost Effectiveness** | Cost Effective – This planning effort will have a low cost with the potential for significant benefits for the entire community. |
| **Discussion:** This planning effort will focus attention on the effects of drought on the community. Specific drought effects will be identified and efforts can be made to mitigate those effects. | |

**EXPANSIVE SOILS**

Low Vulnerability - Expansive soils have caused damage to some structures in River Oaks. However, damage has been limited to relatively small geographic areas and there are no reports of significant damage to commercial structures or infrastructure.

Location – Expansive soils are found in various areas of River Oaks. We could not locate a map of expansive soils in River.

Extent – The extent of expansive soils in River Oaks is believed to be Very Low (0% - 20%) to Low (21% - 50%).

Previous Occurrences – We could find no empirical data on previous occurrences of damage from expansive soils, but it is believed that expansive soils have caused problems since the first buildings were constructed in this area.

Probability of Future Events – Due to the variability of soil types and construction quality, it is very difficult to predict future occurrences of problems with expansive soils. However, a study published in the fall 2003 issue of *Environmental Geology* cited in the September 19, 2003 *Dallas Business Journal* indicates that many new developments in the Metroplex are being built on soil that is more unstable than soils built on prior to 1990. This could lead to a higher incidence of expansive soil related damage in the future.

Impact – The impact of expansive soils ranges from cosmetic cracks in walls to substantial foundation and structural damage that can result in the need to demolish the building. Infrastructure such as pipelines can be damaged causing increased maintenance and repairs, damaged beyond repair requiring replacement, damaged to the point of failure.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **River Oaks Expansive Soils Mitigation Action #1** | Improve construction techniques through building code enhancements. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined (Minimal – Staff Time Only) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building permit fees |
| **Potential Matching Funding Sources** | • City Funds<br>• Building permit fees |
| **Responsible Agency** | River Oaks Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will make new buildings more resistant to damage from expansive soils. |
| **Effect on Existing Buildings** | This action will require modifications to existing buildings to be more resistant to damage from expansive soils. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will improve construction quality and reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **River Oaks Expansive Soils Mitigation Action #2** | Educate construction contractors, home owners, and business owners about mitigation techniques. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building Permit Fees |
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | • River Oaks Public Works<br>• River Oaks Emergency Management |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will provide builders of new construction with expansive soil mitigation techniques that will reduce damage. |

| | |
|---|---|
| **Effect on Existing Buildings** | This action will provide owners of existing buildings with expansive soil mitigation techniques that will reduce damage. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will provide construction contractors and home/business owners with techniques designed to reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**EXTREME HEAT**

High Vulnerability - Summer heat and humidity can occur anytime from May through October. Community health services actively work with at risk populations to prevent heat related deaths and injuries. The elderly, very young people and people with poor health are most at risk from summer heat. People who work outside or in un-air-conditioned buildings are also at high risk to the direct effects of summer heat. Summer heat can also lead to electrical service outages if equipment fails or demand exceeds available supply. Most public safety and special facilities are equipped with emergency generators.

Location - Throughout the City.

Extent - Summer temperatures can reach as high as 113 degrees. River Oaks is also subject to high humidity.

Previous Occurrences - This is an annual occurrence. The summer of 1980 was a record year with 69 consecutive days of temperatures of 100 degrees or more. We were unable to find a reliable record of deaths or injuries related to heat.

Probability of Future Events - Hot summer temperatures are certain to continue to occur in River Oaks.

Impact - Summer heat can cause widespread electrical outages resulting in dangerous conditions, especially for at-risk populations. Occasionally "cooling centers" are opened at community centers to provide a safe place for citizens to seek refuge from the heat. Extreme heat can have economic impacts if construction work is curtailed or outdoor special events are cancelled.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **River Oaks Extreme Heat Mitigation Action #1** | Determine feasibility of expanding monitoring of populations at risk from extreme heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined. Staff time and GIS resources |

| | |
|---|---|
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Other State or Federal Public Health Grants |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Tarrant County Public Health<br>• River Oaks Emergency Management |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | None - This action is intended to expand monitoring of people only. |
| **Effect on Existing Buildings** | None - This action is intended to expand monitoring of people only. |
| **Cost Effectiveness** | Pending, but believed to be Cost Effective |
| **Discussion:** This action would determine the feasibility of expanding monitoring of populations at risk from extreme heat. Existing at risk population monitoring programs will be reviewed to ensure all known populations at risk from extreme heat are included. Any newly discovered at risk populations will be evaluated for inclusion in existing monitoring programs. Tarrant County Public Health provides public health services throughout the County. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **River Oaks Extreme Heat Mitigation Action #2** | Increase public education programs on the dangers of excessive heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness |
| **Priority** | Medium |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Other State or Federal Public Health Grants |
| **Responsible Agency** | • Tarrant County Public Health<br>• River Oaks Emergency Management |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Effect on Existing Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits. |
| **Discussion:** Public education on severe weather in River Oaks has traditionally focused on severe thunderstorms and associated hazards (tornadoes, lighting, flooding, high winds). This action would expand public education to include hazards from extreme heat. | |

**FLOOD**

High Vulnerability - The topography of River Oaks combined with the frequency of severe thunderstorms results in frequent flash flood events. Homes, businesses, and City Hall/Fire Station are vulnerable to flooding. There is a low risk of riverine flooding due to the presence of a well-maintained levee system. FEMA records indicate only 39 Repetitive Loss Properties in all of Tarrant County. However, this is probably more a reflection of the low number of flood insurance polices than vulnerability to flooding. Further analysis using GIS and field verification can specifically identify vulnerable structures.

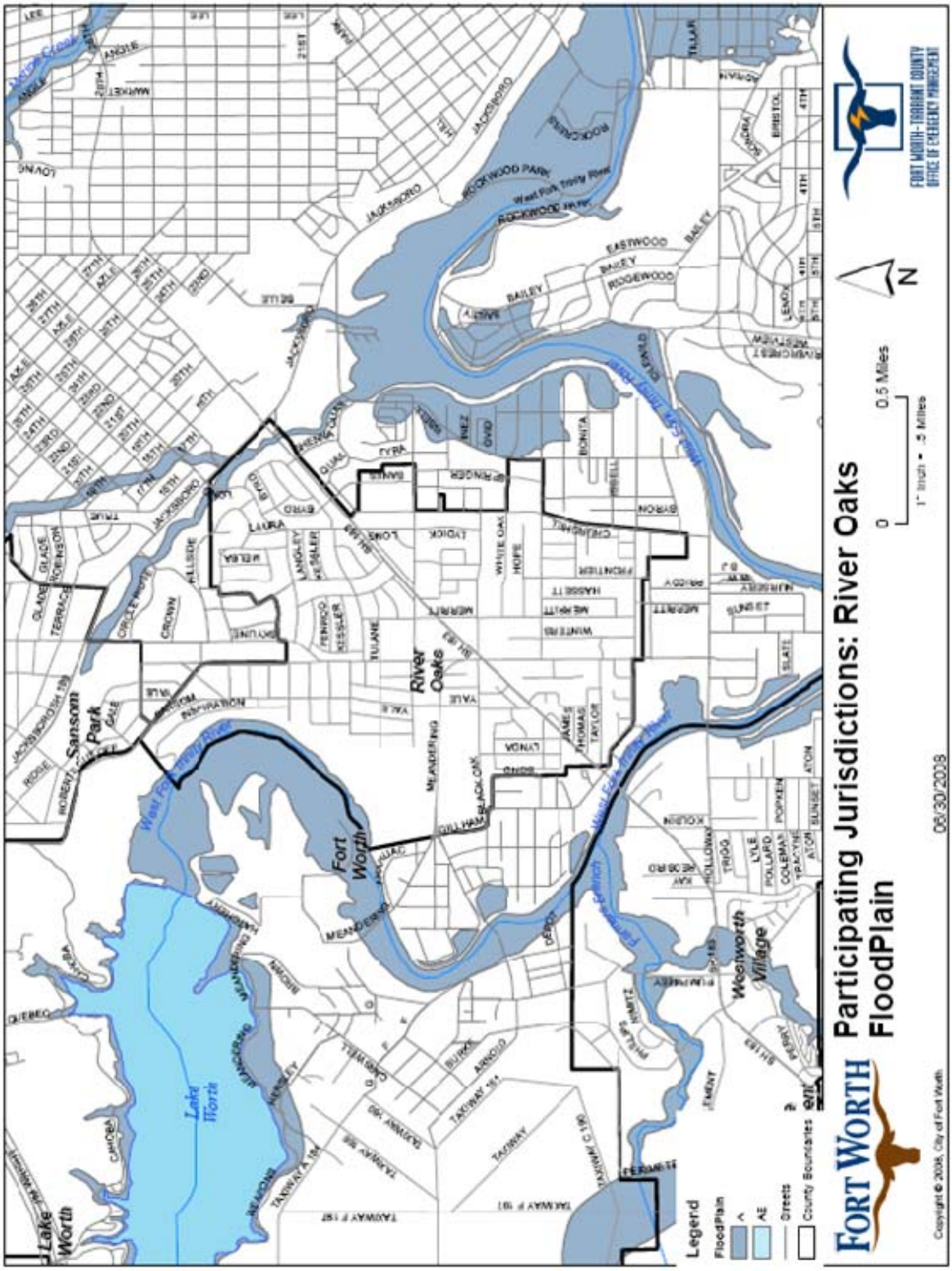
Location - Throughout the City along creeks and drainage structures. An un-named drainage channel that runs from north to south through the center of the City and passes underneath City Hall/Fire Station is prone to flooding - sometimes flooding City Hall/Fire Station.

Extent - Flash floods are the most common type of flooding in River Oaks which tend to occur and recede very quickly. There is a low risk of riverine flooding due to the presence of a well-maintained levee system.

Previous Occurrences - Minor flooding occurs frequently, especially during the spring and early summer. In June of 2004 significant flooding occurred along drainage structures causing damage to homes and businesses.

Probability of Future Events – Based on previous experience River Oaks is certain to suffer flash flood events every year. National Weather Service records indicate an average of 11 flash flood events per year in Tarrant County. Continued development throughout the County and the resulting increase in impervious cover will increase the likelihood and severity of flooding.

Impact - Flash floods kill more people than any other hazard associated with thunderstorms. Property damage from flash flooding is seldom covered by insurance, which makes it very difficult for citizens to recover from the flood. Due to the very rapid rate of development and growth throughout Tarrant County we are experiencing problems with determining actual building footprints within flood plains and will be using planimetric GIS data from the NCTCOG to resolve this issue when it becomes available. At that time we will be able to accurately identify the number and types of buildings vulnerable to flooding; as well as access other data associated with those locations such as appraised value, census data, and owner information.


Participating Jurisdictions: River Oaks
FloodPlain
FORT WORTH
FORT WORTH-TARRANT COUNTY
OFFICE OF EMERGENCY MANAGEMENT
N
0
0.5 Miles
1" Inch = .5 Miles
06/30/2008
Legend
FloodPlain
A
AE
Streets
County Boundaries
River Oaks
Fort Worth
Westworth Village
Lake Worth
Sansom Park
West Fork Trinity River
Copyright © 2008, City of Fort Worth

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **River Oaks Flood Mitigation Project #1** | Participate in the development of the Tarrant County specific "Flood Preparedness" brochure. |
| **Hazard Addressed** | Flooding |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of Flood events.<br>1. c. Develop effective flood mitigation public education materials. |
| **Priority** | High |
| **Estimated Cost** | Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Private Foundation Grants |
| **Responsible Agency** | • River Oaks Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This action will provide flood mitigation techniques for owners of new buildings. |
| **Effect on Existing Buildings** | This action will provide flood mitigation techniques for owners of existing buildings. |
| **Cost Effectiveness** | Cost Effective - This project will provide valuable information to the public in a relatively short time and with relatively low costs. It will also have the added benefit of increasing public awareness of mitigation. The estimated cost could easily be offset by reduced losses to the public in a single small flood event. |

**Discussion**: Develop Tarrant County specific "Flood Preparedness" brochure. Once developed, the brochure will be distributed County-Wide. Historically flood prone areas will be targeted for door-to-door distribution and neighborhood meetings to present the brochure and solicit input for *Fort Worth Hazard Mitigation Action Plan* revisions.

The brochure will include:

- Description of Tarrant County flood hazards
- "Case Studies" of previous flood events in Tarrant County
- Preparedness and "self-help" mitigation information
- Benefits of city participation in NFIP
- Advantages of flood insurance
- Risks of not having flood insurance
- Warnings that typical homeowner's insurance does not cover rising water
- Solicit input for the *Fort Worth Hazard Mitigation Action Plan*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **River Oaks Flood Mitigation Action #2** | Conduct hydrologic study of the un-named creek that flows underneath City Hall and the River Oaks Fire Station to determine best means of mitigating flooding and implement findings. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined pending engineering analysis |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • River Oaks Public Works<br>• River Oaks Emergency Management |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will provide guidance for locating new buildings away from flood prone areas on the un-named creek. |
| **Effect on Existing Buildings** | This action will provide guidance for protection of existing buildings from flooding on un-named creek. |
| **Cost Effectiveness** | Cost Effective – This project will provide guidance to reduce the hazard to life and property from flooding. |
| **Discussion:** This action will develop a study of flooding along the un-named creek and provide findings that can reduce the adverse effects of flooding on the creek. | |

**HAILSTORM**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of large hail are a hazard event in River Oaks. Tarrant County averages eleven significant thunderstorm events (large hail, high winds) per year according to National Weather Service records. Most structures in River Oaks can resist the effects of all but the most severe hailstorms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to hailstorms. Vehicles have proven to be vulnerable to hailstorms with widespread severe vehicle damage reported in 1980 and 1995.

Location - Throughout the City.

Extent - River Oaks is subject to the hazards of severe thunderstorms, including large hail. Hail stones up to the size of grapefruit (H9 on the Combined NOAA/TORRO Hailstorm Intensity Scales) have been reported in Tarrant County.

Previous Occurrences – There are no reports of significant hailstorm events in River Oaks other than the 1980 and 1995 county-wide events.

Probability of Future Events - Thunderstorms with hail are certain to continue to occur in River Oaks. Hail falls on about two or three days per year, ordinarily with only slight and scattered damage (*National Weather Service*).

Impact – The impact from hailstorms can be significant in extreme events such as the hailstorms of 1980 and 1995. Thousands of homes and vehicles can be damaged in a single storm with millions of dollars in damages. Vehicles are especially impacted by large hails with windshields being the vulnerable part. A recurring problem following hailstorms is broken windshields in vehicles belonging to populations who do not have vehicle insurance and cannot afford the replacements costs, resulting in the owners having difficulty traveling to work, medical appointments, etc.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **River Oaks Hailstorm Mitigation Action #1** | Develop a public education campaign to encourage "hail resistant" roofing in new construction and roof replacements. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• Building/Permit Fees<br>• City Funds |
| **Responsible Agency** | • River Oaks Planning & Zoning Department<br>• River Oaks Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will potentially decrease the damage caused by most hailstorms to new buildings. |
| **Effect on Existing Buildings** | This action will potentially decrease the damage caused by most hailstorms to existing buildings. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing hailstorm damage. One long term benefit will be reduced property insurance as claims related to hail damage are reduced. |
| **Discussion**: Public education has proven to be a low cost effective means to achieve changes public behavior. Encouraging hail resistant roofing can benefit citizens through reduced damage, business through reduced damage to their buildings and reduced claims against insurance companies, and government through reduced request for assistance. This campaign can be developed in conjunction with the Tarrant County effort. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **River Oaks Hailstorm Mitigation Action #2** | Evaluate City buildings to determine feasibility of installing hail resistant roofing and window coverings with a focus on critical infrastructure. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• City Funds |
| **Responsible Agency** | River Oaks Public works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on new City buildings. |
| **Effect on Existing Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on existing City buildings. |
| **Cost Effectiveness** | Cost Effective – Although currently undetermined, this project is believed to be cost effective. |
| **Discussion:** Installing hail resistant roofing and window coverings on City buildings could prevent or limit damage to City buildings thus avoiding costs to the City as well as preventing or limiting loss of use of damaged facilities. | |

**HIGH WINDS**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of high winds are a hazard in River Oaks. Tarrant County averages ten reported significant thunderstorm events (large hail, high winds) per year. In addition, strong weather fronts can sometimes be accompanied by high winds which occasionally cause damage. Most structures in River Oaks can resist the effects of all but the most severe high wind events. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to high winds.

Location - Throughout the City.

Extent - Severe thunderstorms with high winds with speeds in excess of 90 mph have been reported in River Oaks.

Previous Occurrences – We could find no records of significant high wind damage in River Oak other that associated with the March 2000 Tornado.

Probability of Future Events – Based on previous experience River Oaks can expect to experience an average of ten significant thunderstorm events with high winds per year.

Impact – Records on high wind events are difficult to separate from severe thunderstorm records. High winds in River Oaks typically cause little damage to commercial buildings. More often high winds cause damage to roofs, trees, and signs.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **River Oaks High Winds Mitigation Action #1** | Enact enhanced building codes to reduce damages from high winds. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined – Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | River Oaks Planning & Zoning Department |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will potentially identify a means to reduce high wind damage on new buildings. |
| **Effect on Existing Buildings** | This action will potentially identify a means to reduce high wind damage on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Although costs are undetermined, this action is believed to be cost effective since the action will require staff time only. |
| **Discussion:** Enhanced building codes will reduce damages from high wind events. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **River Oaks High Winds Mitigation Action #2** | Educate builders and residents about mitigating wind damage. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |
| **Responsible Agency** | River Oaks Planning and Zoning Department |

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| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on new buildings. |
| **Effect on Existing Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost of developing and providing high wind mitigation compared with savings to the community make this action cost effective. |
| **Discussion:** Public education has proven to be a low cost and effective means to achieve changes public behavior. High winds have not been a focus of severe weather preparedness. | |

**LANDSLIDES**

No Vulnerability - Although there is some relatively steep terrain in portions of River Oaks, the relief is associated with rocky outcrops and not susceptible to landslides. There is no history of landslides in River Oaks. Based on the lack of vulnerability, landslides will receive no further consideration in this plan for River Oaks. However, landslide hazards will be reviewed during the annual review of this plan and we will continue looking for areas with landslide potential during hazard surveys.

**LEVEE FAILURE**

No Vulnerability – There are no levees or areas that would be affected by levee failure in River Oaks. Based on the lack of vulnerability, levee failure will receive no further consideration in this plan for River Oaks.

**LIGHTNING**

Moderate Vulnerability – Lightning is one of the most common hazards in River Oaks. Thunderstorms (and by definition, lightning) occur an average of 30 – 50 days per year (*Oklahoma Climatological Survey*). Lightning is the second most common cause of weather-related deaths in Texas (*National Weather Service*). Lightning information is available only for Tarrant County on a county-wide basis.

Location – Throughout the City.

Extent – We could find no references to the average number of strikes per storm in River Oaks. However, lightning is by definition associated with thunderstorms.

Previous Occurrences – River Oaks experiences 30 – 50 thunderstorm days per year. From 1995 – 2004 one person was killed and five were injured by lightning in Tarrant County (*National Weather Service*). Throughout Texas 34 people were killed by lightning, there were 184 injuries, and an estimated 23 million dollars in damages due to lightning from 1995 - 2004 (*National Weather Service*).

Probability of Future Events – Based on past experience River Oaks will experience 30 – 50 thunderstorm days each year. Some days will have more than one thunderstorm during a given thunderstorm day.

Impact – Although lightning is the second most common cause of storm related deaths in Texas, lightning deaths remain relatively rare. Lightning does cause property damage several times per year (we could not find statistical data to validate this observation).

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **River Oaks Lightning Mitigation Action #1** | Provide lightning mitigation materials with building permit packets. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | River Oaks Planning and Zoning Department |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will provide materials that will reduce the vulnerability of new buildings to lightning. |
| **Effect on Existing Buildings** | This action will provide materials that will reduce the vulnerability of existing buildings that are being remodeled to lightning. |
| **Cost Effectiveness** | Cost Effective – The low cost of this project would be offset by eliminating just one lightning caused building loss. |
| **Discussion:** Lightning mitigation materials will be included in all building permit packets distributed to builders or citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **River Oaks Lightning Mitigation Action #2** | Ensure all City critical infrastructure has adequate lightning mitigation in place and upgrade protection as necessary. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |

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| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | River Oaks Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will ensure new City buildings that house critical infrastructure have adequate lightning mitigation. |
| **Effect on Existing Buildings** | This action will ensure existing critical infrastructure has adequate lightning mitigation. |
| **Cost Effectiveness** | Cost Effective – The destructive and sometimes capricious nature of lighting warrant the expense of this action compared with the benefits of avoiding damage to critical infrastructure. |
| **Discussion:** Review and confirmation of the adequacy of lightning protection systems in City buildings housing critical infrastructure is worthwhile considering the number of thunderstorms experienced in River Oaks. | |

**SEVERE THUNDERSTORM**

High Vulnerability - Severe thunderstorms are the most common hazard in River Oaks. From 1950 through August 2007 Tarrant County averaged eleven reported severe thunderstorm events county-wide per year. Most structures in River Oaks can resist the effects of all but the most severe thunderstorms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to thunderstorms.

Location - Throughout the City.

Extent - River Oaks is subject to the hazards of severe thunderstorms of all magnitudes. Hail stones up to the size of baseballs, high winds, and intense lightning have been reported in River Oaks.

Previous Occurrences - Thunderstorms are common in River Oaks. Severe thunderstorms in April of 1980 and May of 1995 dropped baseball sized hail in River Oaks. June 2004 - Severe thunderstorms caused wind damage and flash flooding.

Probability of Future Events – Severe thunderstorms will occur in River Oaks an average of eleven times per year.

Impact – A single severe thunderstorm can cause damage from hail, high winds, lightning, and/or tornadoes to thousands of structures.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **River Oaks Severe Thunderstorm Mitigation Project #1** | Conduct technical assessment to determine the feasibility of structurally hardening the River Oaks Fire Station located at 4900 River Oaks Blvd. against severe weather. |

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| **Hazard Addressed** | Tornado/Severe Thunderstorm |
| **Mitigation Goal/Objective** | 2. Reduce loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | High |
| **Estimated Cost** | $15,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • Private Foundation Grants<br>• Other State or Federal Grants<br>• City Funds |
| **Responsible Agency** | • River Oaks Public Works<br>• River Oaks Emergency Management |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This project will determine the feasibility of structurally hardening the River Oaks Fire Station against severe weather. |
| **Effect on Existing Buildings** | This project will determine the feasibility of structurally hardening the River Oaks Fire Station against severe weather. |
| **Cost Effectiveness** | Cost Effective - This project will provide the basis for a realistic cost benefit analysis of the feasibility of hardening the River Oaks Fire Station against severe weather events. The relatively low cost of this project compared with the potential benefits of protecting a city's emergency response equipment against the jurisdiction's most likely hazard event result in a favorable cost benefit review. |

**Discussion:**

This project will provide for determining the feasibility of hardening the city's only fire station against severe weather. This project will contribute to protecting emergency response equipment so that it will be available to assist the citizens of River Oaks in responding to and recovering from severe weather or other events. Final project details will be developed in accordance with grant requirements at the time the project is funded.

The cost estimate is a conservative "best guess" based on a structural analysis of the existing fire station. That analysis would require:

- Structural analysis of the building by a Structural Engineer
- Analysis of electrical systems
- Analysis of HVAC systems
- Review of building codes

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **River Oaks Severe Thunderstorm Mitigation Action #2** | Encourage builders to install storm resistant construction such as "hurricane clips". |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | High |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |
| **Responsible Agency** | River Oaks Planning and Zoning Department |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will encourage storm resistant construction in new buildings. |
| **Effect on Existing Buildings** | This action will encourage storm resistant construction in existing buildings as they are remodeled. |
| **Cost Effectiveness** | Cost Effective – The low cost of this action will be offset by a reduction in damage from severe thunderstorms. |
| **Discussion:** Effective education on storm resistant construction can reduce damage from severe thunderstorms. Insurance companies may be willing to fund or provide educational materials and/or provide discounts to persons who install storm resistant devices. | |

**SEVERE WINTER STORMS**

Moderate Vulnerability - Since 2000 the National Weather Service has reported 14 Winter Storm/Ice events. Winter storms in River Oaks usually consist of short-lived icing events (ice on the roads for a few hours) that primarily affect traffic and cause numerous motor vehicle accidents. Occasionally an ice storm will cause widespread power outages for as long as several days. ONCOR Electric Delivery has an aggressive tree trimming program. Most structures in River Oaks can resist the effects of all but the most severe winter storms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to winter storms. Electrical service outages are usually the most serious threat in this area. Most public safety and special facilities are equipped with generators.

Location - Throughout the City.

Extent - Severe ice storms have resulted in accumulations in excess of two inches. Most storms leave only a light coating or glaze of ice.

Previous Occurrences – Severe Winter Storms are typically regional events. River Oaks averaged two winter storms per year since 2000. Most winter storms resulting only minor inconveniences and a few motor vehicle accidents.

In 1978 up to an inch of ice coated area trees and roadways causing $14 million in damages region-wide and making travel almost impossible for two days.

In 1996 a winter storm dropped two to four inches of a mixture of sleet, freezing rain, and snow in River Oaks over Thanksgiving weekend causing many motor vehicle accidents and some electrical service outages.

In 2003 a winter storm dropped one inch of sleet across River Oaks resulting in numerous motor vehicle accidents and closing schools for two days.

Probability of Future Events - River Oaks can expect to experience two winter storms per year with a severe winter storm once each ten years.

Impact - Winter storms can cause widespread electrical and telephone service outages, make travel dangerous or impossible, and damage structures. Deaths and injuries due to vehicle accidents and slips/falls are common during ice storms. Occasional deaths and injuries from carbon monoxide poisoning due to improper heating have occurred. Economic losses due to lost production can be significant. Damage from frozen pipes can lead to significant expenses for homeowners.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **River Oaks Severe Winter Storm Mitigation Action #1** | Increase public education concerning winter storm preparedness and mitigation. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | Medium |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | River Oaks Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into new buildings. |
| **Effect on Existing Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost is effective when compared to benefits provided to citizens. |

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| **Discussion:** Winter weather preparedness has not been emphasized in River Oaks as much as severe thunderstorms. This action will provide preparedness information to citizens during the fall. |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **River Oaks Severe Winter Storm Mitigation Action #2** | Purchase additional street sanding capacity |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | City Funds |
| **Responsible Agency** | River Oaks Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will have no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Sanding streets is essential to allow emergency vehicles to respond during severe winter events. |
| **Discussion:** Sanding equipment can be mounted on existing equipment to provide sanding capabilities. During severe winter weather events streets around hospitals, fire stations and other critical facilities are sanded along with major intersections and roadways. Additional sanding capacity would allow for quicker sanding of these areas and for more repeat sanding during prolonged winter weather events. This will improve public safety by facilitating emergency response as well as reducing motor vehicle accidents. | |

**STREAM BANK EROSION**

No Vulnerability - The predominantly low rolling topography of River Oaks prevents stream bank erosion from causing a hazard except in a few locations. No vulnerability to stream bank erosion has been identified in River Oaks. Further analysis using GIS and field verification will continue to search for vulnerable structures or facilities.

**TORNADO**

High Vulnerability – All structures in River Oaks are vulnerable to tornadoes. Very few structures can withstand the effects of an F5 tornado. However, the March 28, 2000 F3 tornado that struck Fort Worth provided good evidence that well built structures can protect people who take appropriate shelter inside those buildings.

Location - Tornadoes can occur anywhere in River Oaks.

Extent - River Oaks is subject to tornadoes of all magnitudes, including F5 tornadoes.

Previous Occurrences – In March 2000 a F3 tornado touched down in central River Oaks and then moved through the west side of Fort Worth and into the downtown area. Several homes were destroyed in the tornado.

Probability of Future Events - Tarrant County has averaged one reported tornado per year and can expect that average to continue. River Oaks based on its relatively small size, will likely experience tornados very infrequently.

Impact - Tornadoes can cause deaths, injuries and property damage/destruction. Special facilities such as hospitals, fire stations, and utilities can be damaged or destroyed. Citizens who live in neighborhoods struck by tornadoes can experience disruption of their life styles and traditions. Areas struck by tornadoes can experience increased demand for mental health services as people deal with grief and stress.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **River Oaks Tornado Mitigation Project #1** | Assist citizens with funding for building tornado safe rooms or in-ground shelters. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction |
| **Priority** | High |
| **Estimated Cost** | $100,000 (25 Safe Rooms at $4,000 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Community Development Block Grant Funds |
| **Potential Matching Funding Sources** | Home/Building Owner |
| **Responsible Agency** | • River Oaks Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This project will encourage new buildings to be constructed with tornado safe rooms as part of the construction process. The safe room will enhance the overall storm resistance of the building. |
| **Effect on Existing Buildings** | This project will encourage homeowners to construct/install tornado safe rooms in their existing homes. A safe room will enhance the overall storm resistance of the building. |

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| **Cost Effectiveness** | Cost Effective - Safe rooms and in-ground shelters have been proven to reduce deaths and injuries during tornadoes and severe thunderstorms. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of safe rooms and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

**Discussion:**

This project will reimburse costs associated with tornado safe room or in-ground shelter installation in new or existing homes. Safe rooms provide increased protection for citizens during severe thunderstorms and tornados. Safe rooms have been proven to save lives and reduce injuries from severe weather events. FEMA publication 320 (*Taking Shelter from the Storm, Building a Safe Room Inside Your House*) provides the standards for safe rooms. As stated on the FEMA website: Although a "*residence may be built "to code," that does not mean it can withstand winds from extreme events such as tornadoes and major hurricanes. The purpose of a safe room or a wind shelter is to provide a space where you and your family can seek refuge that provides a high level of protection. To protect its occupants, a safe room must be built to withstand high winds and flying debris, even if the rest of the residence is severely damaged or destroyed."*

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to home owners will be for no more than $3,000 or 75% of cost, whichever is less
- Eligibility will be limited to individuals who own their home at the time of application
- The safe room or in-ground shelter must be constructed/installed in the primary residence of the applicant
- Each eligible homeowner can only receive one reimbursement, regardless of the number of shelters he/she may purchase/install
- In-ground shelters must meet requirements established in the National Performance Criteria for Tornado Shelters dated May 28, 1999.
- Safe Rooms must meet the requirements of FEMA Publication 320
- Safe Rooms and shelters must meet all applicable city and/or county codes
- Previously owned or used shelters will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **River Oaks Tornado Mitigation Project #2** | Assist citizens with funding for purchase of Weather Alert Radios |

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| **Mitigation Goal/Objective** | 4. Increase the effectiveness of warning systems in Tarrant County.<br>4. a. Increase the number of homes and businesses with Weather Alert Radios. |
| **Priority** | High |
| **Estimated Cost** | $6,000 (150 Weather Alert Radios at $40 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Private Sector Donations<br>• City Funds |
| **Potential Matching Funding Sources** | Citizen/Business Owner |
| **Responsible Agency** | • River Oaks Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings except for providing additional warning time of severe weather events thus allowing citizens more time to secure their home or business against approaching severe weather. |
| **Cost Effectiveness** | Cost Effective – Weather Alert Radios are a proven means to alert and warn citizens about severe weather and civil emergencies. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of Weather Alert Radios and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

***NOTE**: We are aware that Weather Alert Radios are on the "2007 Ineligible Planning Activities" list. It is our opinion that Weather Alert Radios should be considered eligible due to their very high benefit and very low cost.*

This project will reimburse 75% of the cost for citizens to purchase Weather Alert Radios, with the citizen responsible for the remaining 25%. Weather Alert Radios provide the best means for citizens to receive emergency alerts when they are indoors. Severe weather is the primary hazard in our area. Early alert and warning has proven to be a significant factor in saving lives during severe weather events.

In addition, the Weather Alert Radios can be activated for civil emergencies such as hazardous materials incidents. Effective warning saves lives, especially during severe weather events. Weather alert radios provide a proven means of indoor warning to citizens any time of the day or night and compose the vital indoor portion of our emergency warning system.

Warning systems have been shown to have value beyond the initial warning. Persons receiving warning relay the information to family and friends to ensure they are aware of the hazard. The secondary and tertiary warning can greatly amplify the effectiveness of the warning system.

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to citizens will be for no more than $30 or 75% of cost of the radio, whichever is less
- Eligibility will be limited to residents of River Oaks
- The citizen must sign an agreement to keep the radio operational
- Each eligible homeowner can only receive one reimbursement, regardless of the number of radios purchased
- Previously purchased radios will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**WILDFIRE**

Low Vulnerability - Tarrant County has been cited as having more undeveloped land than any other urban county in the United States. The relatively large rural-urban interface has resulted in significant wildfires. Area fire departments are working to educate home and business owners on means to reduce their exposure to wildfires such as keeping grass mowed, planting fire resistant vegetation, removing wood roofing shingles, etc.

Location - Areas in the west and northwest parts of River Oaks are subject to wildfires.

Extent - The effects of wildfire are deaths, injuries, loss of structures, loss of wildlands, and loss of wildlife habitat.

Previous Occurrences – There are no reports of wildfires in River Oaks.

Probability of Future Events - Wildfires are likely to occur annually and increase in frequency and severity as the population continues to increase and formally rural areas are developed.

Vulnerability - Homes are most vulnerable to wildfires. The tendency to locate homes on tree covered lots and lack of fire breaks (such as parking lots around businesses) can enable fires to spread more easily to homes. Special facilities tend to be less vulnerable due to construction type (brick or metal).

Impact - Wildfires can result in the need for rapid evacuations, casualties, loss of homes and businesses, and loss of wildlife habitat and recreational areas.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **River Oaks Wildfire Mitigation Action #1** | Increase public education on how to reduce the risks from wildfires (construction, landscaping, etc.) |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | High |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | River Oaks Emergency Management |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will reduce the effects of wildfire on new buildings through increased use of wildfire mitigation measures. |
| **Effect on Existing Buildings** | This action will reduce the effects of wildfire on existing buildings through increased use of wildfire mitigation measures. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing the effects of wildfire. |
| **Discussion:** Wildfire mitigation measures are not widely known in urban areas such as Tarrant County. This action will increase that knowledge and reduce casualties and damages from wildfires. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **River Oaks Wildfire Mitigation Action #2** | Enact building permit process that encourages wildfire resistant construction. |

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| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | River Oaks Planning and Zoning Department |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will reduce the vulnerability of new structure to wildfire. |
| **Effect on Existing Buildings** | This action will reduce the vulnerability of existing buildings to wildfire if they are remodeled to the extent a building permit is required. |
| **Cost Effectiveness** | Cost Effective – This action will integrate wildfire mitigation into the building process at minimal cost. |
| **Discussion:** Integrating mitigation into building permitting provides a process to reduce vulnerability with few negative impacts. | |

**Existing Hazard Mitigation Efforts**
River Oaks has an outdoor warning system (sirens)

**Texas Standards That Exceed 44 CFR Requirements: Local Capability Assessments**
MAP 1
Projects funded under the following programs. Address the type of project that was funded. If you did not receive money from one of the below grants programs, then state that.
1.1: Hazard Mitigation Grant Program - None
1.2: Pre-Disaster Mitigation Grant Program - None
1.3: Project Impact - None
1.4: Hurricane-Property Protection Mitigation - None
1.5: Flood Mitigation Assistance - None
1.6: 406 Mitigation (through the Public Assistance Program) - None

MAP 2
Current Building Codes. Include the following information:
2.1: Date and type of code: 2003 International Building Code
2.2: How is it being enforced? Plans submitted for review. Projects inspected on site.

MAP 3
Current Fire Codes. Include the following information:

3.1: Date and type of code: 2003 International Fire Code
3.2: How is it being enforced?

- Plans are submitted for review
- Projects inspected on site
- Annual Fire Inspection

MAP 4

4.1: Any other codes, sub-division regulations, etc., that are in effect in your jurisdiction? No
4.2: How are they being enforced?

MAP 5

Floodplain Management. Include the following information:
5.1: Ordinance/Order Date: Ordinance #559, Adopted August 8, 2000
5.2: Do you have a Floodplain Administrator? Yes
5.3: Is the person a Certified Floodplain Manager (CFM)? Yes
5.4: Date of current floodplain maps. August 23, 2000
5.5: Any codes, regulations, etc. that prohibit development in the floodway and/or floodplain: Ordinance #559

MAP 6

Findings/results of Building Code Effectiveness Grading Report (BCEGS). Include date of report and score. Not applicable

MAP 7

Identify other plans that your jurisdiction has or have been done in your jurisdiction.
7.1: Capital Improvement Plans: No
7.2: Comprehensive Plans: Yes
7.3: Storm Water Management Plans: No
7.4: Master Drainage Plans: No
7.5: Corps of Engineers: No
7.6: Flood Mitigation Plan: No
7.7: Any other plans, studies, etc. that may have been done in your jurisdiction: No

# City of Saginaw

**Jurisdictional Profile**

Founded in 1833, Jarvis J. Green hoped to name his small plot of land "Pontiac", after his hometown in Michigan. Rejected by the postal service, he finally decided on another Michigan town - "Saginaw". In the later half of the 1800's, Saginaw was forever changed when the railroad decided to make Saginaw the last stop on their south-bound routes to Fort Worth. Saginaw prospered as the transportation dependent industry, such as grain storage and milling facilities, moved in to be near the railroad. Saginaw remains home to the largest grain storage facility in the world! Burrus Mills, now Cargill, Inc., was the launching pad for the western swing band "The Lightcrust Dough Boys". The railroad continues to engage in active operations with piggyback switching, freight services, railcar repair facilities and more. The grain mills operate 24/7. Saginaw is now one of the fastest growing communities in North Texas.

| 1990 | 2000 | 2006 | 2007 |
|---|---|---|---|
| 8,551 | 12,374 | 18,400 | 18,950 |
| 2007 Population Density (persons per square mile): 2,483.16 | | | |

**City Point of Contact**

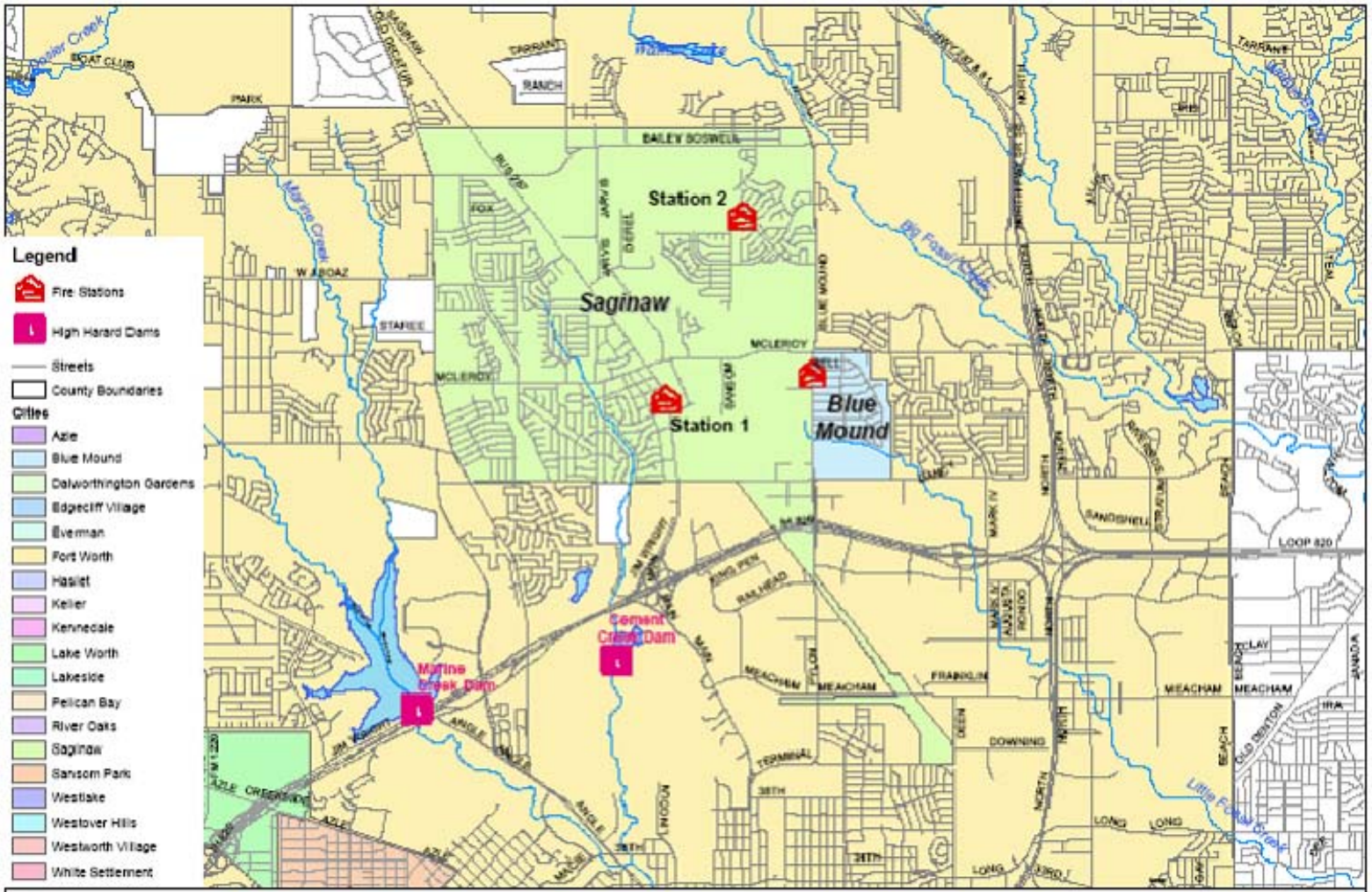
Fire Lieutenant Doug Spears

**Land Use and Development Trends**

Saginaw has a mix of residential, commercial, retail, and industrial areas. Rail yards, grain elevators and mills, and light industrial complexes are located along US Highway 287 through the center of Saginaw. Most new growth is residential developments located in the west and north sides of Saginaw.

**Jurisdiction Unique Hazards**

Hazards specific to Saginaw are discussed below.


Legend
Fire Stations
High Hazard Dams
Streets
County Boundaries
Cities
Azle
Blue Mound
Dalworthington Gardens
Edgecliff Village
Everman
Fort Worth
Haslet
Keller
Kennedale
Lake Worth
Lakeside
Pelican Bay
River Oaks
Saginaw
Sansom Park
Westlake
Westover Hills
Westworth Village
White Settlement
Station 2
Station 1
Saginaw
Blue Mound
Marine Creek Dam
Cement Creek Dam
FORT WORTH
Participating Jurisdictions: Saginaw
Fire Stations
0
1 Miles
1" Inch = 1 Miles
N
Copyright © 2008, City of Fort Worth
02/07/2008

**DAM FAILURE**

No Vulnerability – There are no high hazard dams located in Saginaw and none that would affect Saginaw if they failed. Based on the lack of vulnerability, dam failure will receive no further consideration in this plan for Saginaw.

**DROUGHT**

Moderate Vulnerability – Saginaw purchases water from Fort Worth who purchases water from the Tarrant Regional Water District (TRWD). TRWD water supply comes from three reservoirs on the West Fork of the Trinity River in northwest Tarrant County and from two reservoirs located well southeast of Tarrant County. These diverse supply locations help mitigate the effects of a local drought. An additional reservoir location well northeast of Tarrant County is being pursued. There has been some preliminary discussion of constructing a pipeline to carry water from southern Oklahoma. TRWD is installing pipelines to interconnect area water supply lakes with water treatment plants in order to provide maximum flexibility in water supply and treatment.

Location – Drought can affect all of Saginaw.

Current Extent – As of February 2008, Saginaw was at DO – Abnormally Dry on the Palmer Drought Severity Index.

Previous Occurrences – National Climatic Data Center records indicate that in the past ten years there have been three periods of drought in Saginaw, 1996 - 1998, 2000, and 2005 - 2006.

Probability of Future Events – Droughts are certain to occur again in Saginaw. Significant droughts significantly affecting water supply and resulting in mandatory restrictions traditionally occur on a twenty year cycle. Based on the previously cited National Climatic Data Center recent records, we can anticipate that drought conditions will occur approximately every three years.

Impact – Drought can lead to loss of water for basic needs such as drinking and fire-fighting. Droughts are associated with increased wildfire and damage from expansive soils. More common impacts are damage to landscaping and reduced recreation due to low lake levels.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Saginaw Drought Mitigation Action #1** | Participate in the design and implementation of the Tarrant County specific water conservation public education efforts to compliment existing programs. |
| **Mitigation Goal/Objective** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $1,000 |

| | |
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| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • City Funds<br>• Water Suppliers |
| **Responsible Agency** | Saginaw fire/emergency management |
| **Estimated Completion Time Frame** | One year |
| **Effect on New Buildings** | This action will publicize water conservation efforts that can be incorporated into new construction. |
| **Effect on Existing Buildings** | This action will publicize water conservation efforts that can be incorporated into existing construction. |
| **Cost Effectiveness** | Cost Effective – Public education programs can provide significant results for relatively low costs. |
| **Discussion:** Most cities in the area have existing water conservation programs designed to educate the public and businesses on ways to conserve water. This action will develop a Tarrant County specific program that will compliment existing programs. Jurisdictional public education efforts have been very successful in attracting the attention of local citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Saginaw Drought Mitigation Action #2** | 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. Impacts identified in this plan will be included in updates to the Hazard Mitigation Action Plan. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • City Funds<br>• Water Suppliers |
| **Responsible Agency** | • Saginaw fire/emergency management<br>• Fort Worth – Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One Year |

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| **Effect on New Buildings** | This action will identify drought impacts in Saginaw thus providing specific information for builders of new structures to incorporate drought mitigation into the structures. |
| **Effect on Existing Buildings** | This action will identify drought impacts in Saginaw thus providing specific information for owners of existing structures to incorporate drought mitigation into the structures. |
| **Cost Effectiveness** | Cost Effective – This planning effort will have a low cost with the potential for significant benefits for the entire community. |
| **Discussion:** This planning effort will focus attention on the effects of drought on the community. Specific drought effects will be identified and efforts can be made to mitigate those effects. | |

**EXPANSIVE SOILS**

Low Vulnerability - Expansive soils have caused damage to some structures in Saginaw. However, damage has been limited to relatively small geographic areas and there are no reports of significant damage to commercial structures or infrastructure.

Location – Expansive soils are found in various areas of Saginaw. We could not locate a map of expansive soils in Saginaw.

Extent – The extent of expansive soils in Saginaw is believed to be Very Low (0% - 20%) to Low (21% - 50%).

Previous Occurrences – We could find no empirical data on previous occurrences of damage from expansive soils, but it is believed that expansive soils have caused problems since the first buildings were constructed in this area.

Probability of Future Events – Due to the variability of soil types and construction quality, it is very difficult to predict future occurrences of problems with expansive soils. However, a study published in the fall 2003 issue of *Environmental Geology* cited in the September 19, 2003 *Dallas Business Journal* indicates that many new developments in the Metroplex are being built on soil that is more unstable than soils built on prior to 1990. This could lead to a higher incidence of expansive soil related damage in the future.

Impact – The impact of expansive soils ranges from cosmetic cracks in walls to substantial foundation and structural damage that can result in the need to demolish the building. Infrastructure such as pipelines can be damaged causing increased maintenance and repairs, damaged beyond repair requiring replacement, damaged to the point of failure.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Saginaw Expansive Soils Mitigation Action #1** | Improve construction techniques through building code enhancements. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined (Minimal – Staff Time Only) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building permit fees |
| **Potential Matching Funding Sources** | • City Funds<br>• Building permit fees |
| **Responsible Agency** | Saginaw Building Inspections |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will make new buildings more resistant to damage from expansive soils. |
| **Effect on Existing Buildings** | This action will require modifications to existing buildings to be more resistant to damage from expansive soils. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will improve construction quality and reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Saginaw Expansive Soils Mitigation Action #2** | Educate construction contractors, home owners, and business owners about mitigation techniques. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building Permit Fees |
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | • Saginaw Building Inspections<br>• Saginaw fire/emergency management |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will provide builders of new construction with expansive soil mitigation techniques that will reduce damage. |

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| **Effect on Existing Buildings** | This action will provide owners of existing buildings with expansive soil mitigation techniques that will reduce damage. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will provide construction contractors and home/business owners with techniques designed to reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**EXTREME HEAT**

High Vulnerability - Summer heat and humidity can occur anytime from May through October. Community health services actively work with at risk populations to prevent heat related deaths and injuries. The elderly, very young people and people with poor health are most at risk from summer heat. People who work outside or in un-air-conditioned buildings are also at high risk to the direct effects of summer heat. Summer heat can also lead to electrical service outages if equipment fails or demand exceeds available supply. Most public safety and special facilities are equipped with emergency generators.

Location - Throughout the City.

Extent - Summer temperatures can reach as high as 113 degrees. Saginaw is also subject to high humidity.

Previous Occurrences - This is an annual occurrence. The summer of 1980 was a record year with 69 consecutive days of temperatures of 100 degrees or more. We were unable to find a reliable record of deaths or injuries related to heat.

Probability of Future Events - Hot summer temperatures are certain to continue to occur in Saginaw.

Impact - Summer heat can cause widespread electrical outages resulting in dangerous conditions, especially for at-risk populations. Occasionally "cooling centers" are opened at community centers to provide a safe place for citizens to seek refuge from the heat. Extreme heat can have economic impacts if construction work is curtailed or outdoor special events are cancelled.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Saginaw Extreme Heat Mitigation Action #1** | Determine feasibility of expanding monitoring of populations at risk from extreme heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined. Staff time and GIS resources |

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| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Other State or Federal Public Health Grants |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Tarrant County Public Health<br>• Saginaw fire/emergency management |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | None - This action is intended to expand monitoring of people only. |
| **Effect on Existing Buildings** | None - This action is intended to expand monitoring of people only. |
| **Cost Effectiveness** | Pending, but believed to be Cost Effective |
| **Discussion:** This action would determine the feasibility of expanding monitoring of populations at risk from extreme heat. Existing at risk population monitoring programs will be reviewed to ensure all known populations at risk from extreme heat are included. Any newly discovered at risk populations will be evaluated for inclusion in existing monitoring programs. Tarrant County Public Health provides public health services throughout the County. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Saginaw Extreme Heat Mitigation Action #2** | Increase public education programs on the dangers of excessive heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness |
| **Priority** | Medium |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Other State or Federal Public Health Grants |
| **Responsible Agency** | • Tarrant County Public Health<br>• Saginaw fire/emergency management |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Effect on Existing Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits. |
| **Discussion:** Public education on severe weather in Saginaw has traditionally focused on severe thunderstorms and associated hazards (tornadoes, lighting, flooding, high winds). This action would expand public education to include hazards from extreme heat. | |

**FLOOD**

High Vulnerability - The topography of Saginaw combined with the frequency of severe thunderstorms results in frequent flash flood events. The Saginaw Fire Station experiences some flooding during heavy rain events. Upstream development in Saginaw and Fort Worth will likely increase the number of homes and businesses vulnerable to flooding. FEMA records indicate only 39 Repetitive Loss Properties in all of Tarrant County. However, this is probably more a reflection of the low number of flood insurance polices than vulnerability to flooding. Further analysis using GIS and field verification can specifically identify vulnerable structures.

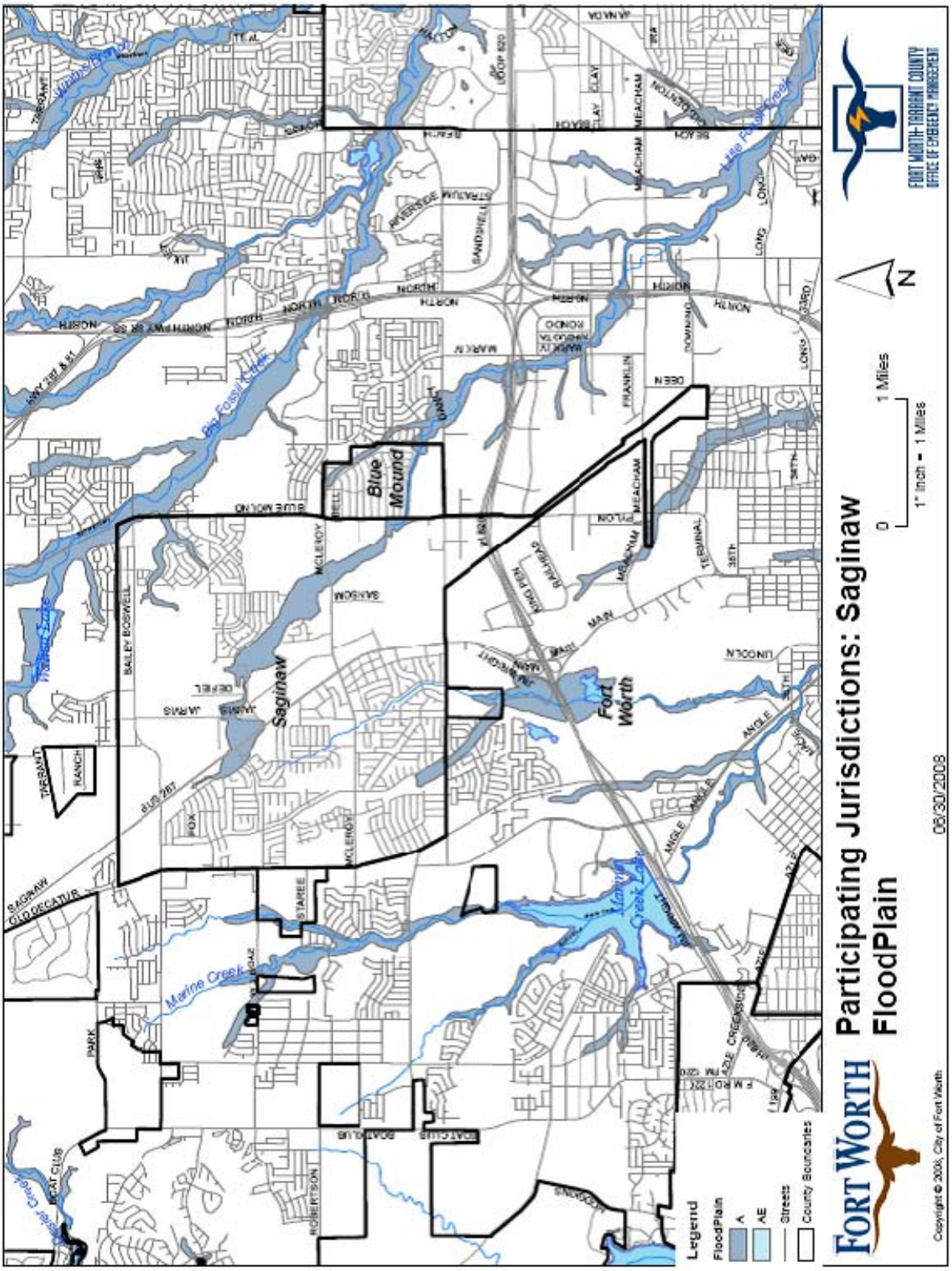
Location - Throughout the City along creeks and drainage structures. Cement Creek, Willow Creek and Little Fossil Creek are prone to flooding. Flooding through Willow Creek Park and some nearby homes occurs after heavy rains.

Extent - Flash floods are the most common type of flooding in Saginaw which tend to occur and recede very quickly.

Previous Occurrences - Minor flooding occurs frequently, especially during the spring and early summer. In June of 2004 significant flooding occurred on Cement Creek and Willow Creek.

Probability of Future Events – Based on previous experience Saginaw is certain to suffer flash flood events every year. National Weather Service records indicate an average of 11 flash flood events per year in Tarrant County. Continued development throughout the County and the resulting increase in impervious cover will increase the likelihood and severity of flooding.

Impact - Flash floods kill more people than any other hazard associated with thunderstorms. Property damage from flash flooding is seldom covered by insurance, which makes it very difficult for citizens to recover from the flood. Due to the very rapid rate of development and growth throughout Tarrant County we are experiencing problems with determining actual building footprints within flood plains and will be using planimetric GIS data from the NCTCOG to resolve this issue when it becomes available. At that time we will be able to accurately identify the number and types of buildings vulnerable to flooding; as well as access other data associated with those locations such as appraised value, census data, and owner information.


Participating Jurisdictions: Saginaw
FloodPlain
FORT WORTH
FORT WORTH-TARRANT COUNTY
OFFICE OF EMERGENCY MANAGEMENT
N
0
1 Miles
1" Inch = 1 Miles
06/30/2008
Legend
FloodPlain
A
AE
Streets
County Boundaries
Saginaw
Blue Mound
Fort Worth
Marine Creek
Big Fossil Creek
Little Fossil Creek
Lake Worth
Copyright © 2008, City of Fort Worth

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Saginaw Flood Mitigation Project #1** | Participate in the development of the Tarrant County specific "Flood Preparedness" brochure. |
| **Hazard Addressed** | Flooding |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of Flood events.<br>1. c. Develop effective flood mitigation public education materials. |
| **Priority** | High |
| **Estimated Cost** | Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Private Foundation Grants |
| **Responsible Agency** | • Saginaw fire/emergency management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This action will provide flood mitigation techniques for owners of new buildings. |
| **Effect on Existing Buildings** | This action will provide flood mitigation techniques for owners of existing buildings. |
| **Cost Effectiveness** | Cost Effective - This project will provide valuable information to the public in a relatively short time and with relatively low costs. It will also have the added benefit of increasing public awareness of mitigation. The estimated cost could easily be offset by reduced losses to the public in a single small flood event. |

**Discussion**: Develop Tarrant County specific "Flood Preparedness" brochure. Once developed, the brochure will be distributed County-Wide. Historically flood prone areas will be targeted for door-to-door distribution and neighborhood meetings to present the brochure and solicit input for *Fort Worth Hazard Mitigation Action Plan* revisions.

The brochure will include:

- Description of Tarrant County flood hazards
- "Case Studies" of previous flood events in Tarrant County
- Preparedness and "self-help" mitigation information
- Benefits of city participation in NFIP
- Advantages of flood insurance
- Risks of not having flood insurance
- Warnings that typical homeowner's insurance does not cover rising water
- Solicit input for the *Fort Worth Hazard Mitigation Action Plan*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Saginaw Flood Mitigation Action #2** | Conduct study to determine best means of mitigating flooding of Saginaw Fire Station #1 located at 400 North Saginaw Blvd. and implement findings. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |
| **Priority** | Medium |
| **Estimated Cost** | $50,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Saginaw Public Works<br>• Saginaw fire/emergency management |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will have no effect on new buildings. |
| **Effect on Existing Buildings** | This action will provide guidance for protection of the existing Saginaw Fire Station #1. |
| **Cost Effectiveness** | Cost Effective – This project will provide guidance to reduce the hazard to life and property from flooding. |
| **Discussion:** This action will develop a study of flooding of Fire Station #1 and provide findings that can reduce the adverse effects of flooding on the creek. | |

**HAILSTORM**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of large hail are a hazard event in Saginaw. Tarrant County averages eleven significant thunderstorm events (large hail, high winds) per year according to National Weather Service records. Most structures in Saginaw can resist the effects of all but the most severe hailstorms. Saginaw has a number of mobile and manufactured home parks that are more vulnerable to the effects of hailstorms than site built structures. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to hailstorms. Vehicles have proven to be vulnerable to hailstorms with widespread severe vehicle damage reported in 1980 and 1995.

Location - Throughout the City.

Extent - Saginaw is subject to the hazards of severe thunderstorms, including large hail. Hail stones up to the size of grapefruit (H9 on the Combined NOAA/TORRO Hailstorm Intensity Scales) have been reported in Saginaw.

Previous Occurrences – There are no reports of significant hailstorm events in Saginaw other than the 1980 and 1995 county-wide events.

Probability of Future Events - Thunderstorms with hail are certain to continue to occur in Saginaw. Hail falls on about two or three days per year, ordinarily with only slight and scattered damage (*National Weather Service*).

Impact – The impact from hailstorms can be significant in extreme events such as the hailstorms of 1980 and 1995. Thousands of homes and vehicles can be damaged in a single storm with millions of dollars in damages. Vehicles are especially impacted by large hails with windshields being the vulnerable part. A recurring problem following hailstorms is broken windshields in vehicles belonging to populations who do not have vehicle insurance and cannot afford the replacements costs, resulting in the owners having difficulty traveling to work, medical appointments, etc.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Saginaw Hailstorm Mitigation Action #1** | Develop a public education campaign to encourage "hail resistant" roofing in new construction and roof replacements. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• Building/Permit Fees<br>• City Funds |
| **Responsible Agency** | • Saginaw fire/emergency management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will potentially decrease the damage caused by most hailstorms to new buildings. |
| **Effect on Existing Buildings** | This action will potentially decrease the damage caused by most hailstorms to existing buildings. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing hailstorm damage. One long term benefit will be reduced property insurance as claims related to hail damage are reduced. |
| **Discussion**: Public education has proven to be a low cost effective means to achieve changes public behavior. Encouraging hail resistant roofing can benefit citizens through reduced damage, business through reduced damage to their buildings and reduced claims against insurance companies, and government through reduced request for assistance. This campaign can be developed in conjunction with the Tarrant County effort. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Saginaw Hailstorm Mitigation Action #2** | Evaluate City buildings to determine feasibility of installing hail resistant roofing and window coverings with a focus on critical infrastructure. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• City Funds |
| **Responsible Agency** | • Saginaw Public Works<br>• Saginaw fire/emergency management (Support) |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on new City buildings. |
| **Effect on Existing Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on existing City buildings. |
| **Cost Effectiveness** | Cost Effective – Although currently undetermined, this project is believed to be cost effective. |
| **Discussion:** Installing hail resistant roofing and window coverings on City buildings could prevent or limit damage to City buildings thus avoiding costs to the City as well as preventing or limiting loss of use of damaged facilities. | |

**HIGH WINDS**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of high winds are a hazard in Saginaw. Tarrant County averages ten reported significant thunderstorm events (large hail, high winds) per year. In addition, strong weather fronts can sometimes be accompanied by high winds which occasionally cause damage. Saginaw has a number of mobile and manufactured home parks that are more vulnerable to the effects of thunderstorms than site built structures. Most structures in Saginaw can resist the effects of all but the most severe high wind events. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to high winds.

Location - Throughout the City.

Extent - Severe thunderstorms with high winds with speeds in excess of 90 mph have been reported in Saginaw.

Previous Occurrences – We could find no records of significant high wind damage in Saginaw.

Probability of Future Events – Based on previous experience Saginaw can expect to experience an average of ten significant thunderstorm events with high winds per year.

Impact – Records on high wind events are difficult to separate from severe thunderstorm records. High winds in Saginaw typically cause little damage to commercial buildings. More often high winds cause damage to roofs, trees, and signs.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Saginaw High Winds Mitigation Action #1** | Enact enhanced building codes to reduce damages from high winds. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined – Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Saginaw Building Inspections Department |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will potentially identify a means to reduce high wind damage on new buildings. |
| **Effect on Existing Buildings** | This action will potentially identify a means to reduce high wind damage on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Although costs are undetermined, this action is believed to be cost effective since the action will require staff time only. |
| **Discussion:** Enhanced building codes will reduce damages from high wind events. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Saginaw High Winds Mitigation Action #2** | Educate builders and residents about mitigating wind damage. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |

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| **Responsible Agency** | • Saginaw Building Inspections Department<br>• Saginaw fire/emergency management |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on new buildings. |
| **Effect on Existing Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost of developing and providing high wind mitigation compared with savings to the community make this action cost effective. |
| **Discussion:** Public education has proven to be a low cost and effective means to achieve changes public behavior. High winds have not been a focus of severe weather preparedness. | |

**LANDSLIDES**

No Vulnerability - Although there is some relatively steep terrain in portions of Saginaw, the relief is associated with rocky outcrops and not susceptible to landslides. There is no history of landslides in Saginaw. Based on the lack of vulnerability, landslides will receive no further consideration in this plan for Saginaw. However, landslide hazards will be reviewed during the annual review of this plan and we will continue looking for areas with landslide potential during hazard surveys.

**LEVEE FAILURE**

No Vulnerability – There are no levees or areas that would be affected by levee failure in Saginaw. Based on the lack of vulnerability, levee failure will receive no further consideration in this plan for Saginaw.

**LIGHTNING**

Moderate Vulnerability – Lightning is one of the most common hazards in Saginaw. Thunderstorms (and by definition, lightning) occur an average of 30 – 50 days per year (*Oklahoma Climatological Survey*). Lightning is the second most common cause of weather-related deaths in Texas (*National Weather Service*). Lightning information is available only for Tarrant County on a county-wide basis.

Location – Throughout the City.

Extent – We could find no references to the average number of strikes per storm in Saginaw. However, lightning is by definition associated with thunderstorms.

Previous Occurrences – Saginaw experiences 30 – 50 thunderstorm days per year. From 1995 – 2004 one person was killed and five were injured by lightning in Tarrant County (*National Weather Service*). Throughout Texas 34 people were killed by lightning, there were 184 injuries, and an estimated 23 million dollars in damages due to lightning from 1995 - 2004 (*National Weather Service*).

Probability of Future Events – Based on past experience Saginaw will experience 30 – 50 thunderstorm days each year. Some days will have more than one thunderstorm during a given thunderstorm day.

Impact – Although lightning is the second most common cause of storm related deaths in Texas, lightning deaths remain relatively rare. Lightning does cause property damage several times per year (we could not find statistical data to validate this observation).

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Saginaw Lightning Mitigation Action #1** | Provide lightning mitigation materials with building permit packets. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Saginaw Building Inspections |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will provide materials that will reduce the vulnerability of new buildings to lightning. |
| **Effect on Existing Buildings** | This action will provide materials that will reduce the vulnerability of existing buildings that are being remodeled to lightning. |
| **Cost Effectiveness** | Cost Effective – The low cost of this project would be offset by eliminating just one lightning caused building loss. |
| **Discussion:** Lightning mitigation materials will be included in all building permit packets distributed to builders or citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Saginaw Lightning Mitigation Action #2** | Ensure all City critical infrastructure has adequate lightning mitigation in place and upgrade protection as necessary. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | $2,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |

| | |
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| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Saginaw Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will ensure new City buildings that house critical infrastructure have adequate lightning mitigation. |
| **Effect on Existing Buildings** | This action will ensure existing critical infrastructure has adequate lightning mitigation. |
| **Cost Effectiveness** | Cost Effective – The destructive and sometimes capricious nature of lighting warrant the expense of this action compared with the benefits of avoiding damage to critical infrastructure. |
| **Discussion:** Review and confirmation of the adequacy of lightning protection systems in City buildings housing critical infrastructure is worthwhile considering the number of thunderstorms experienced in Saginaw. | |

**SEVERE THUNDERSTORM**

High Vulnerability - Severe thunderstorms are the most common hazard in Saginaw. From 1950 through August 2007 Tarrant County averaged eleven reported severe thunderstorm events county-wide per year. Most structures in Saginaw can resist the effects of all but the most severe thunderstorms. Saginaw has a number of mobile and manufactured home parks that are more vulnerable to the effects of thunderstorms than site built structures. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to thunderstorms.

Location - Throughout the City.

Extent - Saginaw is subject to the hazards of severe thunderstorms of all magnitudes.

Previous Occurrences - June 2004 - Severe Thunderstorms caused wind damage and electrical services outages. Heavy rains from the storms caused flooding on Cement Creek and Willow Creek.

Probability of Future Events – Severe thunderstorms will occur in Saginaw an average of eleven times per year.

Impact – A single severe thunderstorm can cause damage from hail, high winds, lightning, and/or tornadoes to thousands of structures.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Saginaw Severe Thunderstorm Mitigation Project #1** | Conduct technical assessment to determine the feasibility of structurally hardening both Saginaw Fire Stations against severe weather. |
| **Hazard Addressed** | Tornado/Severe Thunderstorm |

| | |
|---|---|
| **Mitigation Goal/Objective** | 2. Reduce loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | High |
| **Estimated Cost** | $40,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • Private Foundation Grants<br>• Other State or Federal Grants<br>• City Funds |
| **Responsible Agency** | • Saginaw Building Inspections Department<br>• Saginaw fire/emergency management |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This project will determine the feasibility of structurally hardening the Saginaw Fire Stations against severe weather. |
| **Effect on Existing Buildings** | This project will determine the feasibility of structurally hardening the Saginaw Fire Stations against severe weather. |
| **Cost Effectiveness** | Cost Effective - This project will provide the basis for a realistic cost benefit analysis of the feasibility of hardening the Saginaw Fire Stations against severe weather events. The relatively low cost of this project compared with the potential benefits of protecting a city's emergency response equipment against the jurisdiction's most likely hazard event result in a favorable cost benefit review. |

**Discussion:**
This project will provide for determining the feasibility of hardening the city's two fire stations against severe weather. This project will contribute to protecting emergency response equipment so that it will be available to assist the citizens of Saginaw in responding to and recovering from severe weather or other events. Final project details will be developed in accordance with grant requirements at the time the project is funded.

The cost estimate is a conservative "best guess" based on a structural analysis of the existing fire station. That analysis would require:

- Structural analysis of the building by a Structural Engineer
- Analysis of electrical systems
- Analysis of HVAC systems
- Review of building codes

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Saginaw Severe Thunderstorm Mitigation Action #2** | Encourage builders to install storm resistant construction such as "hurricane clips". |

| | |
|---|---|
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | High |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |
| **Responsible Agency** | Saginaw Building Inspections Department |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will encourage storm resistant construction in new buildings. |
| **Effect on Existing Buildings** | This action will encourage storm resistant construction in existing buildings as they are remodeled. |
| **Cost Effectiveness** | Cost Effective – The low cost of this action will be offset by a reduction in damage from severe thunderstorms. |
| **Discussion:** Effective education on storm resistant construction can reduce damage from severe thunderstorms. Insurance companies may be willing to fund or provide educational materials and/or provide discounts to persons who install storm resistant devices. | |

**SEVERE WINTER STORMS**

Moderate Vulnerability - Since 2000 the National Weather Service has reported 14 Winter Storm/Ice events. Winter storms in Saginaw usually consist of short-lived icing events (ice on the roads for a few hours) that primarily affect traffic and cause numerous motor vehicle accidents. Occasionally an ice storm will cause widespread power outages for as long as several days. ONCOR Electric Delivery has an aggressive tree trimming program. Most structures in Saginaw can resist the effects of all but the most severe winter storms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to winter storms. Electrical service outages are usually the most serious threat in this area. Most public safety and special facilities are equipped with generators.

Location - Throughout the City.

Extent - Severe ice storms have resulted in accumulations in excess of two inches. Most storms leave only a light coating or glaze of ice.

Previous Occurrences – Severe Winter Storms are typically regional events. Saginaw averaged two winter storms per year since 2000. Most winter storms resulting only minor inconveniences and a few motor vehicle accidents.

In 1978 up to an inch of ice coated area trees and roadways causing $14 million in damages region-wide and making travel almost impossible for two days.

In 1996 a winter storm dropped two to four inches of a mixture of sleet, freezing rain, and snow in Saginaw over Thanksgiving weekend causing many motor vehicle accidents and some electrical service outages.

In 2003 a winter storm dropped one inch of sleet across Saginaw resulting in numerous motor vehicle accidents and closing schools for two days.

Probability of Future Events - Saginaw can expect to experience two winter storms per year with a severe winter storm once each ten years.

Impact - Winter storms can cause widespread electrical and telephone service outages, make travel dangerous or impossible, and damage structures. Deaths and injuries due to vehicle accidents and slips/falls are common during ice storms. Occasional deaths and injuries from carbon monoxide poisoning due to improper heating have occurred. Economic losses due to lost production can be significant. Damage from frozen pipes can lead to significant expenses for homeowners.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Saginaw Severe Winter Storm Mitigation Action #1** | Increase public education concerning winter storm preparedness and mitigation. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | Medium |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Saginaw fire/emergency management |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into new buildings. |
| **Effect on Existing Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost is effective when compared to benefits provided to citizens. |
| **Discussion:** Winter weather preparedness has not been emphasized in Saginaw as much as severe thunderstorms. This action will provide preparedness information to citizens during the fall. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Saginaw Severe Winter Storm Mitigation Action #2** | Purchase additional street sanding capacity |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Saginaw Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will have no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Sanding streets is essential to allow emergency vehicles to respond during severe winter events. |
| **Discussion:** Sanding equipment can be mounted on existing equipment to provide sanding capabilities. During severe winter weather events streets around hospitals, fire stations and other critical facilities are sanded along with major intersections and roadways. Additional sanding capacity would allow for quicker sanding of these areas and for more repeat sanding during prolonged winter weather events. This will improve public safety by facilitating emergency response as well as reducing motor vehicle accidents. | |

**STREAM BANK EROSION**

No Vulnerability - The predominantly low rolling topography of Saginaw prevents stream bank erosion from causing a hazard except in a few locations. No vulnerability to stream bank erosion has been identified in Saginaw. Further analysis using GIS and field verification will continue to search for vulnerable structures or facilities.

**TORNADO**

High Vulnerability – All structures in Saginaw are vulnerable to tornadoes. Saginaw has a number of mobile and manufactured home parks that are particularly vulnerable to tornadoes. Very few structures can withstand the effects of an F5 tornado. However, the March 28, 2000 F3 tornado that struck Fort Worth provided good evidence that well built structures can protect people who take appropriate shelter inside those buildings.

Location - Tornadoes can occur anywhere in Saginaw.

Extent - Saginaw is subject to tornadoes of all magnitudes, including F5 tornadoes.

Previous Occurrences – We found no reports of tornados causing damage in Saginaw However, Tarrant County has an average of one tornado reported per year county-wide (Source: National Climatic Data Center). In 2007 there were eight tornadoes reported by

storm spotters county-wide. Four of those tornados caused damage, all within incorporated areas. Since 2000 tornadoes have caused damage in Arlington, Benbrook, Euless, Everman, Fort Worth, Grand Prairie, Haltom City, Mansfield, North Richland Hills, and River Oaks.

Probability of Future Events - Tarrant County has averaged one reported tornado per year and can expect that average to continue. Saginaw, based on its relatively small size, will likely experience tornados very infrequently.

Impact - Tornadoes can cause deaths, injuries and property damage/destruction. Special facilities such as hospitals, fire stations, and utilities can be damaged or destroyed. Citizens who live in neighborhoods struck by tornadoes can experience disruption of their life styles and traditions. Areas struck by tornadoes can experience increased demand for mental health services as people deal with grief and stress.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Saginaw Tornado Mitigation Project #1** | Assist citizens with funding for building tornado safe rooms or in-ground shelters. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction |
| **Priority** | High |
| **Estimated Cost** | $200,000 (50 Safe Rooms at $4,000 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Community Development Block Grant Funds |
| **Potential Matching Funding Sources** | Home/Building Owner |
| **Responsible Agency** | • Saginaw Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This project will encourage new buildings to be constructed with tornado safe rooms as part of the construction process. The safe room will enhance the overall storm resistance of the building. |
| **Effect on Existing Buildings** | This project will encourage homeowners to construct/install tornado safe rooms in their existing homes. A safe room will enhance the overall storm resistance of the building. |

| | |
|---|---|
| **Cost Effectiveness** | Cost Effective - Safe rooms and in-ground shelters have been proven to reduce deaths and injuries during tornadoes and severe thunderstorms. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of safe rooms and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

**Discussion:**

This project will reimburse costs associated with tornado safe room or in-ground shelter installation in new or existing homes. Safe rooms provide increased protection for citizens during severe thunderstorms and tornados. Safe rooms have been proven to save lives and reduce injuries from severe weather events. FEMA publication 320 (*Taking Shelter from the Storm, Building a Safe Room Inside Your House*) provides the standards for safe rooms. As stated on the FEMA website: Although a "*residence may be built "to code," that does not mean it can withstand winds from extreme events such as tornadoes and major hurricanes. The purpose of a safe room or a wind shelter is to provide a space where you and your family can seek refuge that provides a high level of protection. To protect its occupants, a safe room must be built to withstand high winds and flying debris, even if the rest of the residence is severely damaged or destroyed."*

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to home owners will be for no more than $3,000 or 75% of cost, whichever is less
- Eligibility will be limited to individuals who own their home at the time of application
- The safe room or in-ground shelter must be constructed/installed in the primary residence of the applicant
- Each eligible homeowner can only receive one reimbursement, regardless of the number of shelters he/she may purchase/install
- In-ground shelters must meet requirements established in the National Performance Criteria for Tornado Shelters dated May 28, 1999.
- Safe Rooms must meet the requirements of FEMA Publication 320
- Safe Rooms and shelters must meet all applicable city and/or county codes
- Previously owned or used shelters will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Saginaw Tornado Mitigation Project #2** | Assist citizens with funding for purchase of Weather Alert Radios |

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|---|---|
| **Mitigation Goal/Objective** | 4. Increase the effectiveness of warning systems in Tarrant County.<br>4. a. Increase the number of homes and businesses with Weather Alert Radios. |
| **Priority** | High |
| **Estimated Cost** | $16,000 (400 Weather Alert Radios at $40 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Private Sector Donations<br>• City Funds |
| **Potential Matching Funding Sources** | Citizen/Business Owner |
| **Responsible Agency** | • Saginaw Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings except for providing additional warning time of severe weather events thus allowing citizens more time to secure their home or business against approaching severe weather. |
| **Cost Effectiveness** | Cost Effective – Weather Alert Radios are a proven means to alert and warn citizens about severe weather and civil emergencies. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of Weather Alert Radios and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

***NOTE**: We are aware that Weather Alert Radios are on the "2007 Ineligible Planning Activities" list. It is our opinion that Weather Alert Radios should be considered eligible due to their very high benefit and very low cost.*

This project will reimburse 75% of the cost for citizens to purchase Weather Alert Radios, with the citizen responsible for the remaining 25%. Weather Alert Radios provide the best means for citizens to receive emergency alerts when they are indoors. Severe weather is the primary hazard in our area. Early alert and warning has proven to be a significant factor in saving lives during severe weather events.

In addition, the Weather Alert Radios can be activated for civil emergencies such as hazardous materials incidents. Effective warning saves lives, especially during severe weather events. Weather alert radios provide a proven means of indoor warning to citizens any time of the day or night and compose the vital indoor portion of our emergency warning system.

Warning systems have been shown to have value beyond the initial warning. Persons receiving warning relay the information to family and friends to ensure they are aware of the hazard. The secondary and tertiary warning can greatly amplify the effectiveness of the warning system.

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to citizens will be for no more than $30 or 75% of cost of the radio, whichever is less
- Eligibility will be limited to residents of Saginaw
- The citizen must sign an agreement to keep the radio operational
- Each eligible homeowner can only receive one reimbursement, regardless of the number of radios purchased
- Previously purchased radios will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**WILDFIRE**

Moderate Vulnerability - Tarrant County has been cited as having more undeveloped land than any other urban county in the United States. The relatively large rural-urban interface has resulted in significant wildfires. Area fire departments are working to educate home and business owners on means to reduce their exposure to wildfires such as keeping grass mowed, planting fire resistant vegetation, removing wood roofing shingles, etc.

Location - The areas of most concern are on the north and west sides of Saginaw, especially along Cement Creek, Willow Creek, and Little Fossil Creek. Access to fight wildfires is often difficult due to thick trees and undergrowth, and lack of roads.

Extent - The effects of wildfire are deaths, injuries, loss of structures, loss of wildlands, and loss of wildlife habitat.

Previous Occurrences - Wildfires in Saginaw are typically associated with droughts. A number of wildfires occurred during the droughts from 1996 - 1998, 2000, and from 2005 - 2006.

Probability of Future Events - Wildfires are likely to occur annually and increase in frequency and severity as the population continues to increase and formally rural areas are developed.

Vulnerability - Homes are most vulnerable to wildfires. The tendency to locate homes on tree covered lots and lack of fire breaks (such as parking lots around businesses) can enable fires to spread more easily to homes. Special facilities tend to be less vulnerable due to construction type (brick or metal).

Impact - Wildfires can result in the need for rapid evacuations, casualties, loss of homes and businesses, and loss of wildlife habitat and recreational areas.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Saginaw Wildfire Mitigation Action #1** | Increase public education on how to reduce the risks from wildfires (construction, landscaping, etc.) |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | High |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Saginaw Fire/Emergency Management |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will reduce the effects of wildfire on new buildings through increased use of wildfire mitigation measures. |
| **Effect on Existing Buildings** | This action will reduce the effects of wildfire on existing buildings through increased use of wildfire mitigation measures. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing the effects of wildfire. |
| **Discussion:** Wildfire mitigation measures are not widely known in urban areas such as Tarrant County. This action will increase that knowledge and reduce casualties and damages from wildfires. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Saginaw Wildfire Mitigation Action #2** | Enact building permit process that encourages wildfire resistant construction. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | Saginaw Building Inspections |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will reduce the vulnerability of new structure to wildfire. |
| **Effect on Existing Buildings** | This action will reduce the vulnerability of existing buildings to wildfire if they are remodeled to the extent a building permit is required. |
| **Cost Effectiveness** | Cost Effective – This action will integrate wildfire mitigation into the building process at minimal cost. |
| **Discussion:** Integrating mitigation into building permitting provides a process to reduce vulnerability with few negative impacts. | |

**Existing Hazard Mitigation Efforts**
Saginaw operates and outdoor warning system (sirens)

**Texas Standards That Exceed 44 CFR Requirements: Local Capability Assessments**
MAP 1
Projects funded under the following programs. Address the type of project that was funded. If you did not receive money from one of the below grants programs, then state that.
1.1: Hazard Mitigation Grant Program
- Drainage project completed 8/1/97 $442,548.00 DR930
- Drainage project completed 9/11/97 $718,659.00 DR930

1.2: Pre-Disaster Mitigation Grant Program - None
1.3: Project Impact - None
1.4: Hurricane-Property Protection Mitigation - None
1.5: Flood Mitigation Assistance - None
1.6: 406 Mitigation (through the Public Assistance Program) - None

MAP 2
Current Building Codes. Include the following information:
2.1: Date and type of code: 2003 International Building Code
2.2: How is it being enforced? Plans submitted for review. Projects inspected on site.

MAP 3

Current Fire Codes. Include the following information:

3.1: Date and type of code: 2003 International Fire Code

3.2: How is it being enforced?

- Plans are submitted for review
- Projects inspected on site
- Annual Fire Inspection

MAP 4

4.1: Any other codes, sub-division regulations, etc., that are in effect in your jurisdiction?

- Sub-Division Ordinance
- Flood Hazard Prevention & Protection Code
- Planning and Development Code

4.2: How are they being enforced? Exemption requests reviewed by staff and appropriate Board and Council.

MAP 5

Floodplain Management. Include the following information:

5.1: Ordinance/Order Date: Ordinance # 2006-22, adopted Dec. 5, 2006

5.2: Do you have a Floodplain Administrator? Yes

5.3: Is the person a Certified Floodplain Manager (CFM)? Yes

5.4: Date of current floodplain maps. August 23, 2000

5.5: Any codes, regulations, etc. that prohibit development in the floodway and/or floodplain: Ordinance #2006-22

MAP 6

Findings/results of Building Code Effectiveness Grading Report (BCEGS). Include date of report and score. Not applicable

MAP 7

Identify other plans that your jurisdiction has or have been done in your jurisdiction.

7.1: Capital Improvement Plans: Yes

7.2: Comprehensive Plans: Comprehensive Master Plan Adopted December 5, 2006

7.3: Storm Water Management Plans: Yes

7.4: Master Drainage Plans: None

7.5: Corps of Engineers: None

7.6: Flood Mitigation Plan: None

7.7: Any other plans, studies, etc. that may have been done in your jurisdiction. None

# City of Sansom Park

Jurisdiction Profile
Sansom Park has an area of 1.2 square miles and a NCTCOG 2007 population estimate of 4,250.

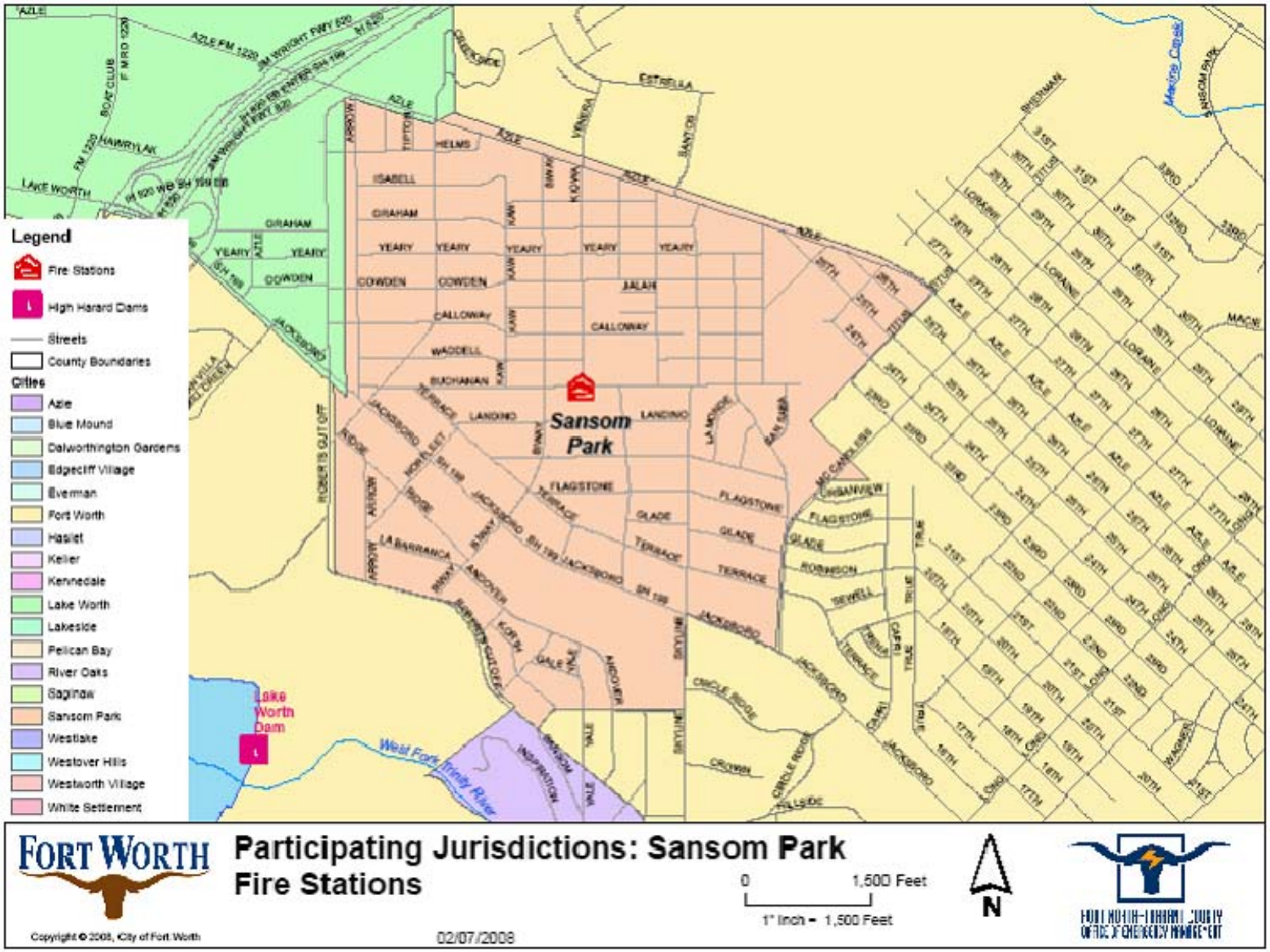
Sansom Park Village is a residential community on State Highway 199 five miles west of Fort Worth in west central Tarrant County. It developed when the area was subdivided by the Rosen Heights Land Company in the 1920s. During the 1930s the construction of the Jacksboro Highway increased its number of businesses and its population. The construction of military facilities during World War II and the addition of defense contractors after the war increased the population to more than 1,000 by 1950, the year the community incorporated. In the 1960s Sansom Park Village reported 5,000 residents, but by 1990 this number had dropped to 3,928. The city has grown slowly during the past decade reaching an estimated 2007 population of 4,250.

| 1990 | 2000 | 2006 | 2007 |
|---|---|---|---|
| 3,928 | 4,181 | 4,200 | 4,250 |
| 2007 Population Density (persons per square mile): 3,427.90 | | | |

City Point-Of-Contact
Steve Sanders, Fire Chief/Emergency Management Coordinator

Land Use and Development Trends
Sansom Park is predominantly residential and is approximately 96% built out.

Jurisdiction Unique Hazards
Hazards specific to Sansom Park are discussed below.


Legend
Fire Stations
High Hazard Dams
Streets
County Boundaries
Cities
Azle
Blue Mound
Dalworthington Gardens
Edgecliff Village
Everman
Fort Worth
Haslet
Keller
Kennedale
Lake Worth
Lakeside
Pelican Bay
River Oaks
Saginaw
Sansom Park
Westlake
Westover Hills
Westworth Village
White Settlement
Sansom Park
Lake Worth Dam
West Fork Trinity River
FORT WORTH
Participating Jurisdictions: Sansom Park
Fire Stations
0
1,500 Feet
1" Inch = 1,500 Feet
N
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02/07/2008

**DAM FAILURE**

No Vulnerability – There are no high hazard dams located in Sansom Park and none that would affect Sansom Park if they failed. Based on the lack of vulnerability, dam failure will receive no further consideration in this plan for Sansom Park.

**DROUGHT**

Low Vulnerability – Sansom Park provides water for its citizens from six groundwater wells. Groundwater wells are less vulnerable to the effects of a drought than surface water sources.

Location – Drought can affect all of Sansom Park.

Current Extent – As of February 2008, Sansom Park was at DO – Abnormally Dry on the Palmer Drought Severity Index.

Previous Occurrences – National Climatic Data Center records indicate that in the past ten years there have been three periods of drought in Sansom Park, 1996 - 1998, 2000, and 2005 - 2006.

Probability of Future Events – Droughts are certain to occur again in Sansom Park. Significant droughts significantly affecting water supply and resulting in mandatory restrictions traditionally occur on a twenty year cycle. Based on the previously cited National Climatic Data Center recent records, we can anticipate that drought conditions will occur approximately every three years.

Impact – Drought can lead to loss of water for basic needs such as drinking and fire-fighting. Droughts are associated with increased wildfire and damage from expansive soils. More common impacts are damage to landscaping and reduced recreation due to low lake levels.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Sansom Park Drought Mitigation Action #1** | Participate in the design and implementation of the Tarrant County specific water conservation public education efforts to compliment existing programs. |
| **Mitigation Goal/Objective** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • City Funds<br>• Water Suppliers |

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| **Responsible Agency** | • Sansom Park Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One year |
| **Effect on New Buildings** | This action will publicize water conservation efforts that can be incorporated into new construction. |
| **Effect on Existing Buildings** | This action will publicize water conservation efforts that can be incorporated into existing construction. |
| **Cost Effectiveness** | Cost Effective – Public education programs can provide significant results for relatively low costs. |
| **Discussion:** Most cities in the area have existing water conservation programs designed to educate the public and businesses on ways to conserve water. This action will develop a Tarrant County specific program that will compliment existing programs. Jurisdictional public education efforts have been very successful in attracting the attention of local citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Sansom Park Drought Mitigation Action #2** | 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. Impacts identified in this plan will be included in updates to the Hazard Mitigation Action Plan. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $2,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • City Funds<br>• Water Suppliers |
| **Responsible Agency** | • Sansom Park Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will identify drought impacts in Sansom Park thus providing specific information for builders of new structures to incorporate drought mitigation into the structures. |

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| **Effect on Existing Buildings** | This action will identify drought impacts in Sansom Park thus providing specific information for owners of existing structures to incorporate drought mitigation into the structures. |
| **Cost Effectiveness** | Cost Effective – This planning effort will have a low cost with the potential for significant benefits for the entire community. |
| **Discussion:** This planning effort will focus attention on the effects of drought on the community. Specific drought effects will be identified and efforts can be made to mitigate those effects. | |

**EXPANSIVE SOILS**

Low Vulnerability - Expansive soils have caused damage to some structures in Sansom Park. However, damage has been limited to relatively small geographic areas and there are no reports of significant damage to commercial structures or infrastructure.

Location – Expansive soils are found in various areas of Sansom Park. We could not locate a map of expansive soils in Sansom Park.

Extent – The extent of expansive soils in Sansom Park is believed to be Very Low (0% - 20%) to Low (21% - 50%).

Previous Occurrences – We could find no empirical data on previous occurrences of damage from expansive soils, but it is believed that expansive soils have caused problems since the first buildings were constructed in this area.

Probability of Future Events – Due to the variability of soil types and construction quality, it is very difficult to predict future occurrences of problems with expansive soils. However, a study published in the fall 2003 issue of *Environmental Geology* cited in the September 19, 2003 *Dallas Business Journal* indicates that many new developments in the Metroplex are being built on soil that is more unstable than soils built on prior to 1990. This could lead to a higher incidence of expansive soil related damage in the future.

Impact – The impact of expansive soils ranges from cosmetic cracks in walls to substantial foundation and structural damage that can result in the need to demolish the building. Infrastructure such as pipelines can be damaged causing increased maintenance and repairs, damaged beyond repair requiring replacement, damaged to the point of failure.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Sansom Park Expansive Soils Mitigation Action #1** | Improve construction techniques through building code enhancements. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |

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| **Priority** | Low |
| **Estimated Cost** | Undetermined (Minimal – Staff Time Only) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building permit fees |
| **Potential Matching Funding Sources** | • City Funds<br>• Building permit fees |
| **Responsible Agency** | Sansom Park Planning and Community Development |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will make new buildings more resistant to damage from expansive soils. |
| **Effect on Existing Buildings** | This action will require modifications to existing buildings to be more resistant to damage from expansive soils. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will improve construction quality and reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Sansom Park Expansive Soils Mitigation Action #2** | Educate construction contractors, home owners, and business owners about mitigation techniques. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building Permit Fees |
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | • Sansom Park Planning and Community Development<br>• Sansom Park Fire/Emergency Management |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will provide builders of new construction with expansive soil mitigation techniques that will reduce damage. |
| **Effect on Existing Buildings** | This action will provide owners of existing buildings with expansive soil mitigation techniques that will reduce damage. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |

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| **Discussion:** This project will provide construction contractors and home/business owners with techniques designed to reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. |

**EXTREME HEAT**

High Vulnerability - Summer heat and humidity can occur anytime from May through October. Community health services actively work with at risk populations to prevent heat related deaths and injuries. The elderly, very young people and people with poor health are most at risk from summer heat. People who work outside or in un-air-conditioned buildings are also at high risk to the direct effects of summer heat. Summer heat can also lead to electrical service outages if equipment fails or demand exceeds available supply. Most public safety and special facilities are equipped with emergency generators.

Location - Throughout the City.

Extent - Summer temperatures can reach as high as 113 degrees. Sansom Park is also subject to high humidity.

Previous Occurrences - This is an annual occurrence. The summer of 1980 was a record year with 69 consecutive days of temperatures of 100 degrees or more. We were unable to find a reliable record of deaths or injuries related to heat.

Probability of Future Events - Hot summer temperatures are certain to continue to occur in Sansom Park.

Impact - Summer heat can cause widespread electrical outages resulting in dangerous conditions, especially for at-risk populations. Occasionally "cooling centers" are opened at community centers to provide a safe place for citizens to seek refuge from the heat. Extreme heat can have economic impacts if construction work is curtailed or outdoor special events are cancelled.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Sansom Park Extreme Heat Mitigation Action #1** | Determine feasibility of expanding monitoring of populations at risk from extreme heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined. Staff time and GIS resources |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Other State or Federal Public Health Grants |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Tarrant County Public Health<br>• Sansom Park Fire/Emergency Management |

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| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | None - This action is intended to expand monitoring of people only. |
| **Effect on Existing Buildings** | None - This action is intended to expand monitoring of people only. |
| **Cost Effectiveness** | Pending, but believed to be Cost Effective |
| **Discussion:** This action would determine the feasibility of expanding monitoring of populations at risk from extreme heat. Existing at risk population monitoring programs will be reviewed to ensure all known populations at risk from extreme heat are included. Any newly discovered at risk populations will be evaluated for inclusion in existing monitoring programs. Tarrant County Public Health provides public health services throughout the County. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Sansom Park Extreme Heat Mitigation Action #2** | Increase public education programs on the dangers of excessive heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness |
| **Priority** | Medium |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Other State or Federal Public Health Grants |
| **Responsible Agency** | • Tarrant County Public Health<br>• Sansom Park Fire/Emergency Management |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Effect on Existing Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits. |
| **Discussion:** Public education on severe weather in Sansom Park has traditionally focused on severe thunderstorms and associated hazards (tornadoes, lighting, flooding, high winds). This action would expand public education to include hazards from extreme heat. | |

**FLOOD**

High Vulnerability - The topography of Sansom Park combined with the frequency of severe thunderstorms results in frequent flash flood events. FEMA records indicate only 39 Repetitive Loss Properties in all of Tarrant County. However, this is probably more a reflection of the low number of flood insurance polices than vulnerability to flooding.

Further analysis using GIS and field verification can specifically identify vulnerable structures.

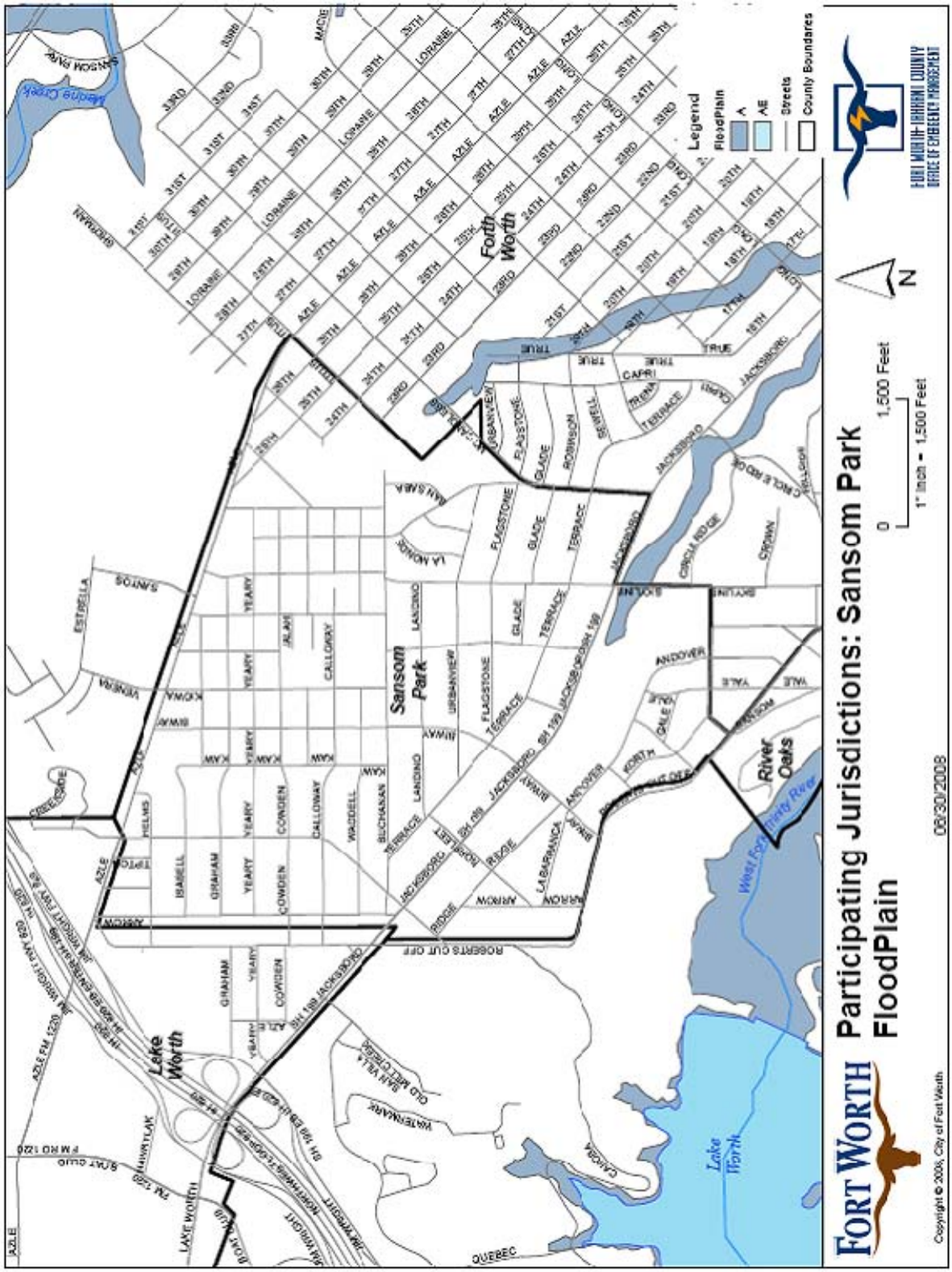
Location - Throughout the City along creeks and drainage structures. Areas along Texas Highway 199 tend to be more subject to flooding than other areas of the city.

Extent - Flash floods are the most common type of flooding in Sansom Park which tend to occur and recede very quickly.

Previous Occurrences - Minor flooding occurs frequently, especially during the spring and early summer. In June of 2004 significant flooding in Sansom Park. State highways over both creeks were closed due to flooding. Homes and businesses were affected by the flooding. Several roadways had to be closed due to the flooding.

Probability of Future Events – Based on previous experience Sansom Park is certain to suffer flash flood events every year. National Weather Service records indicate an average of 11 flash flood events per year in Tarrant County. Continued development throughout the County and the resulting increase in impervious cover will increase the likelihood and severity of flooding.

Impact - Flash floods kill more people than any other hazard associated with thunderstorms. Property damage from flash flooding is seldom covered by insurance, which makes it very difficult for citizens to recover from the flood. Due to the very rapid rate of development and growth throughout Tarrant County we are experiencing problems with determining actual building footprints within flood plains and will be using planimetric GIS data from the NCTCOG to resolve this issue when it becomes available. At that time we will be able to accurately identify the number and types of buildings vulnerable to flooding; as well as access other data associated with those locations such as appraised value, census data, and owner information.


Participating Jurisdictions: Sansom Park
FloodPlain
Legend
FloodPlain
A
AE
Streets
County Boundaries
Fort Worth
Sansom Park
Lake Worth
River Oaks
Lake Worth
West Fork Trinity River
1,500 Feet
0
1" inch = 1,500 Feet
N
08/30/2008
FORT WORTH
TARRANT COUNTY
OFFICE OF EMERGENCY MANAGEMENT
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**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Sansom Park Flood Mitigation Project #1** | Participate in the development of the Tarrant County specific "Flood Preparedness" brochure. |
| **Hazard Addressed** | Flooding |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of Flood events.<br>1. c. Develop effective flood mitigation public education materials. |
| **Priority** | High |
| **Estimated Cost** | Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Private Foundation Grants |
| **Responsible Agency** | • Sansom Park Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This action will provide flood mitigation techniques for owners of new buildings. |
| **Effect on Existing Buildings** | This action will provide flood mitigation techniques for owners of existing buildings. |
| **Cost Effectiveness** | Cost Effective - This project will provide valuable information to the public in a relatively short time and with relatively low costs. It will also have the added benefit of increasing public awareness of mitigation. The estimated cost could easily be offset by reduced losses to the public in a single small flood event. |

**Discussion**: Develop Tarrant County specific "Flood Preparedness" brochure. Once developed, the brochure will be distributed County-Wide. Historically flood prone areas will be targeted for door-to-door distribution and neighborhood meetings to present the brochure and solicit input for *Fort Worth Hazard Mitigation Action Plan* revisions.

The brochure will include:

- Description of Tarrant County flood hazards
- "Case Studies" of previous flood events in Tarrant County
- Preparedness and "self-help" mitigation information
- Benefits of city participation in NFIP
- Advantages of flood insurance
- Risks of not having flood insurance
- Warnings that typical homeowner's insurance does not cover rising water
- Solicit input for the *Fort Worth Hazard Mitigation Action Plan*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Sansom Park Flood Mitigation Action #2** | Conduct city-wide drainage study and implement findings to determine best means of mitigating flooding and implement findings. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Sansom Park Public Works<br>• Sansom Park Fire/Emergency Management |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will provide guidance for locating new buildings away from flood prone areas. |
| **Effect on Existing Buildings** | This action will provide guidance for protection of existing buildings from flooding. |
| **Cost Effectiveness** | Cost Effective – This project will provide guidance to reduce the hazard to life and property from flooding. |
| **Discussion:** This action will develop a study of throughout Sansom Park and provide findings that can reduce the adverse effects of flooding. | |

**HAILSTORM**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of large hail are a hazard event in Sansom Park. Tarrant County averages eleven significant thunderstorm events (large hail, high winds) per year according to National Weather Service records. Most structures in Sansom Park can resist the effects of all but the most severe hailstorms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to hailstorms. Vehicles have proven to be vulnerable to hailstorms with widespread severe vehicle damage reported in 1980 and 1995.

Location - Throughout the City.

Extent - Sansom Park is subject to the hazards of severe thunderstorms, including large hail. Hail stones up to the size of grapefruit (H9 on the Combined NOAA/TORRO Hailstorm Intensity Scales) have been reported in Tarrant County.

Previous Occurrences – There are no reports of significant hailstorm events in Sansom Park other than the 1980 and 1995 county-wide events.

Probability of Future Events - Thunderstorms with hail are certain to continue to occur in Sansom Park. Hail falls on about two or three days per year, ordinarily with only slight and scattered damage (*National Weather Service*).

Impact – The impact from hailstorms can be significant in extreme events such as the hailstorms of 1980 and 1995. Thousands of homes and vehicles can be damaged in a

single storm with millions of dollars in damages. Vehicles are especially impacted by large hails with windshields being the vulnerable part. A recurring problem following hailstorms is broken windshields in vehicles belonging to populations who do not have vehicle insurance and cannot afford the replacements costs, resulting in the owners having difficulty traveling to work, medical appointments, etc.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Sansom Park Hailstorm Mitigation Action #1** | Develop a public education campaign to encourage "hail resistant" roofing in new construction and roof replacements. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• Building/Permit Fees<br>• City Funds |
| **Responsible Agency** | • Sansom Park Planning and Community Development<br>• Sansom Park Fire/Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will potentially decrease the damage caused by most hailstorms to new buildings. |
| **Effect on Existing Buildings** | This action will potentially decrease the damage caused by most hailstorms to existing buildings. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing hailstorm damage. One long term benefit will be reduced property insurance as claims related to hail damage are reduced. |
| **Discussion**: Public education has proven to be a low cost effective means to achieve changes public behavior. Encouraging hail resistant roofing can benefit citizens through reduced damage, business through reduced damage to their buildings and reduced claims against insurance companies, and government through reduced request for assistance. This campaign can be developed in conjunction with the Tarrant County effort. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Sansom Park Hailstorm Mitigation Action #2** | Evaluate City buildings to determine feasibility of installing hail resistant roofing and window coverings with a focus on critical infrastructure. |

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| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• City Funds |
| **Responsible Agency** | Sansom Park Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on new City buildings. |
| **Effect on Existing Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on existing City buildings. |
| **Cost Effectiveness** | Cost Effective – Although currently undetermined, this project is believed to be cost effective. |
| **Discussion:** Installing hail resistant roofing and window coverings on City buildings could prevent or limit damage to City buildings thus avoiding costs to the City as well as preventing or limiting loss of use of damaged facilities. | |

**HIGH WINDS**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of high winds are a hazard in Sansom Park. Tarrant County averages ten reported significant thunderstorm events (large hail, high winds) per year. In addition, strong weather fronts can sometimes be accompanied by high winds which occasionally cause damage. Most structures in Sansom Park can resist the effects of all but the most severe high wind events. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to high winds.

Location - Throughout the City.

Extent - Severe thunderstorms with high winds with speeds in excess of 90 mph have been reported in Sansom Park.

Previous Occurrences – We could find no records of significant high wind damage in Sansom Park.

Probability of Future Events – Based on previous experience Sansom Park can expect to experience an average of ten significant thunderstorm events with high winds per year.

Impact – Records on high wind events are difficult to separate from severe thunderstorm records. High winds in Sansom Park typically cause little damage to commercial buildings. More often high winds cause damage to roofs, trees, and signs.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Sansom Park High Winds Mitigation Action #1** | Enact enhanced building codes to reduce damages from high winds. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined – Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Sansom Park Planning and Community Development |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will potentially identify a means to reduce high wind damage on new buildings. |
| **Effect on Existing Buildings** | This action will potentially identify a means to reduce high wind damage on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Although costs are undetermined, this action is believed to be cost effective since the action will require staff time only. |
| **Discussion:** Enhanced building codes will reduce damages from high wind events. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Sansom Park High Winds Mitigation Action #2** | Educate builders and residents about mitigating wind damage. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |
| **Responsible Agency** | Sansom Park Planning and Community Development |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on new buildings. |

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| **Effect on Existing Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost of developing and providing high wind mitigation compared with savings to the community make this action cost effective. |
| **Discussion:** Public education has proven to be a low cost and effective means to achieve changes public behavior. High winds have not been a focus of severe weather preparedness. | |

**LANDSLIDES**

No Vulnerability - Although there is some relatively steep terrain in portions of Sansom Park, the relief is associated with rocky outcrops and not susceptible to landslides. There is no history of landslides in Sansom Park. Based on the lack of vulnerability, landslides will receive no further consideration in this plan for Sansom Park. However, landslide hazards will be reviewed during the annual review of this plan and we will continue looking for areas with landslide potential during hazard surveys.

**LEVEE FAILURE**

No Vulnerability – There are no levees or areas that would be affected by levee failure in Sansom Park. Based on the lack of vulnerability, levee failure will receive no further consideration in this plan for Sansom Park.

**LIGHTNING**

Moderate Vulnerability – Lightning is one of the most common hazards in Sansom Park. Thunderstorms (and by definition, lightning) occur an average of 30 – 50 days per year (*Oklahoma Climatological Survey*). Lightning is the second most common cause of weather-related deaths in Texas (*National Weather Service*). Lightning information is available only for Tarrant County on a county-wide basis.

Location – Throughout the City.

Extent – We could find no references to the average number of strikes per storm in Sansom Park. However, lightning is by definition associated with thunderstorms.

Previous Occurrences – Sansom Park experiences 30 – 50 thunderstorm days per year. From 1995 – 2004 one person was killed and five were injured by lightning in Tarrant County (*National Weather Service*). Throughout Texas 34 people were killed by lightning, there were 184 injuries, and an estimated 23 million dollars in damages due to lightning from 1995 - 2004 (*National Weather Service*).

Probability of Future Events – Based on past experience Sansom Park will experience 30 – 50 thunderstorm days each year. Some days will have more than one thunderstorm during a given thunderstorm day.

Impact – Although lightning is the second most common cause of storm related deaths in Texas, lightning deaths remain relatively rare. Lightning does cause property damage several times per year (we could not find statistical data to validate this observation).

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Sansom Park Lightning Mitigation Action #1** | Provide lightning mitigation materials with building permit packets. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Sansom Park Planning and Community Development |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will provide materials that will reduce the vulnerability of new buildings to lightning. |
| **Effect on Existing Buildings** | This action will provide materials that will reduce the vulnerability of existing buildings that are being remodeled to lightning. |
| **Cost Effectiveness** | Cost Effective – The low cost of this project would be offset by eliminating just one lightning caused building loss. |
| **Discussion:** Lightning mitigation materials will be included in all building permit packets distributed to builders or citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Sansom Park Lightning Mitigation Action #2** | Ensure all City critical infrastructure has adequate lightning mitigation in place and upgrade protection as necessary. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | $2,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Sansom Park Public Works |
| **Estimated Completion Time Frame** | One Year |

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| **Effect on New Buildings** | This action will ensure new City buildings that house critical infrastructure have adequate lightning mitigation. |
| **Effect on Existing Buildings** | This action will ensure existing critical infrastructure has adequate lightning mitigation. |
| **Cost Effectiveness** | Cost Effective – The destructive and sometimes capricious nature of lighting warrant the expense of this action compared with the benefits of avoiding damage to critical infrastructure. |
| **Discussion:** Review and confirmation of the adequacy of lightning protection systems in City buildings housing critical infrastructure is worthwhile considering the number of thunderstorms experienced in Sansom Park. | |

**SEVERE THUNDERSTORM**

High Vulnerability - Severe thunderstorms are the most common hazard in Sansom Park. From 1950 through August 2007 Tarrant County averaged eleven reported severe thunderstorm events county-wide per year. Most structures in Sansom Park can resist the effects of all but the most severe thunderstorms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to thunderstorms.

Location - Throughout the City.

Extent - Sansom Park is subject to the hazards of severe thunderstorms of all magnitudes.

Previous Occurrences - Records are available only on a county-wide basis.

Probability of Future Events – Severe thunderstorms will occur in Sansom Park an average of eleven times per year.

Impact – A single severe thunderstorm can cause damage from hail, high winds, lightning, and/or tornadoes to thousands of structures.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Sansom Park Severe Thunderstorm Mitigation Project #1** | Conduct technical assessment to determine the feasibility of structurally hardening the Sansom Park Fire Station located at 5500 Buchanan against severe weather. |
| **Hazard Addressed** | Tornado/Severe Thunderstorm |
| **Mitigation Goal/Objective** | 2. Reduce loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | High |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |

| | |
|---|---|
| **Potential Matching Funding Sources** | • Private Foundation Grants<br>• Other State or Federal Grants<br>• City Funds |
| **Responsible Agency** | Sansom Park Fire/Emergency Management |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This project will determine the feasibility of structurally hardening the Sansom Park Fire Station against severe weather. |
| **Effect on Existing Buildings** | This project will determine the feasibility of structurally hardening the Sansom Park Fire Station against severe weather. |
| **Cost Effectiveness** | Cost Effective - This project will provide the basis for a realistic cost benefit analysis of the feasibility of hardening the Sansom Park Fire Station against severe weather events. The relatively low cost of this project compared with the potential benefits of protecting a city's emergency response equipment against the jurisdiction's most likely hazard event result in a favorable cost benefit review. |

**Discussion:**
This project will provide for determining the feasibility of hardening the city's only fire station against severe weather. This project will contribute to protecting emergency response equipment so that it will be available to assist the citizens of Sansom Park in responding to and recovering from severe weather or other events. Final project details will be developed in accordance with grant requirements at the time the project is funded.

The cost estimate is a conservative "best guess" based on a structural analysis of the existing fire station. That analysis would require:

- Structural analysis of the building by a Structural Engineer
- Analysis of electrical systems
- Analysis of HVAC systems
- Review of building codes

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Sansom Park Severe Thunderstorm Mitigation Action #2** | Encourage builders to install storm resistant construction such as "hurricane clips". |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | High |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |

| | |
|---|---|
| **Responsible Agency** | Sansom park Planning & Community Development |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will encourage storm resistant construction in new buildings. |
| **Effect on Existing Buildings** | This action will encourage storm resistant construction in existing buildings as they are remodeled. |
| **Cost Effectiveness** | Cost Effective – The low cost of this action will be offset by a reduction in damage from severe thunderstorms. |
| **Discussion:** Effective education on storm resistant construction can reduce damage from severe thunderstorms. Insurance companies may be willing to fund or provide educational materials and/or provide discounts to persons who install storm resistant devices. | |

**SEVERE WINTER STORMS**

Moderate Vulnerability - Since 2000 the National Weather Service has reported 14 Winter Storm/Ice events. Winter storms in Sansom Park usually consist of short-lived icing events (ice on the roads for a few hours) that primarily affect traffic and cause numerous motor vehicle accidents. Occasionally an ice storm will cause widespread power outages for as long as several days. ONCOR Electric Delivery has an aggressive tree trimming program. Most structures in Sansom Park can resist the effects of all but the most severe winter storms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to winter storms. Electrical service outages are usually the most serious threat in this area. Most public safety and special facilities are equipped with generators.

Location - Throughout the City.

Extent - Severe ice storms have resulted in accumulations in excess of two inches. Most storms leave only a light coating or glaze of ice.

Previous Occurrences – Severe Winter Storms are typically regional events. Sansom Park averaged two winter storms per year since 2000. Most winter storms resulting only minor inconveniences and a few motor vehicle accidents.

In 1978 up to an inch of ice coated area trees and roadways causing $14 million in damages region-wide and making travel almost impossible for two days.

In 1996 a winter storm dropped two to four inches of a mixture of sleet, freezing rain, and snow in Sansom Park over Thanksgiving weekend causing many motor vehicle accidents and some electrical service outages.

In 2003 a winter storm dropped one inch of sleet across Sansom Park resulting in numerous motor vehicle accidents and closing schools for two days.

Probability of Future Events - Sansom Park can expect to experience two winter storms per year with a severe winter storm once each ten years.

Impact - Winter storms can cause widespread electrical and telephone service outages, make travel dangerous or impossible, and damage structures. Deaths and injuries due to vehicle accidents and slips/falls are common during ice storms. Occasional deaths and injuries from carbon monoxide poisoning due to improper heating have occurred. Economic losses due to lost production can be significant. Damage from frozen pipes can lead to significant expenses for homeowners.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Sansom Park Severe Winter Storm Mitigation Action #1** | Increase public education concerning winter storm preparedness and mitigation. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | Medium |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Sansom Park Fire/Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into new buildings. |
| **Effect on Existing Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost is effective when compared to benefits provided to citizens. |
| **Discussion:** Winter weather preparedness has not been emphasized in Sansom Park as much as severe thunderstorms. This action will provide preparedness information to citizens during the fall. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Sansom Park Severe Winter Storm Mitigation Action #2** | Purchase additional street sanding capacity |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined |

| | |
|---|---|
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Sansom Park Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will have no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Sanding streets is essential to allow emergency vehicles to respond during severe winter events. |
| **Discussion:** Sanding equipment can be mounted on existing equipment to provide sanding capabilities. During severe winter weather events streets around hospitals, fire stations and other critical facilities are sanded along with major intersections and roadways. Additional sanding capacity would allow for quicker sanding of these areas and for more repeat sanding during prolonged winter weather events. This will improve public safety by facilitating emergency response as well as reducing motor vehicle accidents. | |

**STREAM BANK EROSION**

No Vulnerability - The predominantly low rolling topography of Sansom Park prevents stream bank erosion from causing a hazard except in a few locations. No vulnerability to stream bank erosion has been identified in Sansom Park. Further analysis using GIS and field verification will continue to search for vulnerable structures or facilities.

**TORNADO**

High Vulnerability – All structures in Sansom Park are vulnerable to tornadoes. Very few structures can withstand the effects of an F5 tornado. However, the March 28, 2000 F3 tornado that struck Fort Worth provided good evidence that well built structures can protect people who take appropriate shelter inside those buildings.

Location - Tornadoes can occur anywhere in Sansom Park.

Extent - Sansom Park is subject to tornadoes of all magnitudes, including F5 tornadoes.

Previous Occurrences – We found no reports of tornados causing damage in Sansom Park. However, Tarrant County has an average of one tornado reported per year county-wide (Source: National Climatic Data Center). In 2007 there were eight tornadoes reported by storm spotters county-wide. Four of those tornados caused damage, all within incorporated areas. Since 2000 tornadoes have caused damage in Arlington, Benbrook, Euless, Everman, Fort Worth, Grand Prairie, Haltom City, Mansfield, North Richland Hills, and River Oaks.

Probability of Future Events - Tarrant County has averaged one reported tornado per year and can expect that average to continue. Sansom Park, based on its relatively small size, will likely experience tornados very infrequently.

Impact - Tornadoes can cause deaths, injuries and property damage/destruction. Special facilities such as hospitals, fire stations, and utilities can be damaged or destroyed. Citizens who live in neighborhoods struck by tornadoes can experience disruption of their life styles and traditions. Areas struck by tornadoes can experience increased demand for mental health services as people deal with grief and stress.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Sansom Park Tornado Mitigation Project #1** | Assist citizens with funding for building tornado safe rooms or in-ground shelters. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction |
| **Priority** | High |
| **Estimated Cost** | $60,000 (15 Safe Rooms at $4,000 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Community Development Block Grant Funds |
| **Potential Matching Funding Sources** | Home/Building Owner |
| **Responsible Agency** | • Sansom Park Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This project will encourage new buildings to be constructed with tornado safe rooms as part of the construction process. The safe room will enhance the overall storm resistance of the building. |
| **Effect on Existing Buildings** | This project will encourage homeowners to construct/install tornado safe rooms in their existing homes. A safe room will enhance the overall storm resistance of the building. |
| **Cost Effectiveness** | Cost Effective - Safe rooms and in-ground shelters have been proven to reduce deaths and injuries during tornadoes and severe thunderstorms. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of safe rooms and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

**Discussion:**
This project will reimburse costs associated with tornado safe room or in-ground shelter installation in new or existing homes. Safe rooms provide increased protection for citizens during severe thunderstorms and tornados. Safe rooms have been proven to save lives and reduce injuries from severe weather events. FEMA publication 320 (*Taking Shelter from the Storm, Building a Safe Room Inside Your House*) provides the standards for safe rooms. As stated on the FEMA website: Although a *"residence may be built "to code," that does not mean it can withstand winds from extreme events such as tornadoes and major hurricanes. The purpose of a safe room or a wind shelter is to provide a space where you and your family can seek refuge that provides a high level of protection. To protect its occupants, a safe room must be built to withstand high winds and flying debris, even if the rest of the residence is severely damaged or destroyed."*

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to home owners will be for no more than $3,000 or 75% of cost, whichever is less
- Eligibility will be limited to individuals who own their home at the time of application
- The safe room or in-ground shelter must be constructed/installed in the primary residence of the applicant
- Each eligible homeowner can only receive one reimbursement, regardless of the number of shelters he/she may purchase/install
- In-ground shelters must meet requirements established in the National Performance Criteria for Tornado Shelters dated May 28, 1999.
- Safe Rooms must meet the requirements of FEMA Publication 320
- Safe Rooms and shelters must meet all applicable city and/or county codes
- Previously owned or used shelters will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Sansom Park Tornado Mitigation Project #2** | Assist citizens with funding for purchase of Weather Alert Radios |
| **Mitigation Goal/Objective** | 4. Increase the effectiveness of warning systems in Tarrant County.<br>4. a. Increase the number of homes and businesses with Weather Alert Radios. |
| **Priority** | High |
| **Estimated Cost** | $2,000 (50 Weather Alert Radios at $40 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Private Sector Donations<br>• City Funds |
| **Potential Matching Funding Sources** | Citizen/Business Owner |

| | |
|---|---|
| **Responsible Agency** | • Sansom Park Fire/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings except for providing additional warning time of severe weather events thus allowing citizens more time to secure their home or business against approaching severe weather. |
| **Cost Effectiveness** | Cost Effective – Weather Alert Radios are a proven means to alert and warn citizens about severe weather and civil emergencies. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of Weather Alert Radios and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

***NOTE**: We are aware that Weather Alert Radios are on the "2007 Ineligible Planning Activities" list. It is our opinion that Weather Alert Radios should be considered eligible due to their very high benefit and very low cost.*

This project will reimburse 75% of the cost for citizens to purchase Weather Alert Radios, with the citizen responsible for the remaining 25%. Weather Alert Radios provide the best means for citizens to receive emergency alerts when they are indoors. Severe weather is the primary hazard in our area. Early alert and warning has proven to be a significant factor in saving lives during severe weather events.

In addition, the Weather Alert Radios can be activated for civil emergencies such as hazardous materials incidents. Effective warning saves lives, especially during severe weather events. Weather alert radios provide a proven means of indoor warning to citizens any time of the day or night and compose the vital indoor portion of our emergency warning system.

Warning systems have been shown to have value beyond the initial warning. Persons receiving warning relay the information to family and friends to ensure they are aware of the hazard. The secondary and tertiary warning can greatly amplify the effectiveness of the warning system.

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to citizens will be for no more than $30 or 75% of cost of the radio, whichever is less
- Eligibility will be limited to residents of Sansom Park
- The citizen must sign an agreement to keep the radio operational
- Each eligible homeowner can only receive one reimbursement, regardless of the number of radios purchased
- Previously purchased radios will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**WILDFIRE**

Low Vulnerability - Sansom Park has very little rural-urban interface that is subject to wildfires.

Location - Areas on the southeast corner are the most vulnerable to wildfires.

Extent - The effects of wildfire are deaths, injuries, loss of structures, loss of wildlands, and loss of wildlife habitat.

Previous Occurrences – There is no record of wildfires in Sansom Park.

Probability of Future Events - Wildfires are likely to occur annually and increase in frequency and severity as the population continues to increase and formally rural areas are developed.

Vulnerability - Homes are most vulnerable to wildfires. The tendency to locate homes on tree covered lots and lack of fire breaks (such as parking lots around businesses) can enable fires to spread more easily to homes. Special facilities tend to be less vulnerable due to construction type (brick or metal).

Impact - Wildfires can result in the need for rapid evacuations, casualties, loss of homes and businesses, and loss of wildlife habitat and recreational areas.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Sansom Park Wildfire Mitigation Action #1** | Increase public education on how to reduce the risks from wildfires (construction, landscaping, etc.) |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | High |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Sansom park Fire/Emergency Management |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will reduce the effects of wildfire on new buildings through increased use of wildfire mitigation measures. |
| **Effect on Existing Buildings** | This action will reduce the effects of wildfire on existing buildings through increased use of wildfire mitigation measures. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing the effects of wildfire. |
| **Discussion:** Wildfire mitigation measures are not widely known in urban areas such as Tarrant County. This action will increase that knowledge and reduce casualties and damages from wildfires. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Sansom Park Wildfire Mitigation Action #2** | Enact building permit process that encourages wildfire resistant construction. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |

| | |
|---|---|
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | Sansom Park Planning & Community Development |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will reduce the vulnerability of new structure to wildfire. |
| **Effect on Existing Buildings** | This action will reduce the vulnerability of existing buildings to wildfire if they are remodeled to the extent a building permit is required. |
| **Cost Effectiveness** | Cost Effective – This action will integrate wildfire mitigation into the building process at minimal cost. |
| **Discussion:** Integrating mitigation into building permitting provides a process to reduce vulnerability with few negative impacts. | |

**Texas Standards That Exceed 44 CFR Requirements: Local Capability Assessments**

MAP 1

Projects funded under the following programs. Address the type of project that was funded. If you did not receive money from one of the below grants programs, then state that.

1.1: Hazard Mitigation Grant Program - None
1.2: Pre-Disaster Mitigation Grant Program - None
1.3: Project Impact - None
1.4: Hurricane-Property Protection Mitigation - None
1.5: Flood Mitigation Assistance - None
1.6: 406 Mitigation (through the Public Assistance Program) - None

MAP 2

Current Building Codes. Include the following information:
2.1: Date and type of code: 2003 International Building Code
2.2: How is it being enforced? Plans submitted for review. Projects inspected on site.

MAP 3

Current Fire Codes. Include the following information:
3.1: Date and type of code: 2003 International Building Code
3.2: How is it being enforced?

- Plans are submitted for review
- Projects inspected on site
- Annual Fire Inspection

MAP 4

4.1: Any other codes, sub-division regulations, etc., that are in effect in your jurisdiction?
Zoning Ordinance # 351
4.2: How are they being enforced?

- Exemption requests reviewed by Planning & Zoning Commission

- Fines for Violations

MAP 5
Floodplain Management. Include the following information:
5.1: Ordinance/Order Date: Flood Damage Prevention Ordinance #406-05
5.2: Do you have a Floodplain Administrator? Yes
5.3: Is the person a Certified Floodplain Manager (CFM)? No
5.4: Date of current floodplain maps. August 23, 2000
5.5: Any codes, regulations, etc. that prohibit development in the floodway and/or floodplain: Ordinance 406-05

MAP 6
Findings/results of Building Code Effectiveness Grading Report (BCEGS). Include date of report and score. Not applicable

MAP 7
Identify other plans that your jurisdiction has or have been done in your jurisdiction.
7.1: Capital Improvement Plans: None
7.2: Comprehensive Plans:
7.3: Storm Water Management Plans:
7.4: Master Drainage Plans: None
7.5: Corps of Engineers: None
7.6: Flood Mitigation Plan: None
7.7: Any other plans, studies, etc. that may have been done in your jurisdiction: None

Previous Hazard Occurrences
June 2004 – Heavy rains resulted in flashfloods causing several roads to be closed.

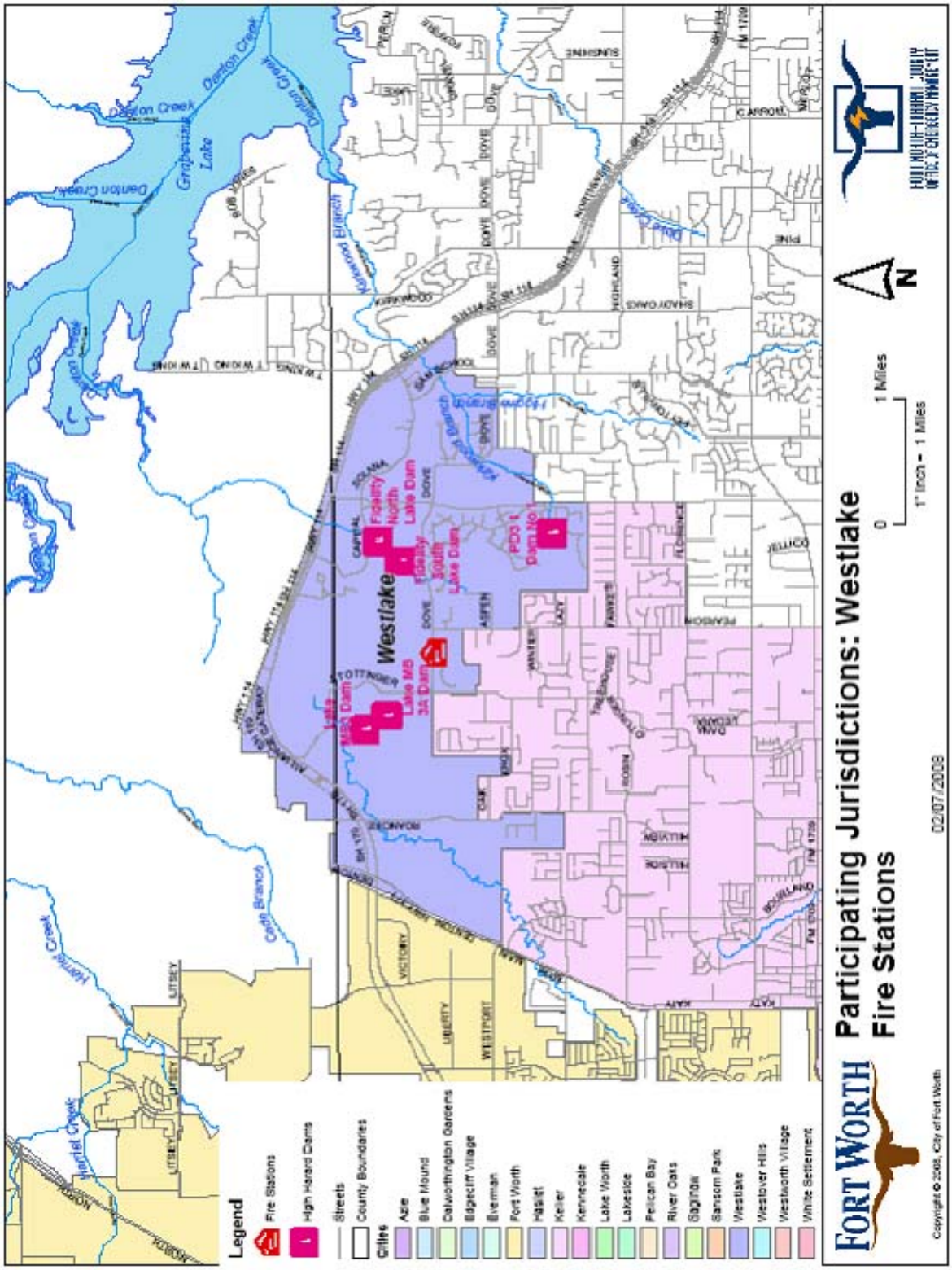
# City of Westlake

Jurisdiction Profile
Westlake has an area of 6.6 square miles and a 2000 Census Population of 207.

The Town of Westlake is approximately 7 square miles. Within its border is located the Solana Business Complex, Fidelity Investments Regional Headquarters, and Daimler Chrysler Financial Center. These are located on office campuses and are the trend of the Town's business development. The Town has a large regional retail center – mall, Town Center, entertainment complex, and resort hotel planned for the remainder of non-residential property. The residential property is mainly gated, high end neighborhoods (almost all new homes are located on at least a ¼ acre lot and are 6,000 square feet plus). The remaining land use is devoted to public use – parks, golf courses, or open land – and governmental entities – Town Hall, Courts/Department of Public Safety Facility, and Westlake Academy (a charter school). This is the trend. Currently land use is 75 vacant ranch lands with the remaining property occupied by those listed above by name. Westlake is growing but is landlocked. The 2006 population is estimated to be 700.

City Point-Of-Contact
Don Wilson; Director, Westlake Department of Public Safety

Jurisdiction Unique Hazards
Hazards specific to Westlake are discussed below.


Participating Jurisdictions: Westlake
Fire Stations
FORT WORTH
02/07/2008
Copyright © 2008, City of Fort Worth
Legend
Fire Stations
High Hazard Dams
Streets
County Boundaries
Cities
Azle
Blue Mound
Dalworthington Gardens
Edgecliff Village
Everman
Fort Worth
Haslet
Keller
Kennedale
Lake Worth
Lakeside
Pelican Bay
River Oaks
Saginaw
Sansom Park
Westlake
Westover Hills
Westworth Village
White Settlement
Westlake
Fidelity North Lake Dam
Fidelity South Lake Dam
PDD 1 Dam No 1
Lake M5 3A Dam
Lake M5A Dam
Grapevine Lake
Denton Creek
Kirkwood Branch
Hogans Branch
Cade Branch
Harriet Creek
0
1 Miles
1" Inch = 1 Miles
N

**DAM FAILURE**

Low Vulnerability – The Texas Commission of Environmental Quality has identified five High Hazard Dams in Westlake. The dams are rural ranch dams that have been incorporated into upscale housing developments. Implementing the Mitigation Actions in this plan will provide validation of our low vulnerability assessment or indicate the need to revise our assessment.

Location – The High Hazard Dams in Westlake are located in the north central and eastern portions of the City (please see maps: *High Hazard Dams in Tarrant County* and *High Hazard Dams in Unincorporated Tarrant County*). However, pending completion of inundation studies it is not clear if Westlake could be affected by the failure of High Hazard Dams in other jurisdictions.

| Location | Dam Name | Latitude | Longitude | River/Stream |
|---|---|---|---|---|
| Westlake | Fidelity North Lake Dam | 32.984606 | -97.190670 | Marshall Branch |
| Westlake | Fidelity South Lake Dam | 32.981992 | -97.193453 | Marshall Branch |
| Westlake | Lake MB 3A Dam | 32.983814 | -97.214606 | Marshall Branch |
| Westlake | Lake MB 3 Dam | 32.986270 | -97.216414 | Marshall Branch |
| Westlake | PD3 1 Dam No 1 | 32.964464 | -97.189902 | Kirkwood Branch |

Some areas that could be affected by failure of each dam are identified below. Inundation studies to identify specific areas that would be affected are Tarrant County Dam Failure Mitigation Action #1 below.

| Dam Name | Potentially Affected Areas |
|---|---|
| Fidelity North Lake Dam | • Highway TX 114<br>• Retail Developments south of TX 114 and between Precinct Line Road and Trophy Club Drive<br>• Indian Creek Neighborhood |
| Fidelity South Lake Dam | • Highway TX 114<br>• Retail Developments south of TX 114 and between Precinct Line Road and Trophy Club Drive<br>• Indian Creek Neighborhood |
| Lake MB 3A Dam | The area below this dam is currently undeveloped |
| Lake MB 3 Dam | The area below this dam is currently undeveloped |
| PD3 1 Dam No 1 | Residential areas to the northeast of the dam |

Extent – The extent of dam failures in Westlake is pending inundation studies.

Previous Occurrences – There have been no reports of dam failures in Westlake.

Probability of Future Events – The probability of future events is difficult to predict based on the lack of previous occurrences. There is some concern that rural ponds and

lakes are being converted to park lakes and detention structures in newly developing areas without proper engineering reviews.

Impact – Failure of a high hazard dam has the potential to cause significant damage to urban structures, main highways, and utilities, as well as potential to cause loss of life (Natural Resources Conservation Service). Infrastructure could be damaged and rendered unusable for extended periods of time.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Westlake Dam Failure Mitigation Action #1** | Conduct Inundation Studies and develop Emergency Action Plans for all High Hazard Dams in Westlake. |
| **Mitigation Goal/Objective** | 3. Reduce the adverse effects of flood events.<br>1. a. Remove structures from flood prone areas |
| **Priority** | Medium |
| **Estimated Cost** | $200,000 ($40,000 for each of two dams) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Dam Owner |
| **Potential Matching Funding Sources** | • City Funds<br>• Dam Owner |
| **Responsible Agency** | • Westlake Public Safety<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will identify areas that should be excluded from development and plan for emergency response should the dam fail. |
| **Effect on Existing Buildings** | This action will identify existing buildings that may be subject to inundation should a dam failure occur, and develop plans for emergency response should the dam fail. |
| **Cost Effectiveness** | Cost Effective - Dam failures tend to be low probability/high consequence events. The relatively low cost of conducting these studies and developing plans compared to the potential benefits in terms of lives saved and property protected make this project cost effective. |
| **Discussion:** Inundation studies of high hazard dams will provide data necessary to assess the vulnerability of downstream people and structures. Vulnerable structures and infrastructure can be identified and relocated or protected as necessary. Based on data from the inundation studies Emergency Action Plans can be developed to provide the framework necessary to protect lives and property should the dams fail. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Westlake Dam Failure Mitigation Action #2** | Conduct a search for previously unidentified High Hazard Dams in Westlake. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events.<br>1. a. Remove structures from flood prone areas.<br>2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | $20,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Dam Owners |
| **Potential Matching Funding Sources** | • City Funds<br>• Dam Owners |
| **Responsible Agency** | • Westlake Public Safety<br>• Fort Worth – Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will potentially identify new hazard areas that should be excluded from development. |
| **Effect on Existing Buildings** | This action will potentially identify existing buildings that may be subject to inundation should a dam failure occur. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of locating previously unknown High Hazard Dams. |
| **Discussion:** This project will conduct a search for previously unidentified High Hazard Dams. Any dams located can then be evaluated for safety and vulnerable populations, structures, or infrastructure below the dams. | |

**DROUGHT**

Moderate Vulnerability – Westlake purchases water from Fort Worth, Keller, and Trophy Club; with most water coming from Fort Worth. Fort Worth purchases water from the Tarrant Regional Water District (TRWD). TRWD water supply comes from three reservoirs on the West Fork of the Trinity River in northwest Tarrant County and from two reservoirs located well southeast of Tarrant County. These diverse supply locations help mitigate the effects of a local drought. An additional reservoir location well northeast of Tarrant County is being pursued. There has been some preliminary discussion of constructing a pipeline to carry water from southern Oklahoma. TRWD is installing pipelines to interconnect area water supply lakes with water treatment plants in order to provide maximum flexibility in water supply and treatment.

Location – Drought can affect all of Westlake.

Current Extent – As of February 2008, Westlake was at DO – Abnormally Dry on the Palmer Drought Severity Index.

Previous Occurrences – National Climatic Data Center records indicate that in the past ten years there have been three periods of drought in Westlake, 1996 - 1998, 2000, and 2005 - 2006.

Probability of Future Events – Droughts are certain to occur again in Westlake. Significant droughts significantly affecting water supply and resulting in mandatory restrictions traditionally occur on a twenty year cycle. Based on the previously cited National Climatic Data Center recent records, we can anticipate that drought conditions will occur approximately every three years.

Impact – Drought can lead to loss of water for basic needs such as drinking and fire-fighting. Droughts are associated with increased wildfire and damage from expansive soils. More common impacts are damage to landscaping and reduced recreation due to low lake levels.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westlake Drought Mitigation Action #1** | Participate in the design and implementation of the Tarrant County specific water conservation public education efforts to compliment existing programs. |
| **Mitigation Goal/Objective** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • City Funds<br>• Water Suppliers |
| **Responsible Agency** | • Westlake Public Safety/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One year |
| **Effect on New Buildings** | This action will publicize water conservation efforts that can be incorporated into new construction. |
| **Effect on Existing Buildings** | This action will publicize water conservation efforts that can be incorporated into existing construction. |
| **Cost Effectiveness** | Cost Effective – Public education programs can provide significant results for relatively low costs. |
| **Discussion:** Most cities in the area have existing water conservation programs designed to educate the public and businesses on ways to conserve water. This action will develop a Tarrant County specific program that will compliment existing programs. Jurisdictional public education efforts have been very successful in attracting the attention of local citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westlake Drought Mitigation Action #2** | 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. Impacts identified in this plan will be included in updates to the Hazard Mitigation Action Plan. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $10,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • City Funds<br>• Water Suppliers |
| **Responsible Agency** | • Westlake Public Safety/Emergency Management<br>• Fort Worth – Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will identify drought impacts in Westlake thus providing specific information for builders of new structures to incorporate drought mitigation into the structures. |
| **Effect on Existing Buildings** | This action will identify drought impacts in Westlake thus providing specific information for owners of existing structures to incorporate drought mitigation into the structures. |
| **Cost Effectiveness** | Cost Effective – This planning effort will have a low cost with the potential for significant benefits for the entire community. |
| **Discussion:** This planning effort will focus attention on the effects of drought on the community. Specific drought effects will be identified and efforts can be made to mitigate those effects. | |

**EXPANSIVE SOILS**

Low Vulnerability - Expansive soils have caused damage to some structures in Westlake. However, damage has been limited to relatively small geographic areas and there are no reports of significant damage to commercial structures or infrastructure.

Location – Expansive soils are found in various areas of Westlake. We could not locate a map of expansive soils in Westlake.

Extent – The extent of expansive soils in Westlake is believed to be Very Low (0% - 20%) to Low (21% - 50%).

Previous Occurrences – We could find no empirical data on previous occurrences of damage from expansive soils, but it is believed that expansive soils have caused problems since the first buildings were constructed in this area.

Probability of Future Events – Due to the variability of soil types and construction quality, it is very difficult to predict future occurrences of problems with expansive soils. However, a study published in the fall 2003 issue of *Environmental Geology* cited in the September 19, 2003 *Dallas Business Journal* indicates that many new developments in the Metroplex are being built on soil that is more unstable than soils built on prior to 1990. This could lead to a higher incidence of expansive soil related damage in the future.

Impact – The impact of expansive soils ranges from cosmetic cracks in walls to substantial foundation and structural damage that can result in the need to demolish the building. Infrastructure such as pipelines can be damaged causing increased maintenance and repairs, damaged beyond repair requiring replacement, damaged to the point of failure.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westlake Expansive Soils Mitigation Action #1** | Improve construction techniques through building code enhancements. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined (Minimal – Staff Time Only) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building permit fees |
| **Potential Matching Funding Sources** | • City Funds<br>• Building permit fees |
| **Responsible Agency** | Westlake Planning & Development |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will make new buildings more resistant to damage from expansive soils. |
| **Effect on Existing Buildings** | This action will require modifications to existing buildings to be more resistant to damage from expansive soils. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will improve construction quality and reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westlake Expansive Soils Mitigation Action #2** | Educate construction contractors, home owners, and business owners about mitigation techniques. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building Permit Fees |
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | • Westlake Planning & Development<br>• Westlake Public Safety/Emergency Management |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will provide builders of new construction with expansive soil mitigation techniques that will reduce damage. |
| **Effect on Existing Buildings** | This action will provide owners of existing buildings with expansive soil mitigation techniques that will reduce damage. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will provide construction contractors and home/business owners with techniques designed to reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**EXTREME HEAT**

High Vulnerability - Summer heat and humidity can occur anytime from May through October. Community health services actively work with at risk populations to prevent heat related deaths and injuries. The elderly, very young people and people with poor health are most at risk from summer heat. People who work outside or in un-air-conditioned buildings are also at high risk to the direct effects of summer heat. Summer heat can also lead to electrical service outages if equipment fails or demand exceeds available supply. Most public safety and special facilities are equipped with emergency generators.

Location - Throughout the City.

Extent - Summer temperatures can reach as high as 113 degrees. Westlake is also subject to high humidity.

Previous Occurrences - This is an annual occurrence. The summer of 1980 was a record year with 69 consecutive days of temperatures of 100 degrees or more. We were unable to find a reliable record of deaths or injuries related to heat.

Probability of Future Events - Hot summer temperatures are certain to continue to occur in Westlake.

Impact - Summer heat can cause widespread electrical outages resulting in dangerous conditions, especially for at-risk populations. Occasionally "cooling centers" are opened at community centers to provide a safe place for citizens to seek refuge from the heat. Extreme heat can have economic impacts if construction work is curtailed or outdoor special events are cancelled.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westlake Extreme Heat Mitigation Action #1** | Determine feasibility of expanding monitoring of populations at risk from extreme heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined. Staff time and GIS resources |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Other State or Federal Public Health Grants |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Tarrant County Public Health<br>• Westlake Public Safety/Emergency Management |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | None - This action is intended to expand monitoring of people only. |
| **Effect on Existing Buildings** | None - This action is intended to expand monitoring of people only. |
| **Cost Effectiveness** | Pending, but believed to be Cost Effective |
| **Discussion:** This action would determine the feasibility of expanding monitoring of populations at risk from extreme heat. Existing at risk population monitoring programs will be reviewed to ensure all known populations at risk from extreme heat are included. Any newly discovered at risk populations will be evaluated for inclusion in existing monitoring programs. Tarrant County Public Health provides public health services throughout the County. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westlake Extreme Heat Mitigation Action #2** | Increase public education programs on the dangers of excessive heat |

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| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness |
| **Priority** | Medium |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Other State or Federal Public Health Grants |
| **Responsible Agency** | Westlake Public Safety/Emergency Management |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Effect on Existing Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits. |
| **Discussion:** Public education on severe weather in Westlake has traditionally focused on severe thunderstorms and associated hazards (tornadoes, lighting, flooding, high winds). This action would expand public education to include hazards from extreme heat. | |

**FLOOD**

High Vulnerability - The topography of Westlake combined with the frequency of severe thunderstorms results in frequent flash flood events. FEMA records indicate only 39 Repetitive Loss Properties in all of Tarrant County. However, this is probably more a reflection of the low number of flood insurance polices than vulnerability to flooding. Further analysis using GIS and field verification can specifically identify vulnerable structures.

Location - Throughout the City along creeks and drainage structures. The 1600 block of Dove Road is known to experience street flooding.

Extent - Flash floods are the most common type of flooding in Westlake which tend to occur and recede very quickly.

Previous Occurrences - The Town of Westlake is not prone to serious flooding but does have some areas that are of concern. The major issue of flooding for the Town is located in and around Turner Lake located on Circle T Ranch. Turner Lake is currently planned to be dredged by the Corps of Engineers, and thus will improve the flood control capabilities of this lake. In heavy rains, Turner Lake commonly overflows the spillway, sending water down stream through Trophy Club and eventually to Lake Grapevine.

Other areas that are subject to flooding in very heavy rain events are 1600 block of Dove Road and 1300 block of Roanoke Road. The problem in both areas is the size of the drainage pipe that is under the road and the amount of up stream run-off. Both locations

will be corrected with future road improvement and development. The Dove Road site currently drains into a public/private park and does not threaten any structures. The Roanoke Road site currently drains from vacant land to vacant land and does not threaten any structures.

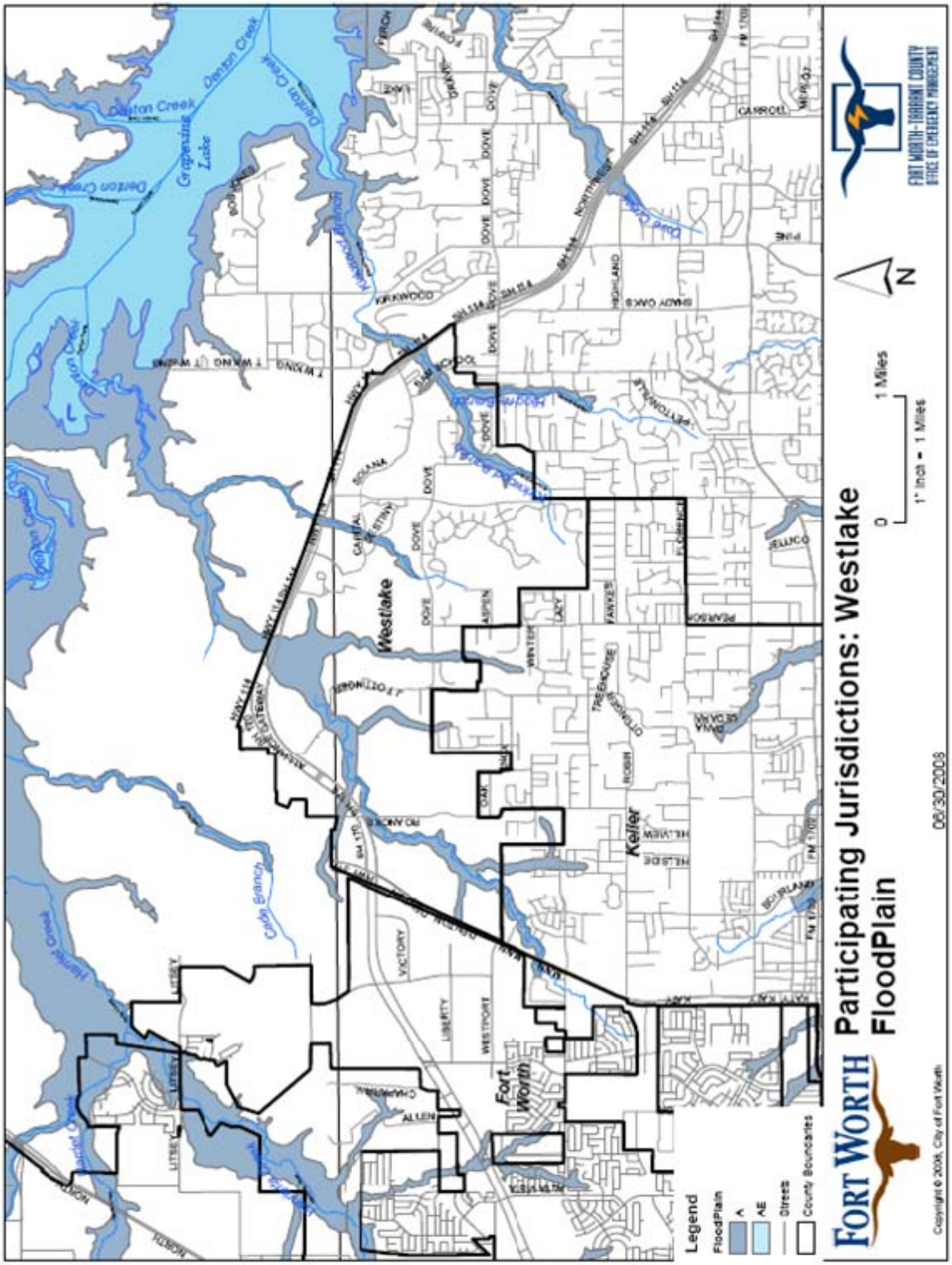
The only other site that is of potential concern is located along Precinct Road. This is a TxDOT project and is currently undergoing engineering studies for road improvements. This project will require the purchase of right-of-way, road improvement and reconstruction. Portions of this project are under construction (Precinct and SH 114 intersection).

All other areas of concern are currently golf courses or planned golf courses or open park land. This will be highlighted in the land use plan. No structures are in the 100 year flood plane nor are any variance/exceptions planned.

In the summer of 2004 some portions of the County received two separate "500-Year" rain events. Tarrant County declared a Local State of Disaster on June 9th and again on August 2nd primarily due to widespread flooding.

Probability of Future Events – Based on previous experience Westlake is certain to suffer flash flood events every year. National Weather Service records indicate an average of 11 flash flood events per year in Tarrant County. Continued development throughout the County and the resulting increase in impervious cover will increase the likelihood and severity of flooding.

Impact - Flash floods kill more people than any other hazard associated with thunderstorms. Property damage from flash flooding is seldom covered by insurance, which makes it very difficult for citizens to recover from the flood. Due to the very rapid rate of development and growth throughout Tarrant County we are experiencing problems with determining actual building footprints within flood plains and will be using planimetric GIS data from the NCTCOG to resolve this issue when it becomes available. At that time we will be able to accurately identify the number and types of buildings vulnerable to flooding; as well as access other data associated with those locations such as appraised value, census data, and owner information.


Participating Jurisdictions: Westlake
FloodPlain
FORT WORTH
FORT WORTH-TARRANT COUNTY
OFFICE OF EMERGENCY MANAGEMENT
Legend
FloodPlain
A
AE
Streets
County Boundaries
0
1 Miles
1" Inch = 1 Miles
N
06/30/2008
Westlake
Keller
Fort Worth
Denton Creek
Grapevine Lake
Cade Branch
Harriet Creek
Copyright © 2008, City of Fort Worth

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westlake Flood Mitigation Project #1** | Participate in the development of the Tarrant County specific "Flood Preparedness" brochure. |
| **Hazard Addressed** | Flooding |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of Flood events.<br>1. c. Develop effective flood mitigation public education materials. |
| **Priority** | High |
| **Estimated Cost** | Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Private Foundation Grants |
| **Responsible Agency** | • Westlake Public Safety/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This action will provide flood mitigation techniques for owners of new buildings. |
| **Effect on Existing Buildings** | This action will provide flood mitigation techniques for owners of existing buildings. |
| **Cost Effectiveness** | Cost Effective - This project will provide valuable information to the public in a relatively short time and with relatively low costs. It will also have the added benefit of increasing public awareness of mitigation. The estimated cost could easily be offset by reduced losses to the public in a single small flood event. |

**Discussion**: Develop Tarrant County specific "Flood Preparedness" brochure. Once developed, the brochure will be distributed County-Wide. Historically flood prone areas will be targeted for door-to-door distribution and neighborhood meetings to present the brochure and solicit input for *Fort Worth Hazard Mitigation Action Plan* revisions.

The brochure will include:

- Description of Tarrant County flood hazards
- "Case Studies" of previous flood events in Tarrant County
- Preparedness and "self-help" mitigation information
- Benefits of city participation in NFIP
- Advantages of flood insurance
- Risks of not having flood insurance
- Warnings that typical homeowner's insurance does not cover rising water
- Solicit input for the *Fort Worth Hazard Mitigation Action Plan*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westlake Flood Mitigation Action #2** | Conduct city-wide drainage study with consideration of upstream development and implement findings. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined pending engineering analysis |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Westlake Planning & Development<br>• Westlake Public Safety/Emergency Management |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will provide guidance for locating new buildings away from flood prone areas. |
| **Effect on Existing Buildings** | This action will provide guidance for protection of existing buildings from flooding. |
| **Cost Effectiveness** | Cost Effective – This project will provide guidance to reduce the hazard to life and property from flooding. |
| **Discussion:** This action will develop a study of throughout the City and provide findings that can reduce the adverse effects of flooding. | |

**HAILSTORM**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of large hail are a hazard event in Westlake. Tarrant County averages eleven significant thunderstorm events (large hail, high winds) per year according to National Weather Service records. Most structures in Westlake can resist the effects of all but the most severe hailstorms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to hailstorms. Vehicles have proven to be vulnerable to hailstorms with widespread severe vehicle damage reported in 1980 and 1995.

Location - Throughout the City.

Extent - Westlake is subject to the hazards of severe thunderstorms, including large hail. Hail stones up to the size of grapefruit (H9 on the Combined NOAA/TORRO Hailstorm Intensity Scales) have been reported in Tarrant County.

Previous Occurrences – There are no reports of significant hailstorm events in Westlake other than the 1980 and 1995 county-wide events.

Probability of Future Events - Thunderstorms with hail are certain to continue to occur in Westlake. Hail falls on about two or three days per year, ordinarily with only slight and scattered damage (*National Weather Service*).

Impact – The impact from hailstorms can be significant in extreme events such as the hailstorms of 1980 and 1995. Thousands of homes and vehicles can be damaged in a single storm with millions of dollars in damages. Vehicles are especially impacted by large hails with windshields being the vulnerable part. A recurring problem following hailstorms is broken windshields in vehicles belonging to populations who do not have vehicle insurance and cannot afford the replacements costs, resulting in the owners having difficulty traveling to work, medical appointments, etc.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westlake Hailstorm Mitigation Action #1** | Develop a public education campaign to encourage "hail resistant" roofing in new construction and roof replacements. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• Building/Permit Fees<br>• City Funds |
| **Responsible Agency** | • Westlake Public Safety/Emergency Management<br>• Westlake Planning and Development |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will potentially decrease the damage caused by most hailstorms to new buildings. |
| **Effect on Existing Buildings** | This action will potentially decrease the damage caused by most hailstorms to existing buildings. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing hailstorm damage. One long term benefit will be reduced property insurance as claims related to hail damage are reduced. |
| **Discussion**: Public education has proven to be a low cost effective means to achieve changes public behavior. Encouraging hail resistant roofing can benefit citizens through reduced damage, business through reduced damage to their buildings and reduced claims against insurance companies, and government through reduced request for assistance. This campaign can be developed in conjunction with the Tarrant County effort. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westlake Hailstorm Mitigation Action #2** | Evaluate City buildings to determine feasibility of installing hail resistant roofing and window coverings with a focus on critical infrastructure. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• City Funds |
| **Responsible Agency** | Westlake Town Engineer |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on new City buildings. |
| **Effect on Existing Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on existing City buildings. |
| **Cost Effectiveness** | Cost Effective – Although currently undetermined, this project is believed to be cost effective. |
| **Discussion:** Installing hail resistant roofing and window coverings on City buildings could prevent or limit damage to City buildings thus avoiding costs to the City as well as preventing or limiting loss of use of damaged facilities. | |

**HIGH WINDS**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of high winds are a hazard in Westlake. Tarrant County averages ten reported significant thunderstorm events (large hail, high winds) per year. In addition, strong weather fronts can sometimes be accompanied by high winds which occasionally cause damage. Most structures in Westlake can resist the effects of all but the most severe high wind events. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to high winds.

Location - Throughout the City.

Extent - Severe thunderstorms with high winds with speeds in excess of 90 mph have been reported in Westlake.

Previous Occurrences – We could find no records of significant high wind damage in Westlake.

Probability of Future Events – Based on previous experience Westlake can expect to experience an average of ten significant thunderstorm events with high winds per year.

Impact – Records on high wind events are difficult to separate from severe thunderstorm records. High winds in Westlake typically cause little damage to commercial buildings. More often high winds cause damage to roofs, trees, and signs.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westlake High Winds Mitigation Action #1** | Enact enhanced building codes to reduce damages from high winds. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined – Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Westlake Planning & Development |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will potentially identify a means to reduce high wind damage on new buildings. |
| **Effect on Existing Buildings** | This action will potentially identify a means to reduce high wind damage on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Although costs are undetermined, this action is believed to be cost effective since the action will require staff time only. |
| **Discussion:** Enhanced building codes will reduce damages from high wind events. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westlake High Winds Mitigation Action #2** | Educate builders and residents about mitigating wind damage. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |
| **Responsible Agency** | • Westlake Planning & Development<br>• Westlake Public Safety/Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |

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| **Effect on New Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on new buildings. |
| **Effect on Existing Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost of developing and providing high wind mitigation compared with savings to the community make this action cost effective. |
| **Discussion:** Public education has proven to be a low cost and effective means to achieve changes public behavior. High winds have not been a focus of severe weather preparedness. | |

**LANDSLIDES**

No Vulnerability - There is no history of landslides in Westlake. Based on the lack of vulnerability, landslides will receive no further consideration in this plan for Westlake. However, landslide hazards will be reviewed during the annual review of this plan and we will continue looking for areas with landslide potential during hazard surveys.

**LEVEE FAILURE**

No Vulnerability – There are no levees or areas that would be affected by levee failure in Westlake. Based on the lack of vulnerability, levee failure will receive no further consideration in this plan for Westlake.

**LIGHTNING**

Moderate Vulnerability – Lightning is one of the most common hazards in Westlake. Thunderstorms (and by definition, lightning) occur an average of 30 – 50 days per year (*Oklahoma Climatological Survey*). Lightning is the second most common cause of weather-related deaths in Texas (*National Weather Service*). Lightning information is available only for Tarrant County on a county-wide basis.

Location – Throughout the City.

Extent – We could find no references to the average number of strikes per storm in Westlake. However, lightning is by definition associated with thunderstorms.

Previous Occurrences – Westlake experiences 30 – 50 thunderstorm days per year. From 1995 – 2004 one person was killed and five were injured by lightning in Tarrant County (*National Weather Service*). Throughout Texas 34 people were killed by lightning, there were 184 injuries, and an estimated 23 million dollars in damages due to lightning from 1995 - 2004 (*National Weather Service*).

Probability of Future Events – Based on past experience Westlake will experience 30 – 50 thunderstorm days each year. Some days will have more than one thunderstorm during a given thunderstorm day.

Impact – Although lightning is the second most common cause of storm related deaths in Texas, lightning deaths remain relatively rare. Lightning does cause property damage several times per year (we could not find statistical data to validate this observation).

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westlake Lightning Mitigation Action #1** | Provide lightning mitigation materials with building permit packets. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Westlake Planning & Development |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will provide materials that will reduce the vulnerability of new buildings to lightning. |
| **Effect on Existing Buildings** | This action will provide materials that will reduce the vulnerability of existing buildings that are being remodeled to lightning. |
| **Cost Effectiveness** | Cost Effective – The low cost of this project would be offset by eliminating just one lightning caused building loss. |
| **Discussion:** Lightning mitigation materials will be included in all building permit packets distributed to builders or citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westlake Lightning Mitigation Action #2** | Ensure all City critical infrastructure has adequate lightning mitigation in place and upgrade protection as necessary. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | $10,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Westlake Public Works |
| **Estimated Completion Time Frame** | One Year |

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| **Effect on New Buildings** | This action will ensure new City buildings that house critical infrastructure have adequate lightning mitigation. |
| **Effect on Existing Buildings** | This action will ensure existing critical infrastructure has adequate lightning mitigation. |
| **Cost Effectiveness** | Cost Effective – The destructive and sometimes capricious nature of lighting warrant the expense of this action compared with the benefits of avoiding damage to critical infrastructure. |
| **Discussion:** Review and confirmation of the adequacy of lightning protection systems in City buildings housing critical infrastructure is worthwhile considering the number of thunderstorms experienced in Westlake. | |

**SEVERE THUNDERSTORM**

High Vulnerability - Severe thunderstorms are the most common hazard in Westlake. From 1950 through August 2007 Tarrant County averaged eleven reported severe thunderstorm events county-wide per year. Most structures in Westlake can resist the effects of all but the most severe thunderstorms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to thunderstorms.

Location - Throughout the City.

Extent - Westlake is subject to the hazards of severe thunderstorms of all magnitudes.

Previous Occurrences - Records are available only on a county-wide basis.

Probability of Future Events – Severe thunderstorms will occur in Westlake an average of eleven times per year.

Impact – A single severe thunderstorm can cause damage from hail, high winds, lightning, and/or tornadoes to thousands of structures.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Westlake Severe Thunderstorm Mitigation Project #1** | Conduct technical assessment to determine the feasibility of structurally hardening the Westlake Fire Station at 2900 Dove Street against severe weather. |
| **Hazard Addressed** | Tornado/Severe Thunderstorm |
| **Mitigation Goal/Objective** | 2. Reduce loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | High |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |

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| **Potential Matching Funding Sources** | • Private Foundation Grants<br>• Other State or Federal Grants<br>• City Funds |
| **Responsible Agency** | Westlake Public Safety/Emergency Management |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This project will determine the feasibility of structurally hardening the Westlake Fire Station against severe weather. |
| **Effect on Existing Buildings** | This project will determine the feasibility of structurally hardening the Westlake Fire Station against severe weather. |
| **Cost Effectiveness** | Cost Effective - This project will provide the basis for a realistic cost benefit analysis of the feasibility of hardening the Westlake Fire Station against severe weather events. The relatively low cost of this project compared with the potential benefits of protecting a city's emergency response equipment against the jurisdiction's most likely hazard event result in a favorable cost benefit review. |

**Discussion:**
This project will provide for determining the feasibility of hardening the city's only fire station against severe weather. This project will contribute to protecting emergency response equipment so that it will be available to assist the citizens of Westlake in responding to and recovering from severe weather or other events. Final project details will be developed in accordance with grant requirements at the time the project is funded.

The cost estimate is a conservative "best guess" based on a structural analysis of the existing fire station. That analysis would require:

- Structural analysis of the building by a Structural Engineer
- Analysis of electrical systems
- Analysis of HVAC systems
- Review of building codes

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Westlake Severe Thunderstorm Mitigation Action #2** | Encourage builders to install storm resistant construction such as "hurricane clips". |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | High |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |

| | |
|---|---|
| **Responsible Agency** | Westlake Planning & Development |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will encourage storm resistant construction in new buildings. |
| **Effect on Existing Buildings** | This action will encourage storm resistant construction in existing buildings as they are remodeled. |
| **Cost Effectiveness** | Cost Effective – The low cost of this action will be offset by a reduction in damage from severe thunderstorms. |
| **Discussion:** Effective education on storm resistant construction can reduce damage from severe thunderstorms. Insurance companies may be willing to fund or provide educational materials and/or provide discounts to persons who install storm resistant devices. | |

**SEVERE WINTER STORMS**

Moderate Vulnerability - Since 2000 the National Weather Service has reported 14 Winter Storm/Ice events. Winter storms in Westlake usually consist of short-lived icing events (ice on the roads for a few hours) that primarily affect traffic and cause numerous motor vehicle accidents. Occasionally an ice storm will cause widespread power outages for as long as several days. ONCOR Electric Delivery has an aggressive tree trimming program. Most structures in Westlake can resist the effects of all but the most severe winter storms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to winter storms. Electrical service outages are usually the most serious threat in this area. Most public safety and special facilities are equipped with generators.

Location - Throughout the City.

Extent - Severe ice storms have resulted in accumulations in excess of two inches. Most storms leave only a light coating or glaze of ice.

Previous Occurrences – Severe Winter Storms are typically regional events. Westlake averaged two winter storms per year since 2000. Most winter storms resulting only minor inconveniences and a few motor vehicle accidents.

In 1978 up to an inch of ice coated area trees and roadways causing $14 million in damages region-wide and making travel almost impossible for two days.

In 1996 a winter storm dropped two to four inches of a mixture of sleet, freezing rain, and snow in Westlake over Thanksgiving weekend causing many motor vehicle accidents and some electrical service outages.

In 2003 a winter storm dropped one inch of sleet across Westlake resulting in numerous motor vehicle accidents and closing schools for two days.

Probability of Future Events - Westlake can expect to experience two winter storms per year with a severe winter storm once each ten years.

Impact - Winter storms can cause widespread electrical and telephone service outages, make travel dangerous or impossible, and damage structures. Deaths and injuries due to vehicle accidents and slips/falls are common during ice storms. Occasional deaths and injuries from carbon monoxide poisoning due to improper heating have occurred. Economic losses due to lost production can be significant. Damage from frozen pipes can lead to significant expenses for homeowners.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Westlake Severe Winter Storm Mitigation Action #1** | Increase public education concerning winter storm preparedness and mitigation. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | Medium |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Westlake Public Safety/Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into new buildings. |
| **Effect on Existing Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost is effective when compared to benefits provided to citizens. |
| **Discussion:** Winter weather preparedness has not been emphasized in Westlake as much as severe thunderstorms. This action will provide preparedness information to citizens during the fall. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Westlake Severe Winter Storm Mitigation Action #2** | Purchase additional street sanding capacity |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined |

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| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Westlake Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will have no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Sanding streets is essential to allow emergency vehicles to respond during severe winter events. |
| **Discussion:** Sanding equipment can be mounted on existing equipment to provide sanding capabilities. During severe winter weather events streets around hospitals, fire stations and other critical facilities are sanded along with major intersections and roadways. Additional sanding capacity would allow for quicker sanding of these areas and for more repeat sanding during prolonged winter weather events. This will improve public safety by facilitating emergency response as well as reducing motor vehicle accidents. | |

**STREAM BANK EROSION**

No Vulnerability - The predominantly low rolling topography of Westlake prevents stream bank erosion from causing a hazard except in a few locations. No vulnerability to stream bank erosion has been identified in Westlake. Further analysis using GIS and field verification will continue to search for vulnerable structures or facilities.

**TORNADO**

High Vulnerability – All structures in Westlake are vulnerable to tornadoes. Very few structures can withstand the effects of an F5 tornado. However, the March 28, 2000 F3 tornado that struck Fort Worth provided good evidence that well built structures can protect people who take appropriate shelter inside those buildings.

Location - Tornadoes can occur anywhere in Westlake.

Extent - Westlake is subject to tornadoes of all magnitudes, including F5 tornadoes.

Previous Occurrences – We found no reports of tornados causing damage in Westlake. However, Tarrant County has an average of one tornado reported per year county-wide (Source: National Climatic Data Center). In 2007 there were eight tornadoes reported by storm spotters county-wide. Four of those tornados caused damage, all within incorporated areas. Since 2000 tornadoes have caused damage in Arlington, Benbrook, Euless, Everman, Fort Worth, Grand Prairie, Haltom City, Mansfield, North Richland Hills, and River Oaks.

Probability of Future Events - Tarrant County has averaged one reported tornado per year and can expect that average to continue. Westlake, based on its relatively small size, will likely experience tornados very infrequently.

Impact - Tornadoes can cause deaths, injuries and property damage/destruction. Special facilities such as hospitals, fire stations, and utilities can be damaged or destroyed. Citizens who live in neighborhoods struck by tornadoes can experience disruption of their life styles and traditions. Areas struck by tornadoes can experience increased demand for mental health services as people deal with grief and stress.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Westlake Tornado Mitigation Project #1** | Assist citizens with funding for building tornado safe rooms or in-ground shelters. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction |
| **Priority** | High |
| **Estimated Cost** | $200,000 (50 Safe Rooms at $4,000 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Community Development Block Grant Funds |
| **Potential Matching Funding Sources** | Home/Building Owner |
| **Responsible Agency** | • Westlake Public Safety/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This project will encourage new buildings to be constructed with tornado safe rooms as part of the construction process. The safe room will enhance the overall storm resistance of the building. |
| **Effect on Existing Buildings** | This project will encourage homeowners to construct/install tornado safe rooms in their existing homes. A safe room will enhance the overall storm resistance of the building. |
| **Cost Effectiveness** | Cost Effective - Safe rooms and in-ground shelters have been proven to reduce deaths and injuries during tornadoes and severe thunderstorms. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of safe rooms and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

**Discussion:**
This project will reimburse costs associated with tornado safe room or in-ground shelter installation in new or existing homes. Safe rooms provide increased protection for citizens during severe thunderstorms and tornados. Safe rooms have been proven to save lives and reduce injuries from severe weather events. FEMA publication 320 (*Taking Shelter from the Storm, Building a Safe Room Inside Your House*) provides the standards for safe rooms. As stated on the FEMA website: Although a *"residence may be built "to code," that does not mean it can withstand winds from extreme events such as tornadoes and major hurricanes. The purpose of a safe room or a wind shelter is to provide a space where you and your family can seek refuge that provides a high level of protection. To protect its occupants, a safe room must be built to withstand high winds and flying debris, even if the rest of the residence is severely damaged or destroyed."*

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to home owners will be for no more than $3,000 or 75% of cost, whichever is less
- Eligibility will be limited to individuals who own their home at the time of application
- The safe room or in-ground shelter must be constructed/installed in the primary residence of the applicant
- Each eligible homeowner can only receive one reimbursement, regardless of the number of shelters he/she may purchase/install
- In-ground shelters must meet requirements established in the National Performance Criteria for Tornado Shelters dated May 28, 1999.
- Safe Rooms must meet the requirements of FEMA Publication 320
- Safe Rooms and shelters must meet all applicable city and/or county codes
- Previously owned or used shelters will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Westlake Tornado Mitigation Project #2** | Assist citizens with funding for purchase of Weather Alert Radios |
| **Mitigation Goal/Objective** | 4. Increase the effectiveness of warning systems in Tarrant County.<br>4. a. Increase the number of homes and businesses with Weather Alert Radios. |
| **Priority** | High |
| **Estimated Cost** | $4,000 (100 Weather Alert Radios at $40 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Private Sector Donations<br>• City Funds |
| **Potential Matching Funding Sources** | Citizen/Business Owner |

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|---|---|
| **Responsible Agency** | • Westlake Public Safety/ Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings except for providing additional warning time of severe weather events thus allowing citizens more time to secure their home or business against approaching severe weather. |
| **Cost Effectiveness** | Cost Effective – Weather Alert Radios are a proven means to alert and warn citizens about severe weather and civil emergencies. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of Weather Alert Radios and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

***NOTE**: We are aware that Weather Alert Radios are on the "2007 Ineligible Planning Activities" list. It is our opinion that Weather Alert Radios should be considered eligible due to their very high benefit and very low cost.*

This project will reimburse 75% of the cost for citizens to purchase Weather Alert Radios, with the citizen responsible for the remaining 25%. Weather Alert Radios provide the best means for citizens to receive emergency alerts when they are indoors. Severe weather is the primary hazard in our area. Early alert and warning has proven to be a significant factor in saving lives during severe weather events.

In addition, the Weather Alert Radios can be activated for civil emergencies such as hazardous materials incidents. Effective warning saves lives, especially during severe weather events. Weather alert radios provide a proven means of indoor warning to citizens any time of the day or night and compose the vital indoor portion of our emergency warning system.

Warning systems have been shown to have value beyond the initial warning. Persons receiving warning relay the information to family and friends to ensure they are aware of the hazard. The secondary and tertiary warning can greatly amplify the effectiveness of the warning system.

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to citizens will be for no more than $30 or 75% of cost of the radio, whichever is less
- Eligibility will be limited to residents of Westlake
- The citizen must sign an agreement to keep the radio operational
- Each eligible homeowner can only receive one reimbursement, regardless of the number of radios purchased
- Previously purchased radios will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**WILDFIRE**

Moderate Vulnerability - Westlake has a limited amount of rural-urban interface that is subject to wildfires.

Location - Areas in the western parts of Westlake are subject to wildfires. Westlake still has many open undeveloped areas with significant brush and tree cover.

Extent - The effects of wildfire are deaths, injuries, loss of structures, loss of wildlands, and loss of wildlife habitat.

Previous Occurrences – There is no record of wildfire in Westlake.

Probability of Future Events - Wildfires are likely to occur annually and increase in frequency and severity as the population continues to increase and formally rural areas are developed.

Vulnerability - Homes are most vulnerable to wildfires. The tendency to locate homes on tree covered lots and lack of fire breaks (such as parking lots around businesses) can enable fires to spread more easily to homes. Special facilities tend to be less vulnerable due to construction type (brick or metal).

Impact - Wildfires can result in the need for rapid evacuations, casualties, loss of homes and businesses, and loss of wildlife habitat and recreational areas.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Westlake Wildfire Mitigation Action #1** | Increase public education on how to reduce the risks from wildfires (construction, landscaping, etc.) |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | High |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Westlake Public Safety/Emergency Management |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will reduce the effects of wildfire on new buildings through increased use of wildfire mitigation measures. |
| **Effect on Existing Buildings** | This action will reduce the effects of wildfire on existing buildings through increased use of wildfire mitigation measures. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing the effects of wildfire. |
| **Discussion:** Wildfire mitigation measures are not widely known in urban areas such as Tarrant County. This action will increase that knowledge and reduce casualties and damages from wildfires. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Westlake Wildfire Mitigation Action #2** | Enact building permit process that encourages wildfire resistant construction. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |

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|---|---|
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | Westlake Planning & Development |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will reduce the vulnerability of new structure to wildfire. |
| **Effect on Existing Buildings** | This action will reduce the vulnerability of existing buildings to wildfire if they are remodeled to the extent a building permit is required. |
| **Cost Effectiveness** | Cost Effective – This action will integrate wildfire mitigation into the building process at minimal cost. |
| **Discussion:** Integrating mitigation into building permitting provides a process to reduce vulnerability with few negative impacts. | |

**Texas Standards That Exceed 44 CFR Requirements: Local Capability Assessments**

MAP 1

Projects funded under the following programs. Address the type of project that was funded. If you did not receive money from one of the below grants programs, then state that.

1.1: Hazard Mitigation Grant Program - None
1.2: Pre-Disaster Mitigation Grant Program - None
1.3: Project Impact - None
1.4: Hurricane-Property Protection Mitigation - None
1.5: Flood Mitigation Assistance - None
1.6: 406 Mitigation (through the Public Assistance Program) - None

MAP 2

Current Building Codes. Include the following information:
2.1: Date and type of code: 2003 International Building Code
2.2: How is it being enforced? Plans submitted for review. Projects inspected on site.

MAP 3

Current Fire Codes. Include the following information:
3.1: Date and type of code: 2003 International Fire Code
3.2: How is it being enforced?

- Plans are submitted for review
- Projects inspected on site
- Annual Fire Inspection

MAP 4

4.1: Any other codes, sub-division regulations, etc., that are in effect in your jurisdiction?
The Town of Westlake has developed and follows a Unified Development Code. This code is utilized in all development issue and is patterned after FEMA, NCTCOG, and other local and regional codes and regulations. The code is

reviewed and updated as needed with the last major revision in 1998 (sections have been updated as recently as 2004).

4.2: How are they being enforced? Exemptions are reviewed and approved if appropriate.

MAP 5

Floodplain Management. Include the following information:

5.1: Ordinance/Order Date: UDC 1994, Art. XIV

5.2: Do you have a Floodplain Administrator? Yes

5.3: Is the person a Certified Floodplain Manager (CFM)? Yes

5.4: Date of current floodplain maps. August 23, 2000

5.5: Any codes, regulations, etc. that prohibit development in the floodway and/or floodplain: UDC 1994, Art. XIV

MAP 6

Findings/results of Building Code Effectiveness Grading Report (BCEGS). Include date of report and score. Not applicable

MAP 7

Identify other plans that your jurisdiction has or have been done in your jurisdiction.

7.1: Capital Improvement Plans: None

7.2: Comprehensive Plans: Adopted August 24, 1992, Amended September 23, 2002

7.3: Storm Water Management Plans: No

7.4: Master Drainage Plans: Westlake Code of Ordinances July 22, 2002; Section 102-64

7.5: Corps of Engineers: No

7.6: Flood Mitigation Plan: Westlake Code of Ordinances July 22, 2002; Section 102-64

7.7: Any other plans, studies, etc. that may have been done in your jurisdiction:

The Town of Westlake is conducting a complete review of all its land uses. This study will identify all zoning, development current in place, thorough fare plan, and implications of future development on existing and planned development. Population density is one issue to be addressed as well.

# City of Westover Hills

Jurisdiction Profile

Westover Hills is off of Interstate Highway 30 six miles west of Fort Worth in west central Tarrant County. The town, which was established during the early twentieth century, incorporated in 1939. By the late 1940s the population of Westover Hills stood at 260; in the late 1960s it reached 350. In the late 1980s it was 717, and in 1990 it was 672. The community probably functions mainly as a suburb of Fort Worth. As of 2000, Westover Hills was the wealthiest location in Texas by per capita income. The population in 2000 was 658.

City Point-Of-Contact

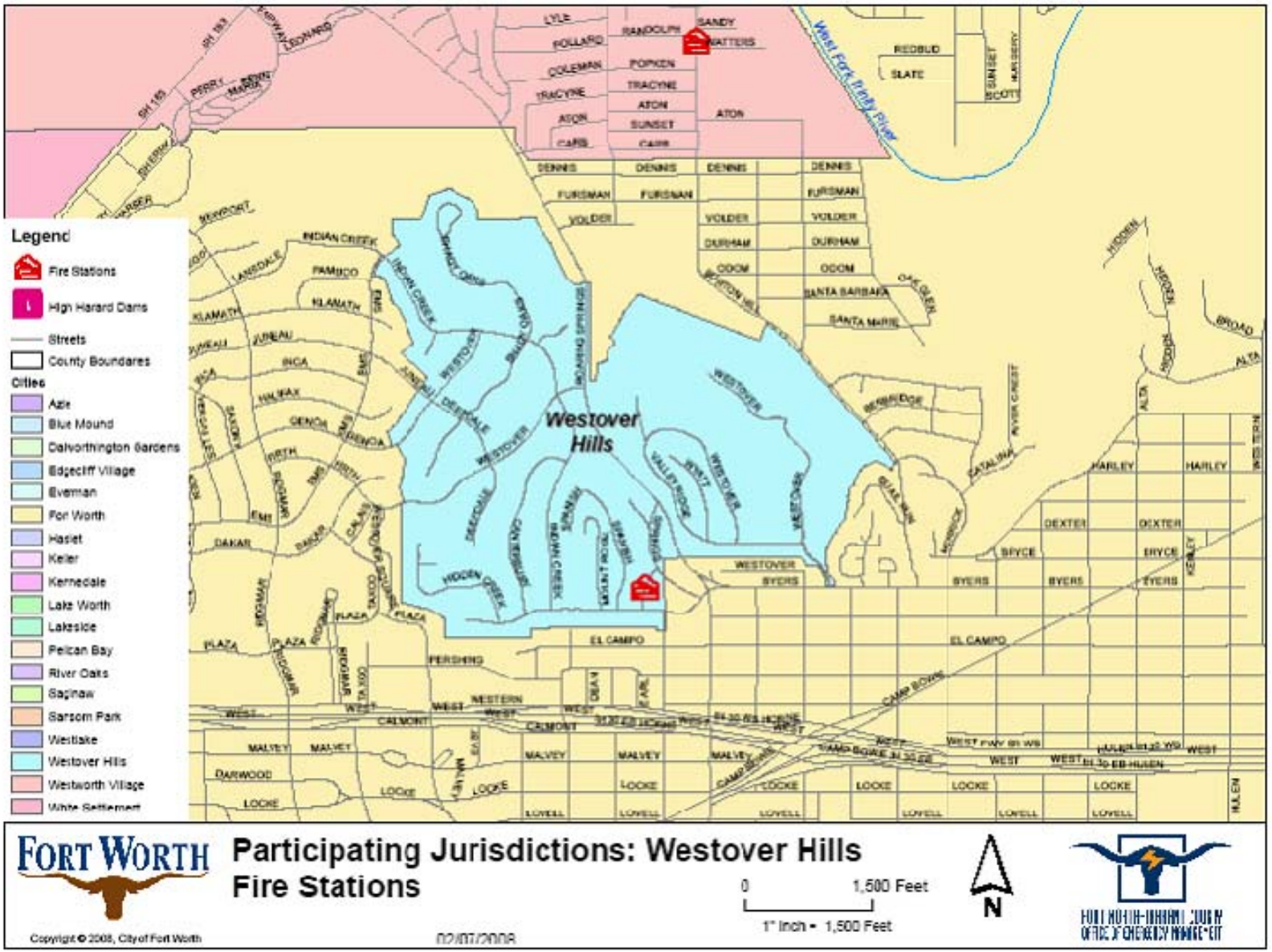
Jim Rutledge - Police Chief, City Administrator, Flood Plain Administrator

Land Use and Development Trends

Westover Hills has 277 homes and no commercial buildings other than City facilities. Westover Hills is essentially built-out.

Jurisdiction Unique Hazards

Hazards Specific to Westover Hills are discussed below.


Legend
Fire Stations
High Harard Dams
Streets
County Boundaries
Cities
Azle
Blue Mound
Dalworthington Gardens
Edgecliff Village
Everman
Fort Worth
Haslet
Keller
Kennedale
Lake Worth
Lakeside
Pelican Bay
River Oaks
Saginaw
Sansom Park
Westlake
Westover Hills
Westworth Village
White Settlement
Westover Hills
West Fork Trinity River
FORT WORTH
Participating Jurisdictions: Westover Hills
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1,500 Feet
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Copyright © 2008, City of Fort Worth
02/07/2008

**DAM FAILURE**

No Vulnerability – There are no high hazard dams located in Westover Hills and none that would affect Westover Hills if they failed. Based on the lack of vulnerability, dam failure will receive no further consideration in this plan for Westover Hills.

**DROUGHT**

Moderate Vulnerability – Westover Hills purchases water from Fort Worth who purchases water from the Tarrant Regional Water District (TRWD). TRWD water supply comes from three reservoirs on the West Fork of the Trinity River in northwest Tarrant County and from two reservoirs located well southeast of Tarrant County. These diverse supply locations help mitigate the effects of a local drought. An additional reservoir location well northeast of Tarrant County is being pursued. There has been some preliminary discussion of constructing a pipeline to carry water from southern Oklahoma. TRWD is installing pipelines to interconnect area water supply lakes with water treatment plants in order to provide maximum flexibility in water supply and treatment.

Location – Drought can affect all of Westover Hills.

Current Extent – As of February 2008, Westover Hills was at DO – Abnormally Dry on the Palmer Drought Severity Index.

Previous Occurrences – National Climatic Data Center records indicate that in the past ten years there have been three periods of drought in Westover Hills, 1996 - 1998, 2000, and 2005 - 2006.

Probability of Future Events – Droughts are certain to occur again in Westover Hills. Significant droughts significantly affecting water supply and resulting in mandatory restrictions traditionally occur on a twenty year cycle. Based on the previously cited National Climatic Data Center recent records, we can anticipate that drought conditions will occur approximately every three years.

Impact – Drought can lead to loss of water for basic needs such as drinking and fire-fighting. Droughts are associated with increased wildfire and damage from expansive soils. More common impacts are damage to landscaping and reduced recreation due to low lake levels.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westover Hills Drought Mitigation Action #1** | Participate in the design and implementation of the Tarrant County specific water conservation public education efforts to compliment existing programs. |
| **Mitigation Goal/Objective** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |

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|---|---|
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • City Funds<br>• Water Suppliers |
| **Responsible Agency** | • Westover Hills Administration/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One year |
| **Effect on New Buildings** | This action will publicize water conservation efforts that can be incorporated into new construction. |
| **Effect on Existing Buildings** | This action will publicize water conservation efforts that can be incorporated into existing construction. |
| **Cost Effectiveness** | Cost Effective – Public education programs can provide significant results for relatively low costs. |
| **Discussion:** Most cities in the area have existing water conservation programs designed to educate the public and businesses on ways to conserve water. This action will develop a Tarrant County specific program that will compliment existing programs. Jurisdictional public education efforts have been very successful in attracting the attention of local citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westover Hills Drought Mitigation Action #2** | 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. Impacts identified in this plan will be included in updates to the Hazard Mitigation Action Plan. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $2,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • City Funds<br>• Water Suppliers |
| **Responsible Agency** | • Westover Hills Administration/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |

| | |
|---|---|
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will identify drought impacts in Westover Hills thus providing specific information for builders of new structures to incorporate drought mitigation into the structures. |
| **Effect on Existing Buildings** | This action will identify drought impacts in Westover Hills thus providing specific information for owners of existing structures to incorporate drought mitigation into the structures. |
| **Cost Effectiveness** | Cost Effective – This planning effort will have a low cost with the potential for significant benefits for the entire community. |
| **Discussion:** This planning effort will focus attention on the effects of drought on the community. Specific drought effects will be identified and efforts can be made to mitigate those effects. | |

**EXPANSIVE SOILS**

Low Vulnerability - Expansive soils have caused damage to some structures in Westover Hills. However, damage has been limited to relatively small geographic areas and there are no reports of significant damage to commercial structures or infrastructure.

Location – Expansive soils are found in various areas of Westover Hills. We could not locate a map of expansive soils in Westover Hills.

Extent – The extent of expansive soils in Westover Hills is believed to be Very Low (0% - 20%) to Low (21% - 50%).

Previous Occurrences – We could find no empirical data on previous occurrences of damage from expansive soils, but it is believed that expansive soils have caused problems since the first buildings were constructed in this area.

Probability of Future Events – Due to the variability of soil types and construction quality, it is very difficult to predict future occurrences of problems with expansive soils. However, a study published in the fall 2003 issue of *Environmental Geology* cited in the September 19, 2003 *Dallas Business Journal* indicates that many new developments in the Metroplex are being built on soil that is more unstable than soils built on prior to 1990. This could lead to a higher incidence of expansive soil related damage in the future.

Impact – The impact of expansive soils ranges from cosmetic cracks in walls to substantial foundation and structural damage that can result in the need to demolish the building. Infrastructure such as pipelines can be damaged causing increased maintenance and repairs, damaged beyond repair requiring replacement, damaged to the point of failure.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westover Hills Expansive Soils Mitigation Action #1** | Improve construction techniques through building code enhancements. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined (Minimal – Staff Time Only) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building permit fees |
| **Potential Matching Funding Sources** | • City Funds<br>• Building permit fees |
| **Responsible Agency** | Westover Hills Building Official |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will make new buildings more resistant to damage from expansive soils. |
| **Effect on Existing Buildings** | This action will require modifications to existing buildings to be more resistant to damage from expansive soils. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will improve construction quality and reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westover Hills Expansive Soils Mitigation Action #2** | Educate construction contractors, home owners, and business owners about mitigation techniques. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building Permit Fees |
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | • Westover Hills Building Official<br>• Westover Hills Administration/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One Year |

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| **Effect on New Buildings** | This action will provide builders of new construction with expansive soil mitigation techniques that will reduce damage. |
| **Effect on Existing Buildings** | This action will provide owners of existing buildings with expansive soil mitigation techniques that will reduce damage. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will provide construction contractors and home/business owners with techniques designed to reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**EXTREME HEAT**

High Vulnerability - Summer heat and humidity can occur anytime from May through October. Community health services actively work with at risk populations to prevent heat related deaths and injuries. The elderly, very young people and people with poor health are most at risk from summer heat. People who work outside or in un-air-conditioned buildings are also at high risk to the direct effects of summer heat. Summer heat can also lead to electrical service outages if equipment fails or demand exceeds available supply. Most public safety and special facilities are equipped with emergency generators.

Location - Throughout the City.

Extent - Summer temperatures can reach as high as 113 degrees. Westover Hills is also subject to high humidity.

Previous Occurrences - This is an annual occurrence. The summer of 1980 was a record year with 69 consecutive days of temperatures of 100 degrees or more. We were unable to find a reliable record of deaths or injuries related to heat.

Probability of Future Events - Hot summer temperatures are certain to continue to occur in Westover Hills.

Impact - Summer heat can cause widespread electrical outages resulting in dangerous conditions, especially for at-risk populations. Occasionally "cooling centers" are opened at community centers to provide a safe place for citizens to seek refuge from the heat. Extreme heat can have economic impacts if construction work is curtailed or outdoor special events are cancelled.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westover Hills Extreme Heat Mitigation Action #1** | Determine feasibility of expanding monitoring of populations at risk from extreme heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |

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| **Priority** | Medium |
| **Estimated Cost** | Undetermined. Staff time and GIS resources |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Other State or Federal Public Health Grants |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Tarrant County Public Health<br>• Westover Hills Administration/Emergency Management |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | None - This action is intended to expand monitoring of people only. |
| **Effect on Existing Buildings** | None - This action is intended to expand monitoring of people only. |
| **Cost Effectiveness** | Pending, but believed to be Cost Effective |
| **Discussion:** This action would determine the feasibility of expanding monitoring of populations at risk from extreme heat. Existing at risk population monitoring programs will be reviewed to ensure all known populations at risk from extreme heat are included. Any newly discovered at risk populations will be evaluated for inclusion in existing monitoring programs. Tarrant County Public Health provides public health services throughout the County. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westover Hills Extreme Heat Mitigation Action #2** | Increase public education programs on the dangers of excessive heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness |
| **Priority** | Medium |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Other State or Federal Public Health Grants |
| **Responsible Agency** | • Westover Hills Administration/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Effect on Existing Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits. |

**Discussion:** Public education on severe weather in Westover Hills has traditionally focused on severe thunderstorms and associated hazards (tornadoes, lighting, flooding, high winds). This action would expand public education to include hazards from extreme heat.

**FLOOD**

High Vulnerability - The topography of Westover Hills combined with the frequency of severe thunderstorms results in frequent flash flood events. FEMA records indicate only 39 Repetitive Loss Properties in all of Tarrant County. However, this is probably more a reflection of the low number of flood insurance polices than vulnerability to flooding. Further analysis using GIS and field verification can specifically identify vulnerable structures.

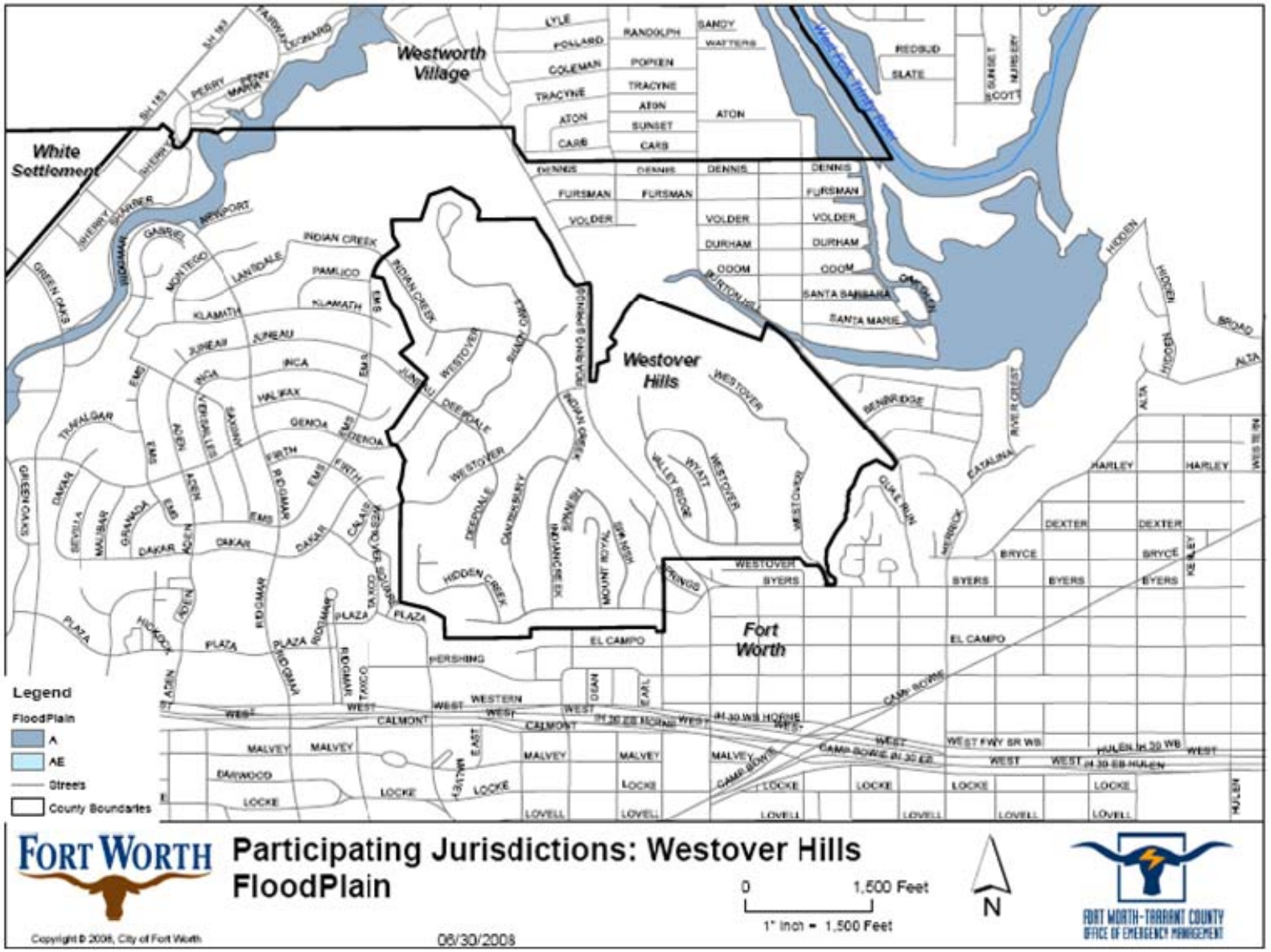
Location - Throughout the City along creeks and drainage structures. Indian Creek at the intersection of Westover Hills Road and Roaring Springs Road is prone to flooding during heavy rain events.

Extent - Flash floods are the most common type of flooding in Westover Hills which tend to occur and recede very quickly.

Previous Occurrences - Minor flooding occurs frequently, especially during the spring and early summer. In June of 2004 significant flooding occurred on Indian Creek at Westover Hills Road resulting in damage to the roadway and drainage structure.

Probability of Future Events – Based on previous experience Westover Hills is certain to suffer flash flood events every year. National Weather Service records indicate an average of 11 flash flood events per year in Tarrant County. Continued development throughout the County and the resulting increase in impervious cover will increase the likelihood and severity of flooding.

Impact - Flash floods kill more people than any other hazard associated with thunderstorms. Property damage from flash flooding is seldom covered by insurance, which makes it very difficult for citizens to recover from the flood. Due to the very rapid rate of development and growth throughout Tarrant County we are experiencing problems with determining actual building footprints within flood plains and will be using planimetric GIS data from the NCTCOG to resolve this issue when it becomes available. At that time we will be able to accurately identify the number and types of buildings vulnerable to flooding; as well as access other data associated with those locations such as appraised value, census data, and owner information.


Westworth Village
White Settlement
Westover Hills
Fort Worth
Legend
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County Boundaries
FORT WORTH
Participating Jurisdictions: Westover Hills
FloodPlain
0
1,500 Feet
1" Inch = 1,500 Feet
N
FORT WORTH-TARRANT COUNTY
OFFICE OF EMERGENCY MANAGEMENT
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06/30/2008

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westover Hills Flood Mitigation Project #1** | Participate in the development of the Tarrant County specific "Flood Preparedness" brochure. |
| **Hazard Addressed** | Flooding |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of Flood events.<br>1. c. Develop effective flood mitigation public education materials. |
| **Priority** | High |
| **Estimated Cost** | Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Private Foundation Grants |
| **Responsible Agency** | • Westover Hills Administration/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This action will provide flood mitigation techniques for owners of new buildings. |
| **Effect on Existing Buildings** | This action will provide flood mitigation techniques for owners of existing buildings. |
| **Cost Effectiveness** | Cost Effective - This project will provide valuable information to the public in a relatively short time and with relatively low costs. It will also have the added benefit of increasing public awareness of mitigation. The estimated cost could easily be offset by reduced losses to the public in a single small flood event. |

**Discussion**: Develop Tarrant County specific "Flood Preparedness" brochure. Once developed, the brochure will be distributed County-Wide. Historically flood prone areas will be targeted for door-to-door distribution and neighborhood meetings to present the brochure and solicit input for *Fort Worth Hazard Mitigation Action Plan* revisions.

The brochure will include:

- Description of Tarrant County flood hazards
- "Case Studies" of previous flood events in Tarrant County
- Preparedness and "self-help" mitigation information
- Benefits of city participation in NFIP
- Advantages of flood insurance
- Risks of not having flood insurance
- Warnings that typical homeowner's insurance does not cover rising water
- Solicit input for the *Fort Worth Hazard Mitigation Action Plan*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westover Hills Flood Mitigation Action #2** | Conduct a city wide drainage study focusing on Indian Creek. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined pending engineering analysis |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Westover Hills Administration/Emergency Management<br>• Westover Hills Public Works |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will provide guidance for locating new buildings away from flood prone areas near Indian Creek. |
| **Effect on Existing Buildings** | This action will provide guidance for protection of existing buildings from flooding on Indian Creek. |
| **Cost Effectiveness** | Cost Effective – This project will provide guidance to reduce the hazard to life and property from flooding. |
| **Discussion:** This action will develop a city-wide study of flooding focusing on Indian Creek and provide findings that can reduce the adverse effects of flooding on the creek. | |

**HAILSTORM**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of large hail are a hazard event in Westover Hills. Tarrant County averages eleven significant thunderstorm events (large hail, high winds) per year according to National Weather Service records. Most structures in Westover Hills can resist the effects of all but the most severe hailstorms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to hailstorms. Vehicles have proven to be vulnerable to hailstorms with widespread severe vehicle damage reported in 1980 and 1995.

Location - Throughout the City.

Extent - Westover Hills is subject to the hazards of severe thunderstorms, including large hail. Hail stones up to the size of grapefruit (H9 on the Combined NOAA/TORRO Hailstorm Intensity Scales) have been reported in Tarrant County.

Previous Occurrences – There are no reports of significant hailstorm events in Westover Hills other than the 1980 and 1995 county-wide events.

Probability of Future Events - Thunderstorms with hail are certain to continue to occur in Westover Hills. Hail falls on about two or three days per year, ordinarily with only slight and scattered damage (*National Weather Service*).

Impact – The impact from hailstorms can be significant in extreme events such as the hailstorms of 1980 and 1995. Thousands of homes and vehicles can be damaged in a single storm with millions of dollars in damages. Vehicles are especially impacted by large hails with windshields being the vulnerable part. A recurring problem following hailstorms is broken windshields in vehicles belonging to populations who do not have vehicle insurance and cannot afford the replacements costs, resulting in the owners having difficulty traveling to work, medical appointments, etc.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westover Hills Hailstorm Mitigation Action #1** | Develop a public education campaign to encourage "hail resistant" roofing in new construction and roof replacements. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• Building/Permit Fees<br>• City Funds |
| **Responsible Agency** | • Westover Hills Administration/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will potentially decrease the damage caused by most hailstorms to new buildings. |
| **Effect on Existing Buildings** | This action will potentially decrease the damage caused by most hailstorms to existing buildings. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing hailstorm damage. One long term benefit will be reduced property insurance as claims related to hail damage are reduced. |
| **Discussion**: Public education has proven to be a low cost effective means to achieve changes public behavior. Encouraging hail resistant roofing can benefit citizens through reduced damage, business through reduced damage to their buildings and reduced claims against insurance companies, and government through reduced request for assistance. This campaign can be developed in conjunction with the Tarrant County effort. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westover Hills Hailstorm Mitigation Action #2** | Evaluate City buildings to determine feasibility of installing hail resistant roofing and window coverings with a focus on critical infrastructure. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• City Funds |
| **Responsible Agency** | • Westover Hills Administration/Emergency Management<br>• Westover Hills Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on new City buildings. |
| **Effect on Existing Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on existing City buildings. |
| **Cost Effectiveness** | Cost Effective – Although currently undetermined, this project is believed to be cost effective. |
| **Discussion:** Installing hail resistant roofing and window coverings on City buildings could prevent or limit damage to City buildings thus avoiding costs to the City as well as preventing or limiting loss of use of damaged facilities. | |

**HIGH WINDS**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of high winds are a hazard in Westover Hills. Tarrant County averages ten reported significant thunderstorm events (large hail, high winds) per year. In addition, strong weather fronts can sometimes be accompanied by high winds which occasionally cause damage. Most structures in Westover Hills can resist the effects of all but the most severe high wind events. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to high winds.

Location - Throughout the City.

Extent - Severe thunderstorms with high winds with speeds in excess of 90 mph have been reported in Westover Hills.

Previous Occurrences – In 2003 high winds caused an electrical service outage that left some homes without power for as long as two days.

Probability of Future Events – Based on previous experience Westover Hills can expect to experience an average of ten significant thunderstorm events with high winds per year.

Impact – Records on high wind events are difficult to separate from severe thunderstorm records. High winds in Westover Hills typically cause little damage to commercial buildings. More often high winds cause damage to roofs, trees, and signs.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westover Hills High Winds Mitigation Action #1** | Enact enhanced building codes to reduce damages from high winds. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined – Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Westover Hills Building Official |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will potentially identify a means to reduce high wind damage on new buildings. |
| **Effect on Existing Buildings** | This action will potentially identify a means to reduce high wind damage on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Although costs are undetermined, this action is believed to be cost effective since the action will require staff time only. |
| **Discussion:** Enhanced building codes will reduce damages from high wind events. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westover Hills High Winds Mitigation Action #2** | Educate builders and residents about mitigating wind damage. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |

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| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |
| **Responsible Agency** | • Westover Hills Building Official<br>• Westover Hills Administration/Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on new buildings. |
| **Effect on Existing Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost of developing and providing high wind mitigation compared with savings to the community make this action cost effective. |
| **Discussion:** Public education has proven to be a low cost and effective means to achieve changes public behavior. High winds have not been a focus of severe weather preparedness. | |

**LANDSLIDES**

No Vulnerability - Although there is some relatively steep terrain in portions of Westover Hills, the relief is associated with rocky outcrops and not susceptible to landslides. There is no history of landslides in Westover Hills. Based on the lack of vulnerability, landslides will receive no further consideration in this plan for Westover Hills. However, landslide hazards will be reviewed during the annual review of this plan and we will continue looking for areas with landslide potential during hazard surveys.

**LEVEE FAILURE**

No Vulnerability – There are no levees or areas that would be affected by levee failure in Westover Hills. Based on the lack of vulnerability, levee failure will receive no further consideration in this plan for Westover Hills.

**LIGHTNING**

Moderate Vulnerability – Lightning is one of the most common hazards in Westover Hills. Thunderstorms (and by definition, lightning) occur an average of 30 – 50 days per year (*Oklahoma Climatological Survey*). Lightning is the second most common cause of weather-related deaths in Texas (*National Weather Service*). Lightning information is available only for Tarrant County on a county-wide basis.

Location – Throughout the City.

Extent – We could find no references to the average number of strikes per storm in Westover Hills. However, lightning is by definition associated with thunderstorms.

Previous Occurrences – Westover Hills experiences 30 – 50 thunderstorm days per year. From 1995 – 2004 one person was killed and five were injured by lightning in Tarrant

County (*National Weather Service*). Throughout Texas 34 people were killed by lightning, there were 184 injuries, and an estimated 23 million dollars in damages due to lightning from 1995 - 2004 (*National Weather Service*).

Probability of Future Events – Based on past experience Westover Hills will experience 30 – 50 thunderstorm days each year. Some days will have more than one thunderstorm during a given thunderstorm day.

Impact – Although lightning is the second most common cause of storm related deaths in Texas, lightning deaths remain relatively rare. Lightning does cause property damage several times per year (we could not find statistical data to validate this observation).

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westover Hills Lightning Mitigation Action #1** | Provide lightning mitigation materials with building permit packets. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Westover Hills Building Official |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will provide materials that will reduce the vulnerability of new buildings to lightning. |
| **Effect on Existing Buildings** | This action will provide materials that will reduce the vulnerability of existing buildings that are being remodeled to lightning. |
| **Cost Effectiveness** | Cost Effective – The low cost of this project would be offset by eliminating just one lightning caused building loss. |
| **Discussion:** Lightning mitigation materials will be included in all building permit packets distributed to builders or citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westover Hills Lightning Mitigation Action #2** | Ensure all City critical infrastructure has adequate lightning mitigation in place and upgrade protection as necessary. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |

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| **Estimated Cost** | $2,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Westover Hills Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will ensure new City buildings that house critical infrastructure have adequate lightning mitigation. |
| **Effect on Existing Buildings** | This action will ensure existing critical infrastructure has adequate lightning mitigation. |
| **Cost Effectiveness** | Cost Effective – The destructive and sometimes capricious nature of lighting warrant the expense of this action compared with the benefits of avoiding damage to critical infrastructure. |
| **Discussion:** Review and confirmation of the adequacy of lightning protection systems in City buildings housing critical infrastructure is worthwhile considering the number of thunderstorms experienced in Westover Hills. | |

**SEVERE THUNDERSTORM**

High Vulnerability - Severe thunderstorms are the most common hazard in Westover Hills. From 1950 through August 2007 Tarrant County averaged eleven reported severe thunderstorm events county-wide per year. Most structures in Westover Hills can resist the effects of all but the most severe thunderstorms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to thunderstorms.

Location - Throughout the City.

Extent - Westover Hills is subject to the hazards of severe thunderstorms of all magnitudes.

Previous Occurrences – In 1997 A severe thunderstorm caused extensive hail damage to structures and damaged many trees.

Probability of Future Events – Severe thunderstorms will occur in Westover Hills an average of eleven times per year.

Impact – A single severe thunderstorm can cause damage from hail, high winds, lightning, and/or tornadoes to thousands of structures.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westover Hills Severe Thunderstorm Mitigation Project #1** | Conduct technical assessment to determine the feasibility of structurally hardening the Westover Hills City Hall against severe weather. |
| **Hazard Addressed** | Tornado/Severe Thunderstorm |
| **Mitigation Goal/Objective** | 2. Reduce loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | High |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • Private Foundation Grants<br>• Other State or Federal Grants<br>• City Funds |
| **Responsible Agency** | Westover Hills Building Official |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This project will determine the feasibility of structurally hardening the Westover Hills City Hall against severe weather. |
| **Effect on Existing Buildings** | This project will determine the feasibility of structurally hardening the Westover Hills City Hall against severe weather. |
| **Cost Effectiveness** | Cost Effective - This project will provide the basis for a realistic cost benefit analysis of the feasibility of hardening the Westover Hills City Hall against severe weather events. The relatively low cost of this project compared with the potential benefits of protecting the city's ability to respond against the jurisdiction's most likely hazard event result in a favorable cost benefit review. |

**Discussion:**

This project will provide for determining the feasibility of hardening the city's only fire station against severe weather. This project will contribute to protecting emergency response equipment so that it will be available to assist the citizens of Westover Hills City Hall in responding to and recovering from severe weather or other events. Final project details will be developed in accordance with grant requirements at the time the project is funded.

The cost estimate is a conservative "best guess" based on a structural analysis of the existing fire station. That analysis would require:

- Structural analysis of the building by a Structural Engineer
- Analysis of electrical systems
- Analysis of HVAC systems
- Review of building codes

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westover Hills Severe Thunderstorm Mitigation Action #2** | Encourage builders to install storm resistant construction such as "hurricane clips". |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | High |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |
| **Responsible Agency** | Westover Hills Building Official |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will encourage storm resistant construction in new buildings. |
| **Effect on Existing Buildings** | This action will encourage storm resistant construction in existing buildings as they are remodeled. |
| **Cost Effectiveness** | Cost Effective – The low cost of this action will be offset by a reduction in damage from severe thunderstorms. |
| **Discussion:** Effective education on storm resistant construction can reduce damage from severe thunderstorms. Insurance companies may be willing to fund or provide educational materials and/or provide discounts to persons who install storm resistant devices. | |

**SEVERE WINTER STORMS**

Moderate Vulnerability - Since 2000 the National Weather Service has reported 14 Winter Storm/Ice events. Winter storms in Westover Hills usually consist of short-lived icing events (ice on the roads for a few hours) that primarily affect traffic and cause numerous motor vehicle accidents. Occasionally an ice storm will cause widespread power outages for as long as several days. ONCOR Electric Delivery has an aggressive tree trimming program. Most structures in Westover Hills can resist the effects of all but the most severe winter storms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to winter storms. Electrical service outages are usually the most serious threat in this area. Most public safety and special facilities are equipped with generators.

Location - Throughout the City.

Extent - Severe ice storms have resulted in accumulations in excess of two inches. Most storms leave only a light coating or glaze of ice.

Previous Occurrences – Severe Winter Storms are typically regional events. Westover Hills averaged two winter storms per year since 2000. Most winter storms resulting only minor inconveniences and a few motor vehicle accidents.

In 1978 up to an inch of ice coated area trees and roadways causing $14 million in damages region-wide and making travel almost impossible for two days.

In 1996 a winter storm dropped two to four inches of a mixture of sleet, freezing rain, and snow in Westover Hills over Thanksgiving weekend causing many motor vehicle accidents and some electrical service outages.

In 2003 a winter storm dropped one inch of sleet across Westover Hills resulting in numerous motor vehicle accidents and closing schools for two days.

Probability of Future Events - Westover Hills can expect to experience two winter storms per year with a severe winter storm once each ten years.

Impact - Winter storms can cause widespread electrical and telephone service outages, make travel dangerous or impossible, and damage structures. Deaths and injuries due to vehicle accidents and slips/falls are common during ice storms. Occasional deaths and injuries from carbon monoxide poisoning due to improper heating have occurred. Economic losses due to lost production can be significant. Damage from frozen pipes can lead to significant expenses for homeowners.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Westover Hills Severe Winter Storm Mitigation Action #1** | Increase public education concerning winter storm preparedness and mitigation. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | Medium |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Westover Hills Administration/Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into new buildings. |
| **Effect on Existing Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost is effective when compared to benefits provided to citizens. |

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|---|
| **Discussion:** Winter weather preparedness has not been emphasized in Westover Hills as much as severe thunderstorms. This action will provide preparedness information to citizens during the fall. |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Westover Hills Severe Winter Storm Mitigation Action #2** | Purchase additional street sanding capacity |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Westover Hills Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will have no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Sanding streets is essential to allow emergency vehicles to respond during severe winter events. |
| **Discussion:** Sanding equipment can be mounted on existing equipment to provide sanding capabilities. During severe winter weather events streets around hospitals, fire stations and other critical facilities are sanded along with major intersections and roadways. Additional sanding capacity would allow for quicker sanding of these areas and for more repeat sanding during prolonged winter weather events. This will improve public safety by facilitating emergency response as well as reducing motor vehicle accidents. | |

**STREAM BANK EROSION**

Moderate Vulnerability - Flash floods along Indian Creek can cause stream bank erosion.

Location - Along Indian Creek through the north-central portions of the City.

Extent - Stream bank erosion along Indian could cause severe damage to homes and has caused significant damage to a road way. Erosion along Indian Creek has washed away several feet of bank during a single flash flood event.

Previous Occurrences - Minor flooding associated erosion occurs frequently, especially during the spring and early summer. In June of 2004 flooding on Indian Creek caused significant bank erosion.

Probability of Future Events – Westover Hills is certain to experience stream bank erosion in the future. Continued development and the resulting impervious cover will

increase the likelihood and severity of flooding and associated erosion. It is likely that flooding will cause some damage in the next five years.

Vulnerability - Some homes, businesses, and roadways are vulnerable to stream bank erosion. Most buildings are a safe distance from the current path of the creek. Further analysis using GIS and field verification can specifically identify vulnerable structures.

Impact - Extreme stream bank erosion could destroy homes, businesses, and/or roadways. Roadway damage can restrict access for home/business owners and cause minor to major inconveniences to for drivers.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westover Hills Stream Bank Erosion Mitigation Action #1** | Conduct study to evaluate the adequacy of the drainage structure at the intersection of Westover Hills Road and Roaring Springs Road and implement findings. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |
| **Priority** | Medium |
| **Estimated Cost** | $30,000 for Study |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Westover Hills Public Works |
| **Estimated Completion Time Frame** | 3 years |
| **Effect on New Buildings** | This action will not affect new buildings |
| **Effect on Existing Buildings** | This action may affect existing buildings if significant construction is required. |
| **Cost Effectiveness** | Cost Effective – The action will reduce the adverse effects of flooding. |
| **Discussion:** This intersection has been the site of several flood events, including one which damaged the roadway. The study will evaluate the drainage structure with future upstream development and increased traffic flow in mind. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westover Hills Stream Bank Erosion Mitigation Action #2** | Determine and implement expedient erosion control techniques along Indian Creek. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |

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| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Westover Hills Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will not have an effect on new buildings. |
| **Effect on Existing Buildings** | This action will protect existing buildings along Indian Creek. |
| **Cost Effectiveness** | Cost Effective – Although the final project cost is undetermined, it is believed the action will be cost effective. |
| **Discussion:** This action will review erosion control techniques and implement the most effective technique for controlling erosion along Indian Creek pending an in-depth study of the creek. | |

**TORNADO**

High Vulnerability – All structures in Westover Hills are vulnerable to tornadoes. Very few structures can withstand the effects of an F5 tornado. However, the March 28, 2000 F3 tornado that struck Fort Worth provided good evidence that well built structures can protect people who take appropriate shelter inside those buildings.

Location - Tornadoes can occur anywhere in Westover Hills.

Extent - Westover Hills is subject to tornadoes of all magnitudes, including F5 tornadoes.

Previous Occurrences – We found no reports of tornados causing damage in Westover Hills. However, Tarrant County has an average of one tornado reported per year county-wide (Source: National Climatic Data Center). In 2007 there were eight tornadoes reported by storm spotters county-wide. Four of those tornados caused damage, all within incorporated areas. Since 2000 tornadoes have caused damage in Arlington, Benbrook, Euless, Everman, Fort Worth, Grand Prairie, Haltom City, Mansfield, North Richland Hills, and River Oaks.

Probability of Future Events - Tarrant County has averaged one reported tornado per year and can expect that average to continue. Westover Hills, based on its relatively small size, will likely experience tornados very infrequently.

Impact - Tornadoes can cause deaths, injuries and property damage/destruction. Special facilities such as hospitals, fire stations, and utilities can be damaged or destroyed. Citizens who live in neighborhoods struck by tornadoes can experience disruption of their life styles and traditions. Areas struck by tornadoes can experience increased demand for mental health services as people deal with grief and stress.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Westover Hills Tornado Mitigation Project #1** | Assist citizens with funding for building tornado safe rooms or in-ground shelters. |

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| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction |
| **Priority** | High |
| **Estimated Cost** | $80,000 (20 Safe Rooms at $4,000 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Community Development Block Grant Funds |
| **Potential Matching Funding Sources** | Home/Building Owner |
| **Responsible Agency** | • Westover Hills Administration/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This project will encourage new buildings to be constructed with tornado safe rooms as part of the construction process. The safe room will enhance the overall storm resistance of the building. |
| **Effect on Existing Buildings** | This project will encourage homeowners to construct/install tornado safe rooms in their existing homes. A safe room will enhance the overall storm resistance of the building. |
| **Cost Effectiveness** | Cost Effective - Safe rooms and in-ground shelters have been proven to reduce deaths and injuries during tornadoes and severe thunderstorms. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of safe rooms and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

**Discussion:**
This project will reimburse costs associated with tornado safe room or in-ground shelter installation in new or existing homes. Safe rooms provide increased protection for citizens during severe thunderstorms and tornados. Safe rooms have been proven to save lives and reduce injuries from severe weather events. FEMA publication 320 (*Taking Shelter from the Storm, Building a Safe Room Inside Your House*) provides the standards for safe rooms. As stated on the FEMA website: Although a *"residence may be built "to code," that does not mean it can withstand winds from extreme events such as tornadoes and major hurricanes. The purpose of a safe room or a wind shelter is to provide a space where you and your family can seek refuge that provides a high level of protection. To protect its occupants, a safe room must be built to withstand high winds and flying debris, even if the rest of the residence is severely damaged or destroyed."*

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to home owners will be for no more than $3,000 or 75% of cost, whichever is less
- Eligibility will be limited to individuals who own their home at the time of application
- The safe room or in-ground shelter must be constructed/installed in the primary residence of the applicant
- Each eligible homeowner can only receive one reimbursement, regardless of the number of shelters he/she may purchase/install
- In-ground shelters must meet requirements established in the National Performance Criteria for Tornado Shelters dated May 28, 1999.
- Safe Rooms must meet the requirements of FEMA Publication 320
- Safe Rooms and shelters must meet all applicable city and/or county codes
- Previously owned or used shelters will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Westover Hills Tornado Mitigation Project #2** | Assist citizens with funding for purchase of Weather Alert Radios |
| **Mitigation Goal/Objective** | 4. Increase the effectiveness of warning systems in Tarrant County.<br>4. a. Increase the number of homes and businesses with Weather Alert Radios. |
| **Priority** | High |
| **Estimated Cost** | $2,000 (50 Weather Alert Radios at $40 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Private Sector Donations<br>• City Funds |
| **Potential Matching Funding Sources** | Citizen/Business Owner |

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|---|---|
| **Responsible Agency** | • Westover Hills Administration/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings except for providing additional warning time of severe weather events thus allowing citizens more time to secure their home or business against approaching severe weather. |
| **Cost Effectiveness** | Cost Effective – Weather Alert Radios are a proven means to alert and warn citizens about severe weather and civil emergencies. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of Weather Alert Radios and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

***NOTE**: We are aware that Weather Alert Radios are on the "2007 Ineligible Planning Activities" list. It is our opinion that Weather Alert Radios should be considered eligible due to their very high benefit and very low cost.*

This project will reimburse 75% of the cost for citizens to purchase Weather Alert Radios, with the citizen responsible for the remaining 25%. Weather Alert Radios provide the best means for citizens to receive emergency alerts when they are indoors. Severe weather is the primary hazard in our area. Early alert and warning has proven to be a significant factor in saving lives during severe weather events.

In addition, the Weather Alert Radios can be activated for civil emergencies such as hazardous materials incidents. Effective warning saves lives, especially during severe weather events. Weather alert radios provide a proven means of indoor warning to citizens any time of the day or night and compose the vital indoor portion of our emergency warning system.

Warning systems have been shown to have value beyond the initial warning. Persons receiving warning relay the information to family and friends to ensure they are aware of the hazard. The secondary and tertiary warning can greatly amplify the effectiveness of the warning system.

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to citizens will be for no more than $30 or 75% of cost of the radio, whichever is less
- Eligibility will be limited to residents of Westover Hills
- The citizen must sign an agreement to keep the radio operational
- Each eligible homeowner can only receive one reimbursement, regardless of the number of radios purchased
- Previously purchased radios will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**WILDFIRE**

Low Vulnerability - Westover Hills has very little rural-urban interface that is subject to wildfires.

Location – Westover Hills is heavily wooded with large homes on large lots. The areas along Indian Creek are the most likely to experience wildfire.

Extent - The effects of wildfire are deaths, injuries, loss of structures, loss of wildlands, and loss of wildlife habitat.

Previous Occurrences – There are no reports of wildfires in Westover Hills.

Probability of Future Events – The probability of future events is low. It is difficult to predict in Westover Hills since there is no record of previous fires.

Vulnerability - Homes are most vulnerable to wildfires. The tendency to locate homes on tree covered lots and lack of fire breaks (such as parking lots around businesses) can enable fires to spread more easily to homes. Special facilities tend to be less vulnerable due to construction type (brick or metal).

Impact - Wildfires can result in the need for rapid evacuations, casualties, loss of homes and businesses, and loss of wildlife habitat and recreational areas.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westover Hills Wildfire Mitigation Action #1** | Increase public education on how to reduce the risks from wildfires (construction, landscaping, etc.) |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | High |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Westover Hills Administration/Emergency Management |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will reduce the effects of wildfire on new buildings through increased use of wildfire mitigation measures. |
| **Effect on Existing Buildings** | This action will reduce the effects of wildfire on existing buildings through increased use of wildfire mitigation measures. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing the effects of wildfire. |
| **Discussion:** Wildfire mitigation measures are not widely known in urban areas such as Tarrant County. This action will increase that knowledge and reduce casualties and damages from wildfires. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Westover Hills Wildfire Mitigation Action #2** | Enact building permit process that encourages wildfire resistant construction. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |

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|---|---|
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | Westover Hills Building Official |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will reduce the vulnerability of new structure to wildfire. |
| **Effect on Existing Buildings** | This action will reduce the vulnerability of existing buildings to wildfire if they are remodeled to the extent a building permit is required. |
| **Cost Effectiveness** | Cost Effective – This action will integrate wildfire mitigation into the building process at minimal cost. |
| **Discussion:** Integrating mitigation into building permitting provides a process to reduce vulnerability with few negative impacts. | |

**Existing Hazard Mitigation Efforts**
Stormwater creek channeling project completed May 30, 1995.

**Texas Standards That Exceed 44 CFR Requirements: Local Capability Assessments**
MAP 1
Projects funded under the following programs. Address the type of project that was funded. If you did not receive money from one of the below grants programs, then state that.
1.1: Hazard Mitigation Grant Program - None
1.2: Pre-Disaster Mitigation Grant Program - None
1.3: Project Impact - None
1.4: Hurricane-Property Protection Mitigation - None
1.5: Flood Mitigation Assistance - None
1.6: 406 Mitigation (through the Public Assistance Program) - None

MAP 2
Current Building Codes. Include the following information:
2.1: Date and type of code: 2006 International Building Code, Adopted January 2007
2.2: How is it being enforced? Plans submitted for review. Projects inspected on site.

MAP 3
Current Fire Codes. Include the following information:
3.1: Date and type of code: Uniform Fire Code
3.2: How is it being enforced?
- Plans are submitted for review
- Projects inspected on site
- Annual Fire Inspection

MAP 4

4.1: Any other codes, sub-division regulations, etc., that are in effect in your jurisdiction? No
4.2: How are they being enforced?

MAP 5
Floodplain Management. Include the following information:
5.1: Ordinance/Order Date: None
5.2: Do you have a Floodplain Administrator? None
5.3: Is the person a Certified Floodplain Manager (CFM)? None
5.4: Date of current floodplain maps. August 23, 2000
5.5: Any codes, regulations, etc. that prohibit development in the floodway and/or floodplain: None

MAP 6
Findings/results of Building Code Effectiveness Grading Report (BCEGS). Include date of report and score. Not applicable

MAP 7
Identify other plans that your jurisdiction has or have been done in your jurisdiction.
7.1: Capital Improvement Plans: Adopted 1996
7.2: Comprehensive Plans: None
7.3: Storm Water Management Plans: None
7.4: Master Drainage Plans: None
7.5: Corps of Engineers: None
7.6: Flood Mitigation Plan: None
7.7: Any other plans, studies, etc. that may have been done in your jurisdiction: None

# City of Westworth Village

Jurisdiction Profile
Westworth Village has an area of 1.9 square miles and a NCTCOG 2007 Population Estimate of 3000.

Westworth Village is on State Highway 183 four miles west of Fort Worth in western Tarrant County. In 1941 the Fort Worth Chamber of Commerce deeded to the federal government 1,450 acres to construct a plant to build B-24 bombers and a landing field, which would become Carswell Air Force Base. That year Westworth Village residents voted to incorporate their community, choosing an aldermanic form of government. The construction of the air base, which was activated by the army in 1942, became the catalyst for community development. Throughout the 1950s the number of residents at Westworth Village was 500. Beginning in the 1960s the population increased, reaching over 4,500 by 1970. Following the Vietnam war and a series of layoffs at General Dynamics, the population of Westworth Village decreased to 3,651 in the late 1980s. In 1990 the population was 2,350.

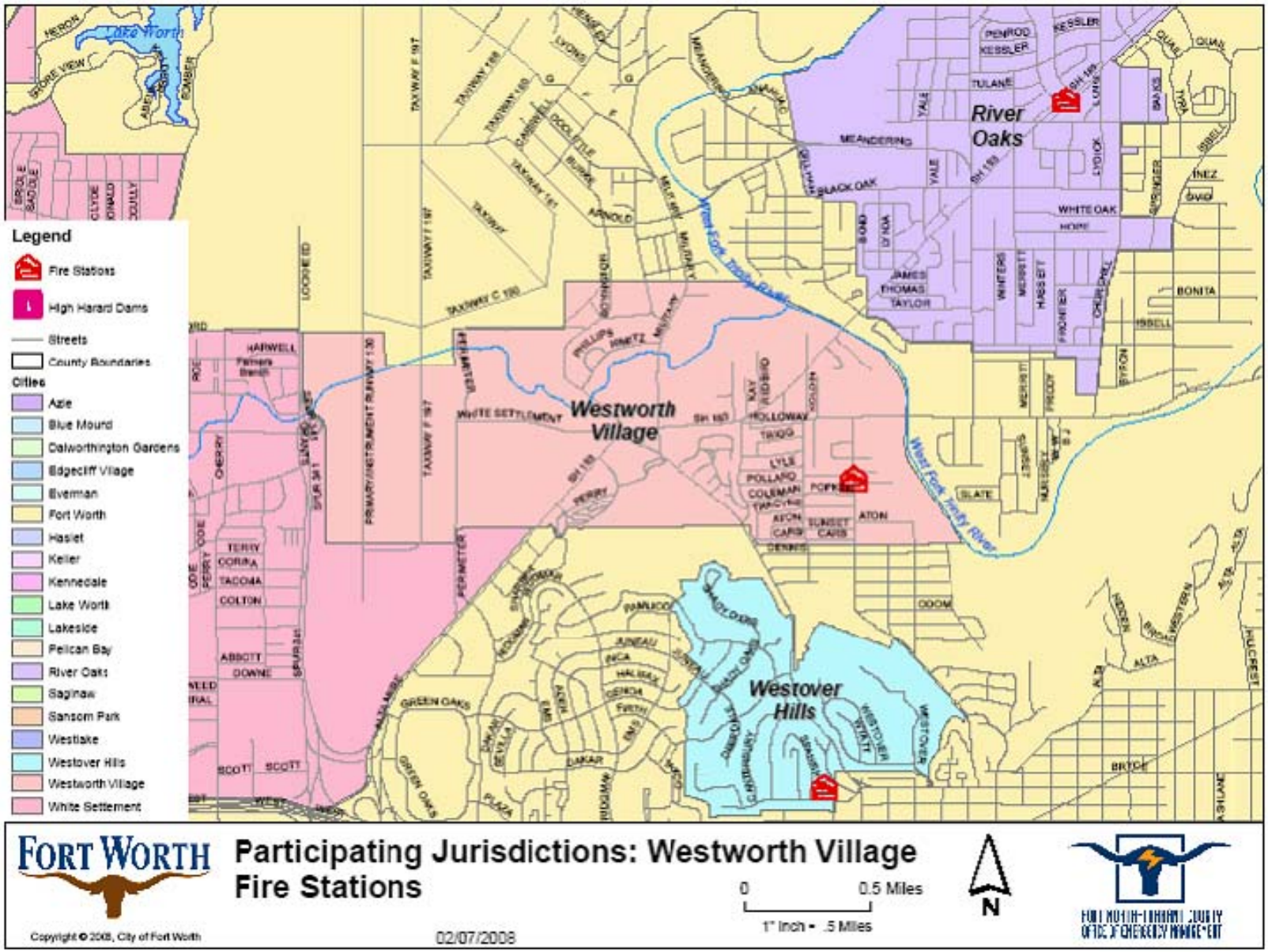
Following the transition of Carswell Air Force Base to the Naval Air Station Fort Worth in 1998, the City embarked upon an ambitious program to transform 400 acres of federal government property and 500 abandoned houses into a high quality, multi-use urban development. The project's design reflects attention to extensive greenbelts; placement separating residential neighborhoods from master planned commercial areas, and taking maximum advantage of its convenient location along Highway 183 and White Settlement Road. This bedroom community enjoys an exceptionally low crime rate and among the lowest ad valorem tax rates in Tarrant County. Westworth Village remains one of the most fiscally sound incorporated cities in the Metroplex.  Commercial development includes large power center retailers, as well as smaller boutique shops offering a wide range of specialty merchandise and services.

| 1990 | 2000 | 2006 | 2007 |
|---|---|---|---|
| 2,350 | 2,124 | 3,000 | 3,000 |
| 2007 Population Density (persons per square mile): 1,442.51 | | | |

City Point-Of-Contact
Tammy McGovney

Land Use and Development Trends
Westworth Village is transitioning from a predominantly bedroom community to a mixed commercial/residential city.  It is approximately 85% built-out.

Jurisdiction Unique Hazards
Hazards specific to Westworth Village are discussed below.


Legend
Fire Stations
High Hazard Dams
Streets
County Boundaries
Cities
Azle
Blue Mound
Dalworthington Gardens
Edgecliff Village
Everman
Fort Worth
Haslet
Keller
Kennedale
Lake Worth
Lakeside
Pelican Bay
River Oaks
Saginaw
Sansom Park
Westlake
Westover Hills
Westworth Village
White Settlement
Lake Worth
River Oaks
Westworth Village
Westover Hills
West Fork Trinity River
FORT WORTH
Participating Jurisdictions: Westworth Village
Fire Stations
0
0.5 Miles
1" Inch = .5 Miles
N
Copyright © 2008, City of Fort Worth
02/07/2008

**DAM FAILURE**

Undetermined Vulnerability –There are no high hazard dams in Westworth Village. The nearest upstream high hazard dam is Lake Worth Dam, approximately 1.5 miles from Westworth Village. Completion of inundation studies for all high-hazard dams in Tarrant County will determine whether Westworth Village is vulnerable to a failure of the Lake Worth Dam.

**DROUGHT**

Moderate Vulnerability – Westworth Village purchases water from Fort Worth who purchases water from the Tarrant Regional Water District (TRWD). TRWD water supply comes from three reservoirs on the West Fork of the Trinity River in northwest Tarrant County and from two reservoirs located well southeast of Tarrant County. These diverse supply locations help mitigate the effects of a local drought. An additional reservoir location well northeast of Tarrant County is being pursued. There has been some preliminary discussion of constructing a pipeline to carry water from southern Oklahoma. TRWD is installing pipelines to interconnect area water supply lakes with water treatment plants in order to provide maximum flexibility in water supply and treatment.

Location – Drought can affect all of Westworth Village.

Current Extent – As of February 2008, Westworth Village was at DO – Abnormally Dry on the Palmer Drought Severity Index.

Previous Occurrences – National Climatic Data Center records indicate that in the past ten years there have been three periods of drought in Westworth Village, 1996 - 1998, 2000, and 2005 - 2006.

Probability of Future Events – Droughts are certain to occur again in Westworth Village. Significant droughts significantly affecting water supply and resulting in mandatory restrictions traditionally occur on a twenty year cycle. Based on the previously cited National Climatic Data Center recent records, we can anticipate that drought conditions will occur approximately every three years.

Impact – Drought can lead to loss of water for basic needs such as drinking and fire-fighting. Droughts are associated with increased wildfire and damage from expansive soils. More common impacts are damage to landscaping and reduced recreation due to low lake levels.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westworth Village Drought Mitigation Action #1** | Participate in the design and implementation of the Tarrant County specific water conservation public education efforts to compliment existing programs. |

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| **Mitigation Goal/Objective** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • City Funds<br>• Water Suppliers |
| **Responsible Agency** | • Westworth Village Police/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One year |
| **Effect on New Buildings** | This action will publicize water conservation efforts that can be incorporated into new construction. |
| **Effect on Existing Buildings** | This action will publicize water conservation efforts that can be incorporated into existing construction. |
| **Cost Effectiveness** | Cost Effective – Public education programs can provide significant results for relatively low costs. |
| **Discussion:** Most cities in the area have existing water conservation programs designed to educate the public and businesses on ways to conserve water. This action will develop a Tarrant County specific program that will compliment existing programs. Jurisdictional public education efforts have been very successful in attracting the attention of local citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westworth Village Drought Mitigation Action #2** | 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. Impacts identified in this plan will be included in updates to the Hazard Mitigation Action Plan. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $2,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • City Funds<br>• Water Suppliers |
| **Responsible Agency** | • Westworth Village Police/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |

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| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will identify drought impacts in Westworth Village thus providing specific information for builders of new structures to incorporate drought mitigation into the structures. |
| **Effect on Existing Buildings** | This action will identify drought impacts in Westworth Village thus providing specific information for owners of existing structures to incorporate drought mitigation into the structures. |
| **Cost Effectiveness** | Cost Effective – This planning effort will have a low cost with the potential for significant benefits for the entire community. |
| **Discussion:** This planning effort will focus attention on the effects of drought on the community. Specific drought effects will be identified and efforts can be made to mitigate those effects. | |

**EXPANSIVE SOILS**

Low Vulnerability - Expansive soils have caused damage to some structures in Westworth Village. However, damage has been limited to relatively small geographic areas and there are no reports of significant damage to commercial structures or infrastructure.

Location – Expansive soils are found in various areas of Westworth Village. We could not locate a map of expansive soils in Westworth Village.

Extent – The extent of expansive soils in Westworth Village is believed to be Very Low (0% - 20%) to Low (21% - 50%).

Previous Occurrences – We could find no empirical data on previous occurrences of damage from expansive soils, but it is believed that expansive soils have caused problems since the first buildings were constructed in this area.

Probability of Future Events – Westworth Village has a high likelihood of future occurrences. Due to the variability of soil types and construction quality, it is very difficult to predict specific future occurrences of problems with expansive soils. However, a study published in the fall 2003 issue of *Environmental Geology* cited in the September 19, 2003 *Dallas Business Journal* indicates that many new developments in the Metroplex are being built on soil that is more unstable than soils built on prior to 1990. This could lead to a higher incidence of expansive soil related damage in the future.

Impact – The impact of expansive soils ranges from cosmetic cracks in walls to substantial foundation and structural damage that can result in the need to demolish the building. Infrastructure such as pipelines can be damaged causing increased maintenance

and repairs, damaged beyond repair requiring replacement, damaged to the point of failure.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Westworth Village Expansive Soils Mitigation Action #1** | Improve construction techniques through building code enhancements. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined (Minimal – Staff Time Only) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building permit fees |
| **Potential Matching Funding Sources** | • City Funds<br>• Building permit fees |
| **Responsible Agency** | Westworth Village City Engineer |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will make new buildings more resistant to damage from expansive soils. |
| **Effect on Existing Buildings** | This action will require modifications to existing buildings to be more resistant to damage from expansive soils. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will improve construction quality and reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westworth Village Expansive Soils Mitigation Action #2** | Educate construction contractors, home owners, and business owners about mitigation techniques. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building Permit Fees |
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | • Westworth Village Police/Emergency Management<br>• Westworth Village City Engineer |

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| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will provide builders of new construction with expansive soil mitigation techniques that will reduce damage. |
| **Effect on Existing Buildings** | This action will provide owners of existing buildings with expansive soil mitigation techniques that will reduce damage. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will provide construction contractors and home/business owners with techniques designed to reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**EXTREME HEAT**

High Vulnerability - Summer heat and humidity can occur anytime from May through October. Community health services actively work with at risk populations to prevent heat related deaths and injuries. The elderly, very young people and people with poor health are most at risk from summer heat. People who work outside or in un-air-conditioned buildings are also at high risk to the direct effects of summer heat. Summer heat can also lead to electrical service outages if equipment fails or demand exceeds available supply. Most public safety and special facilities are equipped with emergency generators.

Location - Throughout the City.

Extent - Summer temperatures can reach as high as 113 degrees. Westworth Village is also subject to high humidity.

Previous Occurrences - This is an annual occurrence. The summer of 1980 was a record year with 69 consecutive days of temperatures of 100 degrees or more. We were unable to find a reliable record of deaths or injuries related to heat.

Probability of Future Events – Hot summer temperatures are certain to continue to occur in Westworth Village.

Impact - Summer heat can cause widespread electrical outages resulting in dangerous conditions, especially for at-risk populations. Occasionally "cooling centers" are opened at community centers to provide a safe place for citizens to seek refuge from the heat. Extreme heat can have economic impacts if construction work is curtailed or outdoor special events are cancelled.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westworth Village Extreme Heat Mitigation Action #1** | Determine feasibility of expanding monitoring of populations at risk from extreme heat |

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| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined. Staff time and GIS resources |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Other State or Federal Public Health Grants |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Westworth Village Police/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | None - This action is intended to expand monitoring of people only. |
| **Effect on Existing Buildings** | None - This action is intended to expand monitoring of people only. |
| **Cost Effectiveness** | Pending, but believed to be Cost Effective |
| **Discussion:** This action would determine the feasibility of expanding monitoring of populations at risk from extreme heat. Existing at risk population monitoring programs will be reviewed to ensure all known populations at risk from extreme heat are included. Any newly discovered at risk populations will be evaluated for inclusion in existing monitoring programs. Tarrant County Public Health provides public health services throughout the County. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westworth Village Extreme Heat Mitigation Action #2** | Increase public education programs on the dangers of excessive heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness |
| **Priority** | Medium |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Other State or Federal Public Health Grants |
| **Responsible Agency** | • Tarrant County Public Health<br>• Westworth Village Police/Emergency Management |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Effect on Existing Buildings** | None - This action is intended to expand public education on extreme heat. |

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| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits. |
| **Discussion:** Public education on severe weather in Westworth Village has traditionally focused on severe thunderstorms and associated hazards (tornadoes, lighting, flooding, high winds). This action would expand public education to include hazards from extreme heat. | |

**FLOOD**

High Vulnerability - The topography of Westworth Village combined with the frequency of severe thunderstorms results in frequent flash flood events. Homes businesses and a golf course are vulnerable to flooding in Westworth Village. There is a low risk of riverine flooding due to the presence of a well-maintained levee system. FEMA records indicate only 39 Repetitive Loss Properties in all of Tarrant County. However, this is probably more a reflection of the low number of flood insurance polices than vulnerability to flooding. Further analysis using GIS and field verification can specifically identify vulnerable structures.

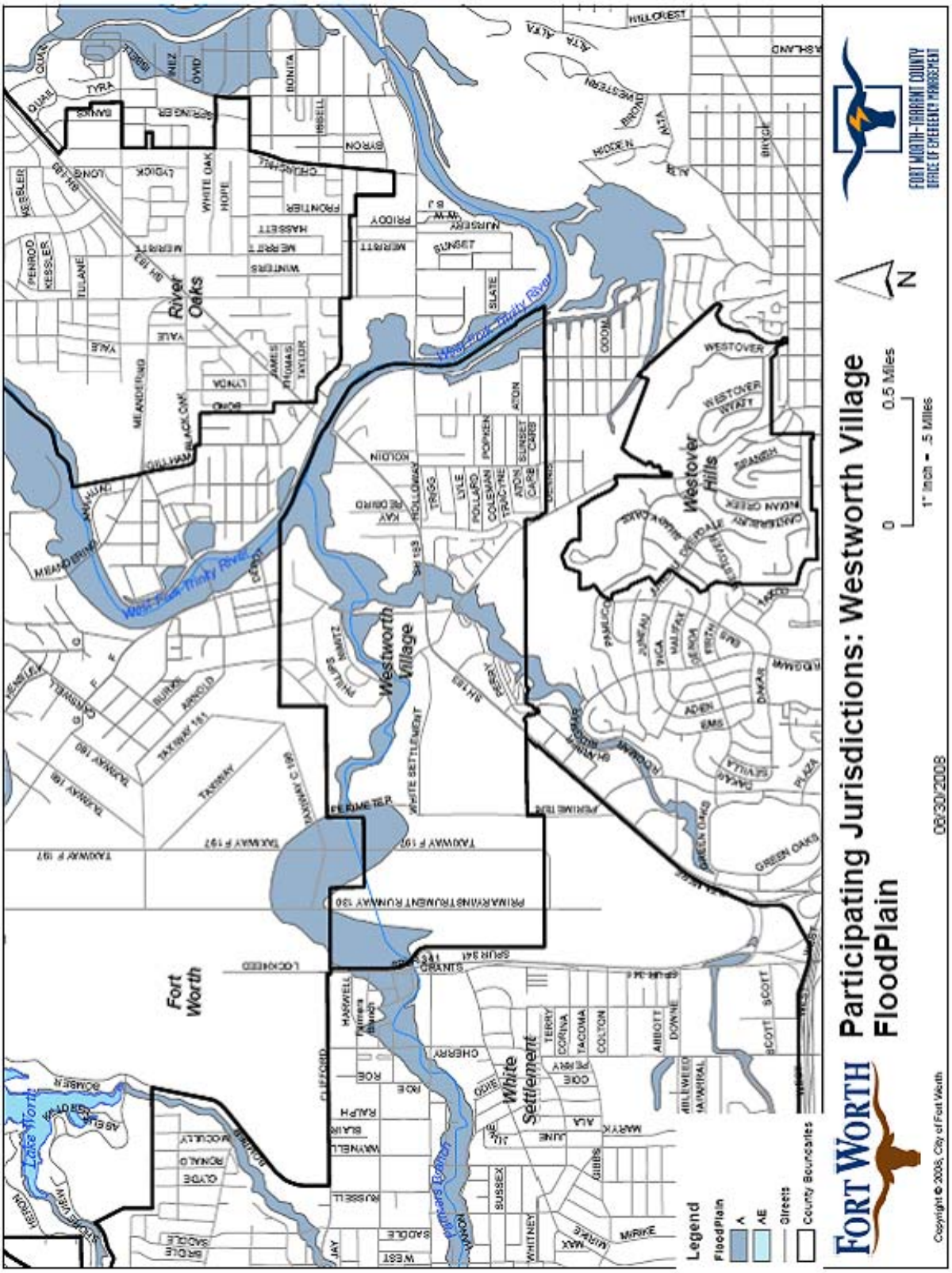
Location - Throughout Westworth Village along creeks and drainage structures. A sump area below the levee on the west side of TX 183 floods periodically in wet weather. In addition, there have been isolated instances of overland flooding on high ground due to intense rainfall on saturated soil. Significant Flooding has occurred on Farmers Branch near where it empties into the West Fork of the Trinity River in northwest Westworth Village.

Extent - Flash floods are the most common type of flooding in Westworth Village which tend to occur and recede very quickly. There is a low risk of riverine flooding due to the presence of a well-maintained levee system.

Previous Occurrences - Minor flooding occurs frequently, especially during the spring and early summer. In June of 2004 significant flooding occurred on Farmers Branch damaging homes and a golf course.

Probability of Future Events – Based on previous experience Westworth Village has a high likelihood of future occurrences. National Weather Service records indicate an average of 11 flash flood events per year in Tarrant County. Continued development throughout the County and the resulting increase in impervious cover will increase the likelihood and severity of flooding.

Impact - Flash floods kill more people than any other hazard associated with thunderstorms. Property damage from flash flooding is seldom covered by insurance, which makes it very difficult for citizens to recover from the flood. Due to the very rapid rate of development and growth throughout Tarrant County we are experiencing problems with determining actual building footprints within flood plains and will be using planimetric GIS data from the NCTCOG to resolve this issue when it becomes available. At that time we will be able to accurately identify the number and types of buildings vulnerable to flooding; as well as access other data associated with those locations such as appraised value, census data, and owner information.


Participating Jurisdictions: Westworth Village
FloodPlain
FORT WORTH
FORT WORTH-TARRANT COUNTY
OFFICE OF EMERGENCY MANAGEMENT
N
0
0.5 Miles
1" Inch = .5 Miles
09/30/2008
Legend
FloodPlain
A
AE
Streets
County Boundaries
Copyright © 2008, City of Fort Worth
Fort Worth
Westworth Village
River Oaks
White Settlement
Lake Worth
Westover Hills
West Fork Trinity River

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westworth Village Flood Mitigation Project #1** | Participate in the development of the Tarrant County specific "Flood Preparedness" brochure. |
| **Hazard Addressed** | Flooding |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of Flood events.<br>1. c. Develop effective flood mitigation public education materials. |
| **Priority** | High |
| **Estimated Cost** | Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Private Foundation Grants |
| **Responsible Agency** | • Westworth Village Police/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This action will provide flood mitigation techniques for owners of new buildings. |
| **Effect on Existing Buildings** | This action will provide flood mitigation techniques for owners of existing buildings. |
| **Cost Effectiveness** | Cost Effective - This project will provide valuable information to the public in a relatively short time and with relatively low costs. It will also have the added benefit of increasing public awareness of mitigation. The estimated cost could easily be offset by reduced losses to the public in a single small flood event. |

**Discussion**: Develop Tarrant County specific "Flood Preparedness" brochure. Once developed, the brochure will be distributed County-Wide. Historically flood prone areas will be targeted for door-to-door distribution and neighborhood meetings to present the brochure and solicit input for *Fort Worth Hazard Mitigation Action Plan* revisions.

The brochure will include:

- Description of Tarrant County flood hazards
- "Case Studies" of previous flood events in Tarrant County
- Preparedness and "self-help" mitigation information
- Benefits of city participation in NFIP
- Advantages of flood insurance
- Risks of not having flood insurance
- Warnings that typical homeowner's insurance does not cover rising water
- Solicit input for the *Fort Worth Hazard Mitigation Action Plan*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Westworth Village Flood Mitigation Action #2** | Conduct hydrologic study of Farmers Branch Creek to determine best means of mitigating flooding and implement findings. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined pending engineering analysis |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Westworth Village Public Works<br>• Westworth Village Police/Emergency Management |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will provide guidance for locating new buildings away from flood prone areas on Farmers Branch Creek. |
| **Effect on Existing Buildings** | This action will provide guidance for protection of existing buildings from flooding on Farmers Branch Creek. |
| **Cost Effectiveness** | Cost Effective – This project will provide guidance to reduce the hazard to life and property from flooding. |
| **Discussion:** This action will develop a study of flooding along Farmers Branch Creek and provide findings that can reduce the adverse effects of flooding on the creek. | |

**HAILSTORM**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of large hail are a hazard event in Westworth Village. Tarrant County averages eleven significant thunderstorm events (large hail, high winds) per year according to National Weather Service records. Most structures in Westworth Village can resist the effects of all but the most severe hailstorms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to hailstorms. Vehicles have proven to be vulnerable to hailstorms with widespread severe vehicle damage reported in 1980 and 1995.

Location - Throughout the City.

Extent - Westworth Village is subject to the hazards of severe thunderstorms, including large hail. Hail stones up to the size of grapefruit (H9 on the Combined NOAA/TORRO Hailstorm Intensity Scales) have been reported in Tarrant County.

Previous Occurrences – There are no reports of significant hailstorm events in Westworth Village other than the 1980 and 1995 county-wide events.

Probability of Future Events - Thunderstorms with hail are certain to continue to occur in Westworth Village. Hail falls on about two or three days per year, ordinarily with only slight and scattered damage (*National Weather Service*).

Impact – The impact from hailstorms can be significant in extreme events such as the hailstorms of 1980 and 1995. Thousands of homes and vehicles can be damaged in a single storm with millions of dollars in damages. Vehicles are especially impacted by large hails with windshields being the vulnerable part. A recurring problem following hailstorms is broken windshields in vehicles belonging to populations who do not have vehicle insurance and cannot afford the replacements costs, resulting in the owners having difficulty traveling to work, medical appointments, etc.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Westworth Village Hailstorm Mitigation Action #1** | Develop a public education campaign to encourage "hail resistant" roofing in new construction and roof replacements. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• Building/Permit Fees<br>• City Funds |
| **Responsible Agency** | • Westworth Village Police/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will potentially decrease the damage caused by most hailstorms to new buildings. |
| **Effect on Existing Buildings** | This action will potentially decrease the damage caused by most hailstorms to existing buildings. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing hailstorm damage. One long term benefit will be reduced property insurance as claims related to hail damage are reduced. |
| **Discussion**: Public education has proven to be a low cost effective means to achieve changes public behavior. Encouraging hail resistant roofing can benefit citizens through reduced damage, business through reduced damage to their buildings and reduced claims against insurance companies, and government through reduced request for assistance. This campaign can be developed in conjunction with the Tarrant County effort. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westworth Village Hailstorm Mitigation Action #2** | Evaluate City buildings to determine feasibility of installing hail resistant roofing and window coverings with a focus on critical infrastructure. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• City Funds |
| **Responsible Agency** | • Westworth Village Public Works<br>• Westworth Village City Engineer |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on new City buildings. |
| **Effect on Existing Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on existing City buildings. |
| **Cost Effectiveness** | Cost Effective – Although currently undetermined, this project is believed to be cost effective. |
| **Discussion:** Installing hail resistant roofing and window coverings on City buildings could prevent or limit damage to City buildings thus avoiding costs to the City as well as preventing or limiting loss of use of damaged facilities. | |

**HIGH WINDS**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of high winds are a hazard in Westworth Village. Tarrant County averages ten reported significant thunderstorm events (large hail, high winds) per year. In addition, strong weather fronts can sometimes be accompanied by high winds which occasionally cause damage. Most structures in Westworth Village can resist the effects of all but the most severe high wind events. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to high winds.

Location - Throughout the City.

Extent - Severe thunderstorms with high winds with speeds in excess of 90 mph have been reported in Westworth Village.

Previous Occurrences – We could find no records of significant high wind damage in Westworth Village.

Probability of Future Events – Based on previous experience Westworth Village can expect to experience an average of ten significant thunderstorm events with high winds per year.

Impact – Records on high wind events are difficult to separate from severe thunderstorm records. High winds in Westworth Village typically cause little damage to commercial buildings. More often high winds cause damage to roofs, trees, and signs.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westworth Village High Winds Mitigation Action #1** | Enact enhanced building codes to reduce damages from high winds. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined – Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Westworth Village City Engineer |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will potentially identify a means to reduce high wind damage on new buildings. |
| **Effect on Existing Buildings** | This action will potentially identify a means to reduce high wind damage on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Although costs are undetermined, this action is believed to be cost effective since the action will require staff time only. |
| **Discussion:** Enhanced building codes will reduce damages from high wind events. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westworth Village High Winds Mitigation Action #2** | Educate builders and residents about mitigating wind damage. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |

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| **Responsible Agency** | • Westworth Village City Engineer<br>• Westworth Village Police/Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on new buildings. |
| **Effect on Existing Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost of developing and providing high wind mitigation compared with savings to the community make this action cost effective. |
| **Discussion:** Public education has proven to be a low cost and effective means to achieve changes public behavior. High winds have not been a focus of severe weather preparedness. | |

**LANDSLIDES**

No Vulnerability - There is no history of landslides in Westworth Village. Based on the lack of vulnerability, landslides will receive no further consideration in this plan for Westworth Village. However, landslide hazards will be reviewed during the annual review of this plan and we will continue looking for areas with landslide potential during hazard surveys.

**LEVEE FAILURE**

Low Vulnerability – There are levees protecting some areas of Westworth Village. The levees are maintained by the Tarrant Regional Water District. The levees are designed to protect against a 500 year flood event and are extremely well maintained.

Location – Along the northern edge of the City. Streets that could be affected include Sky Acres and Pecan south of TX183 and properties east of Burton Hill Road .

Extent – If the levees failed during a flood event water could reach 10 feet in depth in homes.

Previous Occurrences – We could find no records of levee failure in Westworth Village.

Probability of Future Events – Levee failure has a low likelihood of future events based on the excellent maintenance the levees receive. No prediction can be made as to a failure.

Impact – A levee failure would destroy homes, roadways, infrastructure, and businesses.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westworth Village Levee Failure Mitigation Action #1** | Develop a Levee Failure Emergency Action Plan (EAP) with the Tarrant Regional Water District (TRWD). |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $2,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Westworth Village Police/Emergency Management<br>• Fort Worth – Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will potentially identify a means to protect new buildings from a levee failure if possible. |
| **Effect on Existing Buildings** | This action will potentially identify a means to protect existing buildings from a levee failure if possible. |
| **Cost Effectiveness** | Cost Effective – The low cost and potential benefits make this action cost effective. |
| **Discussion:** An EAP for a levee failure will ensure that Westworth Village and the TRWD have communication lines identified in the event citizens need to evacuate or Westworth Village can provide emergency assistance to prevent a levee failure. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westworth Village Levee Failure Mitigation Action #2** | Conduct a levee failure inundation study. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $2,500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |
| **Responsible Agency** | • Westworth Village City Engineer<br>• Westworth Village Police/Emergency Management<br>• Fort Worth – Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 9 Months |

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| **Effect on New Buildings** | This action will provide an estimation of the effects of a levee failure so that new buildings can be located in appropriate areas. |
| **Effect on Existing Buildings** | This action will provide an estimation of the effects of a levee failure on existing buildings. Some existing building owners may consider relocating. |
| **Cost Effectiveness** | Cost Effective – The low cost of developing and providing data for informed decision making makes this action cost effective. |
| **Discussion:** An inundation study will provide data that can be use to reach decision regarding potential emergency situations. | |

**LIGHTNING**

Moderate Vulnerability – Lightning is one of the most common hazards in Westworth Village. Thunderstorms (and by definition, lightning) occur an average of 30 – 50 days per year (*Oklahoma Climatological Survey*). Lightning is the second most common cause of weather-related deaths in Texas (*National Weather Service*). Lightning information is available only for Tarrant County on a county-wide basis.

Location – Throughout the City.

Extent – We could find no references to the average number of strikes per storm in Westworth Village. However, lightning is by definition associated with thunderstorms.

Previous Occurrences – Westworth Village experiences 30 – 50 thunderstorm days per year. From 1995 – 2004 one person was killed and five were injured by lightning in Tarrant County (*National Weather Service*). Throughout Texas 34 people were killed by lightning, there were 184 injuries, and an estimated 23 million dollars in damages due to lightning from 1995 - 2004 (*National Weather Service*).

Probability of Future Events – Based on past experience Westworth Village will experience 30 – 50 thunderstorm days each year. Some days will have more than one thunderstorm during a given thunderstorm day.

Impact – Although lightning is the second most common cause of storm related deaths in Texas, lightning deaths remain relatively rare. Lightning does cause property damage several times per year (we could not find statistical data to validate this observation).

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westworth Village Lightning Mitigation Action #1** | Provide lightning mitigation materials with building permit packets. |

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| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Westworth Village Administration |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will provide materials that will reduce the vulnerability of new buildings to lightning. |
| **Effect on Existing Buildings** | This action will provide materials that will reduce the vulnerability of existing buildings that are being remodeled to lightning. |
| **Cost Effectiveness** | Cost Effective – The low cost of this project would be offset by eliminating just one lightning caused building loss. |
| **Discussion:** Lightning mitigation materials will be included in all building permit packets distributed to builders or citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westworth Village Lightning Mitigation Action #2** | Ensure all City critical infrastructure has adequate lightning mitigation in place and upgrade protection as necessary. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | $2,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • Westworth Village City Engineer<br>• Westworth Village Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will ensure new City buildings that house critical infrastructure have adequate lightning mitigation. |
| **Effect on Existing Buildings** | This action will ensure existing critical infrastructure has adequate lightning mitigation. |

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| **Cost Effectiveness** | Cost Effective – The destructive and sometimes capricious nature of lighting warrant the expense of this action compared with the benefits of avoiding damage to critical infrastructure. |
| **Discussion:** Review and confirmation of the adequacy of lightning protection systems in City buildings housing critical infrastructure is worthwhile considering the number of thunderstorms experienced in Westworth Village. | |

**SEVERE THUNDERSTORM**

High Vulnerability - Severe thunderstorms are the most common hazard in Westworth Village. From 1950 through August 2007 Tarrant County averaged eleven reported severe thunderstorm events county-wide per year. Most structures in Westworth Village can resist the effects of all but the most severe thunderstorms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to thunderstorms.

Location - Throughout the City.

Extent - Westworth Village is subject to the hazards of severe thunderstorms of all magnitudes.

Previous Occurrences – In June 2004 severe thunderstorms caused flooding, electrical service loss, and numerous trees to fall into roadways.

Probability of Future Events – Severe thunderstorms will occur in Westworth Village an average of eleven times per year.

Impact – A single severe thunderstorm can cause damage from hail, high winds, lightning, and/or tornadoes to thousands of structures.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **Westworth Village Severe Thunderstorm Mitigation Project #1** | Conduct technical assessment to determine the feasibility of structurally hardening the Westworth Village Fire Station located 128 Koldin Lane against severe weather. |
| **Hazard Addressed** | Tornado/Severe Thunderstorm |
| **Mitigation Goal/Objective** | 2. Reduce loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | High |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |

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| **Potential Matching Funding Sources** | • Private Foundation Grants<br>• Other State or Federal Grants<br>• City Funds |
| **Responsible Agency** | Westworth Village Fire Department |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This project will determine the feasibility of structurally hardening the Westworth Village Fire Station against severe weather. |
| **Effect on Existing Buildings** | This project will determine the feasibility of structurally hardening the Westworth Village Fire Station against severe weather. |
| **Cost Effectiveness** | Cost Effective - This project will provide the basis for a realistic cost benefit analysis of the feasibility of hardening the Westworth Village Fire Station against severe weather events. The relatively low cost of this project compared with the potential benefits of protecting a city's emergency response equipment against the jurisdiction's most likely hazard event result in a favorable cost benefit review. |

**Discussion:**
This project will provide for determining the feasibility of hardening the city's only fire station against severe weather. This project will contribute to protecting emergency response equipment so that it will be available to assist the citizens of Westworth Village in responding to and recovering from severe weather or other events. Final project details will be developed in accordance with grant requirements at the time the project is funded.

The cost estimate is a conservative "best guess" based on a structural analysis of the existing fire station. That analysis would require:

- Structural analysis of the building by a Structural Engineer
- Analysis of electrical systems
- Analysis of HVAC systems
- Review of building codes

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Westworth Village Severe Thunderstorm Mitigation Action #2** | Encourage builders to install storm resistant construction such as "hurricane clips". |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | High |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |

| | |
|---|---|
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |
| **Responsible Agency** | Westworth Village City Engineer) |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will encourage storm resistant construction in new buildings. |
| **Effect on Existing Buildings** | This action will encourage storm resistant construction in existing buildings as they are remodeled. |
| **Cost Effectiveness** | Cost Effective – The low cost of this action will be offset by a reduction in damage from severe thunderstorms. |
| **Discussion:** Effective education on storm resistant construction can reduce damage from severe thunderstorms. Insurance companies may be willing to fund or provide educational materials and/or provide discounts to persons who install storm resistant devices. | |

**SEVERE WINTER STORMS**

Moderate Vulnerability - Since 2000 the National Weather Service has reported 14 Winter Storm/Ice events. Winter storms in Westworth Village usually consist of short-lived icing events (ice on the roads for a few hours) that primarily affect traffic and cause numerous motor vehicle accidents. Occasionally an ice storm will cause widespread power outages for as long as several days. ONCOR Electric Delivery has an aggressive tree trimming program. Most structures in Westworth Village can resist the effects of all but the most severe winter storms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to winter storms. Electrical service outages are usually the most serious threat in this area. Most public safety and special facilities are equipped with generators.

Location - Throughout the City.

Extent - Severe ice storms have resulted in accumulations in excess of two inches. Most storms leave only a light coating or glaze of ice.

Previous Occurrences – Severe Winter Storms are typically regional events. Westworth Village averaged two winter storms per year since 2000. Most winter storms resulting only minor inconveniences and a few motor vehicle accidents.

In 1978 up to an inch of ice coated area trees and roadways causing $14 million in damages region-wide and making travel almost impossible for two days.

In 1996 a winter storm dropped two to four inches of a mixture of sleet, freezing rain, and snow in Westworth Village over Thanksgiving weekend causing many motor vehicle accidents and some electrical service outages.

In 2003 a winter storm dropped one inch of sleet across Westworth Village resulting in numerous motor vehicle accidents and closing schools for two days.

Probability of Future Events - Westworth Village can expect to experience two winter storms per year with a severe winter storm once each ten years.

Impact - Winter storms can cause widespread electrical and telephone service outages, make travel dangerous or impossible, and damage structures. Deaths and injuries due to vehicle accidents and slips/falls are common during ice storms. Occasional deaths and injuries from carbon monoxide poisoning due to improper heating have occurred. Economic losses due to lost production can be significant. Damage from frozen pipes can lead to significant expenses for homeowners.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Westworth Village Severe Winter Storm Mitigation Action #1** | Increase public education concerning winter storm preparedness and mitigation. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | Medium |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Westworth Village Police/Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into new buildings. |
| **Effect on Existing Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost is effective when compared to benefits provided to citizens. |
| **Discussion:** Winter weather preparedness has not been emphasized in Westworth Village as much as severe thunderstorms. This action will provide preparedness information to citizens during the fall. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **Westworth Village Severe Winter Storm Mitigation Action #2** | Purchase additional street sanding capacity |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |

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|---|---|
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Westworth Village Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will have no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Sanding streets is essential to allow emergency vehicles to respond during severe winter events. |
| **Discussion:** Sanding equipment can be mounted on existing equipment to provide sanding capabilities. During severe winter weather events streets around hospitals, fire stations and other critical facilities are sanded along with major intersections and roadways. Additional sanding capacity would allow for quicker sanding of these areas and for more repeat sanding during prolonged winter weather events. This will improve public safety by facilitating emergency response as well as reducing motor vehicle accidents. | |

**STREAM BANK EROSION**

No Vulnerability - The predominantly low rolling topography of Westworth Village prevents stream bank erosion from causing a hazard except in a few locations. Some limited Erosion has been reported along Farmers Branch with little impact. No vulnerability to stream bank erosion has been identified in Westworth Village. Further analysis using GIS and field verification will continue to search for vulnerable structures or facilities.

**TORNADO**

High Vulnerability – All structures in Westworth Village are vulnerable to tornadoes. Very few structures can withstand the effects of an F5 tornado. However, the March 28, 2000 F3 tornado that struck Fort Worth provided good evidence that well built structures can protect people who take appropriate shelter inside those buildings.

Location - Tornadoes can occur anywhere in Westworth Village.

Extent - Westworth Village is subject to tornadoes of all magnitudes, including F5 tornadoes.

Previous Occurrences – We found no reports of tornados causing damage in Westworth Village. However, Tarrant County has an average of one tornado reported per year county-wide (Source: National Climatic Data Center). In 2007 there were eight tornadoes reported by storm spotters county-wide. Four of those tornados caused damage, all within incorporated areas. Since 2000 tornadoes have caused damage in Arlington, Benbrook, Euless, Everman, Fort Worth, Grand Prairie, Haltom City, Mansfield, North Richland Hills, and River Oaks.

Probability of Future Events - Tarrant County has averaged one reported tornado per year and can expect that average to continue. Westworth Village, based on its relatively small size, has a low likelihood of future events.

Impact - Tornadoes can cause deaths, injuries and property damage/destruction. Special facilities such as hospitals, fire stations, and utilities can be damaged or destroyed. Citizens who live in neighborhoods struck by tornadoes can experience disruption of their life styles and traditions. Areas struck by tornadoes can experience increased demand for mental health services as people deal with grief and stress.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Westworth Village Tornado Mitigation Project #1** | Assist citizens with funding for building tornado safe rooms or in-ground shelters. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction |
| **Priority** | High |
| **Estimated Cost** | $60,000 (15 Safe Rooms at $4,000 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Community Development Block Grant Funds |
| **Potential Matching Funding Sources** | Home/Building Owner |
| **Responsible Agency** | • Westworth Village Administration<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This project will encourage new buildings to be constructed with tornado safe rooms as part of the construction process. The safe room will enhance the overall storm resistance of the building. |
| **Effect on Existing Buildings** | This project will encourage homeowners to construct/install tornado safe rooms in their existing homes. A safe room will enhance the overall storm resistance of the building. |
| **Cost Effectiveness** | Cost Effective - Safe rooms and in-ground shelters have been proven to reduce deaths and injuries during tornadoes and severe thunderstorms. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of safe rooms and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

**Discussion:**
This project will reimburse costs associated with tornado safe room or in-ground shelter installation in new or existing homes. Safe rooms provide increased protection for citizens during severe thunderstorms and tornados. Safe rooms have been proven to save lives and reduce injuries from severe weather events. FEMA publication 320 (*Taking Shelter from the Storm, Building a Safe Room Inside Your House*) provides the standards for safe rooms. As stated on the FEMA website: Although a *"residence may be built "to code," that does not mean it can withstand winds from extreme events such as tornadoes and major hurricanes. The purpose of a safe room or a wind shelter is to provide a space where you and your family can seek refuge that provides a high level of protection. To protect its occupants, a safe room must be built to withstand high winds and flying debris, even if the rest of the residence is severely damaged or destroyed."*

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to home owners will be for no more than $3,000 or 75% of cost, whichever is less
- Eligibility will be limited to individuals who own their home at the time of application
- The safe room or in-ground shelter must be constructed/installed in the primary residence of the applicant
- Each eligible homeowner can only receive one reimbursement, regardless of the number of shelters he/she may purchase/install
- In-ground shelters must meet requirements established in the National Performance Criteria for Tornado Shelters dated May 28, 1999.
- Safe Rooms must meet the requirements of FEMA Publication 320
- Safe Rooms and shelters must meet all applicable city and/or county codes
- Previously owned or used shelters will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Westworth Village Tornado Mitigation Project #2** | Assist citizens with funding for purchase of Weather Alert Radios |
| **Mitigation Goal/Objective** | 4. Increase the effectiveness of warning systems in Tarrant County.<br>4. a. Increase the number of homes and businesses with Weather Alert Radios. |
| **Priority** | High |
| **Estimated Cost** | $2,000 (50 Weather Alert Radios at $40 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Private Sector Donations<br>• City Funds |
| **Potential Matching Funding Sources** | Citizen/Business Owner |

| | |
|---|---|
| **Responsible Agency** | • Westworth Village Administration<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings except for providing additional warning time of severe weather events thus allowing citizens more time to secure their home or business against approaching severe weather. |
| **Cost Effectiveness** | Cost Effective – Weather Alert Radios are a proven means to alert and warn citizens about severe weather and civil emergencies. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of Weather Alert Radios and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

***NOTE**: We are aware that Weather Alert Radios are on the "2007 Ineligible Planning Activities" list. It is our opinion that Weather Alert Radios should be considered eligible due to their very high benefit and very low cost.*

This project will reimburse 75% of the cost for citizens to purchase Weather Alert Radios, with the citizen responsible for the remaining 25%. Weather Alert Radios provide the best means for citizens to receive emergency alerts when they are indoors. Severe weather is the primary hazard in our area. Early alert and warning has proven to be a significant factor in saving lives during severe weather events.

In addition, the Weather Alert Radios can be activated for civil emergencies such as hazardous materials incidents. Effective warning saves lives, especially during severe weather events. Weather alert radios provide a proven means of indoor warning to citizens any time of the day or night and compose the vital indoor portion of our emergency warning system.

Warning systems have been shown to have value beyond the initial warning. Persons receiving warning relay the information to family and friends to ensure they are aware of the hazard. The secondary and tertiary warning can greatly amplify the effectiveness of the warning system.

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to citizens will be for no more than $30 or 75% of cost of the radio, whichever is less
- Eligibility will be limited to residents of Westworth Village
- The citizen must sign an agreement to keep the radio operational
- Each eligible homeowner can only receive one reimbursement, regardless of the number of radios purchased
- Previously purchased radios will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**WILDFIRE**

Low Vulnerability - Westworth Village has a very small amount of rural-urban interface that is subject to wildfires.

Location - Areas along the river and Farmers Branch Creek are subject to wildfires.

Extent - The effects of wildfire are deaths, injuries, loss of structures, loss of wildlands, and loss of wildlife habitat.

Previous Occurrences – There is no record of wildfire events in Westworth Village.

Probability of Future Events – Wildfire has a low probability of occurrence.

Vulnerability - Homes are most vulnerable to wildfires. The tendency to locate homes on tree covered lots and lack of fire breaks (such as parking lots around businesses) can

enable fires to spread more easily to homes. Special facilities tend to be less vulnerable due to construction type (brick or metal).

Impact - Wildfires can result in the need for rapid evacuations, casualties, loss of homes and businesses, and loss of wildlife habitat and recreational areas.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Westworth Village Wildfire Mitigation Action #1** | Increase public education on how to reduce the risks from wildfires (construction, landscaping, etc.) |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | High |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | Westworth Village Police/Emergency Management |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will reduce the effects of wildfire on new buildings through increased use of wildfire mitigation measures. |
| **Effect on Existing Buildings** | This action will reduce the effects of wildfire on existing buildings through increased use of wildfire mitigation measures. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing the effects of wildfire. |
| **Discussion:** Wildfire mitigation measures are not widely known in urban areas such as Tarrant County. This action will increase that knowledge and reduce casualties and damages from wildfires. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **Westworth Village Wildfire Mitigation Action #2** | Enact building permit process that encourages wildfire resistant construction. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |

| | |
|---|---|
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | Westworth Village City Engineer |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will reduce the vulnerability of new structure to wildfire. |
| **Effect on Existing Buildings** | This action will reduce the vulnerability of existing buildings to wildfire if they are remodeled to the extent a building permit is required. |
| **Cost Effectiveness** | Cost Effective – This action will integrate wildfire mitigation into the building process at minimal cost. |
| **Discussion:** Integrating mitigation into building permitting provides a process to reduce vulnerability with few negative impacts. | |

**Texas Standards That Exceed 44 CFR Requirements: Local Capability Assessments**

MAP 1

Projects funded under the following programs. Address the type of project that was funded. If you did not receive money from one of the below grants programs, then state that.

1.1: Hazard Mitigation Grant Program - None
1.2: Pre-Disaster Mitigation Grant Program - None
1.3: Project Impact - None
1.4: Hurricane-Property Protection Mitigation - None
1.5: Flood Mitigation Assistance - None
1.6: 406 Mitigation (through the Public Assistance Program) - None

MAP 2

Current Building Codes. Include the following information:
2.1: Date and type of code: 2003 International Building Code
2.2: How is it being enforced? Plans submitted for review. Projects inspected on site.

MAP 3

Current Fire Codes. Include the following information:
3.1: Date and type of code: 2003 International Building Code
3.2: How is it being enforced?

- Plans are submitted for review
- Projects inspected on site
- Annual Fire Inspection

MAP 4

4.1: Any other codes, sub-division regulations, etc., that are in effect in your jurisdiction? No
4.2: How are they being enforced?

MAP 5

Floodplain Management. Include the following information:

5.1: Ordinance/Order Date: No
5.2: Do you have a Floodplain Administrator? No
5.3: Is the person a Certified Floodplain Manager (CFM)? No
5.4: Date of current floodplain maps. August 23, 2000
5.5: Any codes, regulations, etc. that prohibit development in the floodway and/or floodplain: No

MAP 6

Findings/results of Building Code Effectiveness Grading Report (BCEGS). Include date of report and score. Not applicable

MAP 7

Identify other plans that your jurisdiction has or have been done in your jurisdiction.
7.1: Capital Improvement Plans: None
7.2: Comprehensive Plans: Yes (Under Development)
7.3: Storm Water Management Plans: None
7.4: Master Drainage Plans: None
7.5: Corps of Engineers: None
7.6: Flood Mitigation Plan: None
7.7: Any other plans, studies, etc. that may have been done in your jurisdiction: None

# City of White Settlement

Jurisdiction Profile
White Settlement has an area of 4.8 square miles and a NCTCOG 2007 population estimate of 15,900.

Many people wonder where the name for the City of White Settlement came from. The roots of the name and the city itself can be traced back to the earliest days of the Texas Republic. In a time when many predominantly white pioneers were moving to the area, several surrounding settlements were still occupied by Native Americans. In 1849, in an effort to help protect the pioneers, the War Department constructed a small fort at the confluence of the Clear and West Forks of the Trinity River. It was given the name Fort Worth.

This historical chain of events led to the development of two settlements, one occupied by white settlers and another encompassing a grouping of seven villages occupied by Native Americans. Thus, the name White Settlement was coined. The City of White Settlement was officially incorporated in 1941 and has enjoyed a steady increase in population and development ever since.

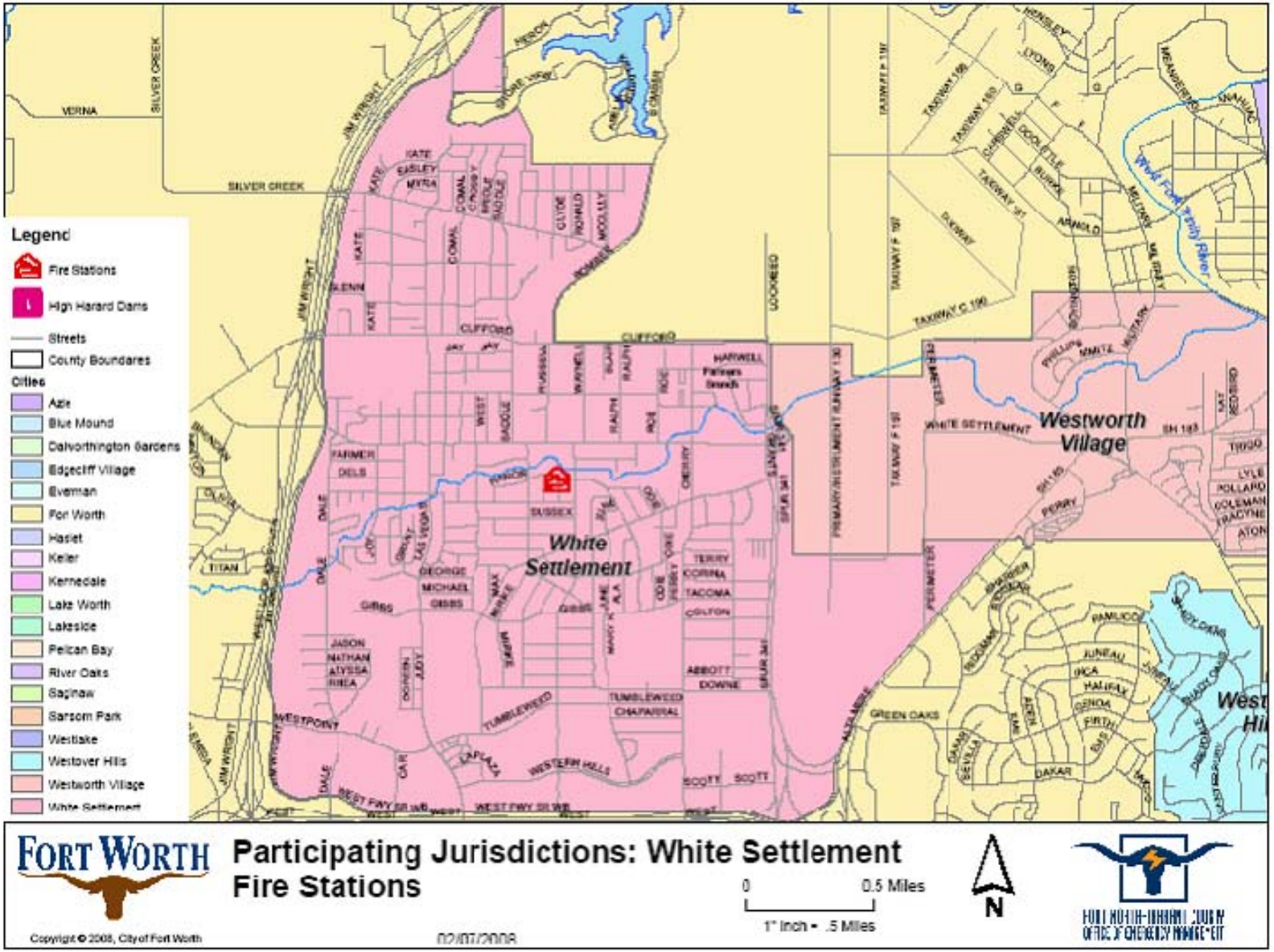
The City of White Settlement, Texas is located in Tarrant County approximately 7 miles from downtown Fort Worth. Lockheed Martin Aeronautics Company and Naval Air Station Joint Reserve Base Fort Worth - Carswell Field border the northeast city limits. Interstates 30 and 820 are located respectively on the City's southern and western city limits.

| 1990 | 2000 | 2006 | 2007 |
|---|---|---|---|
| 15,472 | 14,831 | 15,750 | 15,900 |
| 2007 Population Density (persons per square mile): 3,186.03 | | | |

City Point-Of-Contact
Police Lt. J.P. Bevering

Land Use and Development Trends
White Settlement has a mixture of residential and commercial land use and is approximately 80% built-out. Residential development is expected to continue. The city is landlocked.

Jurisdiction Unique Hazards
Hazards specific to White Settlement are discussed below.


Legend
Fire Stations
High Hazard Dams
Streets
County Boundaries
Cities
Azle
Blue Mound
Dalworthington Gardens
Edgecliff Village
Everman
Fort Worth
Haslet
Keller
Kennedale
Lake Worth
Lakeside
Pelican Bay
River Oaks
Saginaw
Sansom Park
Westlake
Westover Hills
Westworth Village
White Settlement
White Settlement
Westworth Village
Participating Jurisdictions: White Settlement
Fire Stations
0
0.5 Miles
1" Inch = .5 Miles
N
Copyright © 2008, City of Fort Worth
02/07/2008

**DAM FAILURE**

No Vulnerability – There are no high hazard dams located in White Settlement and none that would affect White Settlement if they failed. Based on the lack of vulnerability, dam failure will receive no further consideration in this plan for White Settlement.

**DROUGHT**

Low Vulnerability – White Settlement provides water to its citizens from 11 groundwater wells. These wells are less vulnerable to the effects of a drought than surface water sources.

Location – Drought can affect all of White Settlement.

Current Extent – As of February 2008, White Settlement was at DO – Abnormally Dry on the Palmer Drought Severity Index.

Previous Occurrences – National Climatic Data Center records indicate that in the past ten years there have been three periods of drought in White Settlement, 1996 - 1998, 2000, and 2005 - 2006.

Probability of Future Events – Droughts are certain to occur again in White Settlement. Significant droughts significantly affecting water supply and resulting in mandatory restrictions traditionally occur on a twenty year cycle. Based on the previously cited National Climatic Data Center recent records, we can anticipate that drought conditions will occur approximately every three years.

Impact – Drought can lead to loss of water for basic needs such as drinking and fire-fighting. Droughts are associated with increased wildfire and damage from expansive soils. More common impacts are damage to landscaping and reduced recreation due to low lake levels.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **White Settlement Drought Mitigation Action #1** | Participate in the design and implementation of the Tarrant County specific water conservation public education efforts to compliment existing programs. |
| **Mitigation Goal/Objective** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • City Funds<br>• Water Suppliers |

| | |
|---|---|
| **Responsible Agency** | • White Settlement Police/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One year |
| **Effect on New Buildings** | This action will publicize water conservation efforts that can be incorporated into new construction. |
| **Effect on Existing Buildings** | This action will publicize water conservation efforts that can be incorporated into existing construction. |
| **Cost Effectiveness** | Cost Effective – Public education programs can provide significant results for relatively low costs. |
| **Discussion:** Most cities in the area have existing water conservation programs designed to educate the public and businesses on ways to conserve water. This action will develop a Tarrant County specific program that will compliment existing programs. Jurisdictional public education efforts have been very successful in attracting the attention of local citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **White Settlement Drought Mitigation Action #2** | 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. Impacts identified in this plan will be included in updates to the Hazard Mitigation Action Plan. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $2,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Water Suppliers |
| **Potential Matching Funding Sources** | • City Funds<br>• Water Suppliers |
| **Responsible Agency** | • White Settlement Police/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will identify drought impacts in White Settlement thus providing specific information for builders of new structures to incorporate drought mitigation into the structures. |

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| **Effect on Existing Buildings** | This action will identify drought impacts in White Settlement thus providing specific information for owners of existing structures to incorporate drought mitigation into the structures. |
| **Cost Effectiveness** | Cost Effective – This planning effort will have a low cost with the potential for significant benefits for the entire community. |
| **Discussion:** This planning effort will focus attention on the effects of drought on the community. Specific drought effects will be identified and efforts can be made to mitigate those effects. | |

**EXPANSIVE SOILS**

Low Vulnerability - Expansive soils have caused damage to some structures in White Settlement. However, damage has been limited to relatively small geographic areas and there are no reports of significant damage to commercial structures or infrastructure.

Location – Expansive soils are found in various areas of White Settlement. We could not locate a map of expansive soils in White Settlement.

Extent – The extent of expansive soils in White Settlement is believed to be Very Low (0% - 20%) to Low (21% - 50%).

Previous Occurrences – We could find no empirical data on previous occurrences of damage from expansive soils, but it is believed that expansive soils have caused problems since the first buildings were constructed in this area.

Probability of Future Events – Expansive soils have a high likelihood of future occurrence. Due to the variability of soil types and construction quality, it is very difficult to predict specific future occurrences of problems with expansive soils. However, a study published in the fall 2003 issue of *Environmental Geology* cited in the September 19, 2003 *Dallas Business Journal* indicates that many new developments in the Metroplex are being built on soil that is more unstable than soils built on prior to 1990. This could lead to a higher incidence of expansive soil related damage in the future.

Impact – The impact of expansive soils ranges from cosmetic cracks in walls to substantial foundation and structural damage that can result in the need to demolish the building. Infrastructure such as pipelines can be damaged causing increased maintenance and repairs, damaged beyond repair requiring replacement, damaged to the point of failure.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **White Settlement Expansive Soils Mitigation Action #1** | Improve construction techniques through building code enhancements. |

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| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined (Minimal – Staff Time Only) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building permit fees |
| **Potential Matching Funding Sources** | • City Funds<br>• Building permit fees |
| **Responsible Agency** | White Settlement Code Compliance |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will make new buildings more resistant to damage from expansive soils. |
| **Effect on Existing Buildings** | This action will require modifications to existing buildings to be more resistant to damage from expansive soils. |
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will improve construction quality and reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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|---|---|
| **White Settlement Expansive Soils Mitigation Action #2** | Educate construction contractors, home owners, and business owners about mitigation techniques. |
| **Mitigation Goal** | 2. Reduce loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Building Permit Fees |
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | • White Settlement Code Compliance<br>• White Settlement Police/Emergency Management |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will provide builders of new construction with expansive soil mitigation techniques that will reduce damage. |
| **Effect on Existing Buildings** | This action will provide owners of existing buildings with expansive soil mitigation techniques that will reduce damage. |

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|---|---|
| **Cost Effectiveness** | Cost Effective – Minimal cost to implement with long term benefits for the community. |
| **Discussion:** This project will provide construction contractors and home/business owners with techniques designed to reduce damage from expansive soils. Benefits will not be immediately apparent, but will reduce property damage over time. | |

**EXTREME HEAT**

High Vulnerability - Summer heat and humidity can occur anytime from May through October. Community health services actively work with at risk populations to prevent heat related deaths and injuries. The elderly, very young people and people with poor health are most at risk from summer heat. People who work outside or in un-air-conditioned buildings are also at high risk to the direct effects of summer heat. Summer heat can also lead to electrical service outages if equipment fails or demand exceeds available supply. Most public safety and special facilities are equipped with emergency generators.

Location - Throughout the City.

Extent - Summer temperatures can reach as high as 113 degrees. White Settlement is also subject to high humidity.

Previous Occurrences - This is an annual occurrence. The summer of 1980 was a record year with 69 consecutive days of temperatures of 100 degrees or more. We were unable to find a reliable record of deaths or injuries related to heat.

Probability of Future Events - Hot summer temperatures are certain to continue to occur in White Settlement.

Impact - Summer heat can cause widespread electrical outages resulting in dangerous conditions, especially for at-risk populations. Occasionally "cooling centers" are opened at community centers to provide a safe place for citizens to seek refuge from the heat. Extreme heat can have economic impacts if construction work is curtailed or outdoor special events are cancelled.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **White Settlement Extreme Heat Mitigation Action #1** | Determine feasibility of expanding monitoring of populations at risk from extreme heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined. Staff time and GIS resources |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Other State or Federal Public Health Grants |
| **Potential Matching Funding Sources** | • City Funds |

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| **Responsible Agency** | • Tarrant County Public Health<br>• White Settlement Police/Emergency Management |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | None - This action is intended to expand monitoring of people only. |
| **Effect on Existing Buildings** | None - This action is intended to expand monitoring of people only. |
| **Cost Effectiveness** | Pending, but believed to be Cost Effective |
| **Discussion:** This action would determine the feasibility of expanding monitoring of populations at risk from extreme heat. Existing at risk population monitoring programs will be reviewed to ensure all known populations at risk from extreme heat are included. Any newly discovered at risk populations will be evaluated for inclusion in existing monitoring programs. Tarrant County Public Health provides public health services throughout the County. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **White Settlement Extreme Heat Mitigation Action #2** | Increase public education programs on the dangers of excessive heat |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness |
| **Priority** | Medium |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Other State or Federal Public Health Grants |
| **Responsible Agency** | • Tarrant County Public Health<br>• White Settlement Police/Emergency Management |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Effect on Existing Buildings** | None - This action is intended to expand public education on extreme heat. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits. |
| **Discussion:** Public education on severe weather in White Settlement has traditionally focused on severe thunderstorms and associated hazards (tornadoes, lighting, flooding, high winds). This action would expand public education to include hazards from extreme heat. | |

**FLOOD**

High Vulnerability - The topography of White Settlement combined with the frequency of severe thunderstorms results in frequent flash flood events. Homes, businesses, and roadways along Farmers Branch are subject to damage from flooding. White Settlement

City Hall is located next to Farmers Branch and was flooded in June of 2000. FEMA records indicate only 39 Repetitive Loss Properties in all of Tarrant County. However, this is probably more a reflection of the low number of flood insurance polices than vulnerability to flooding. Further analysis using GIS and field verification can specifically identify vulnerable structures.

Location - Throughout the City along creeks and drainage structures. The most frequent location for flooding is along Farmers Branch which runs from west to east through the center of the City.

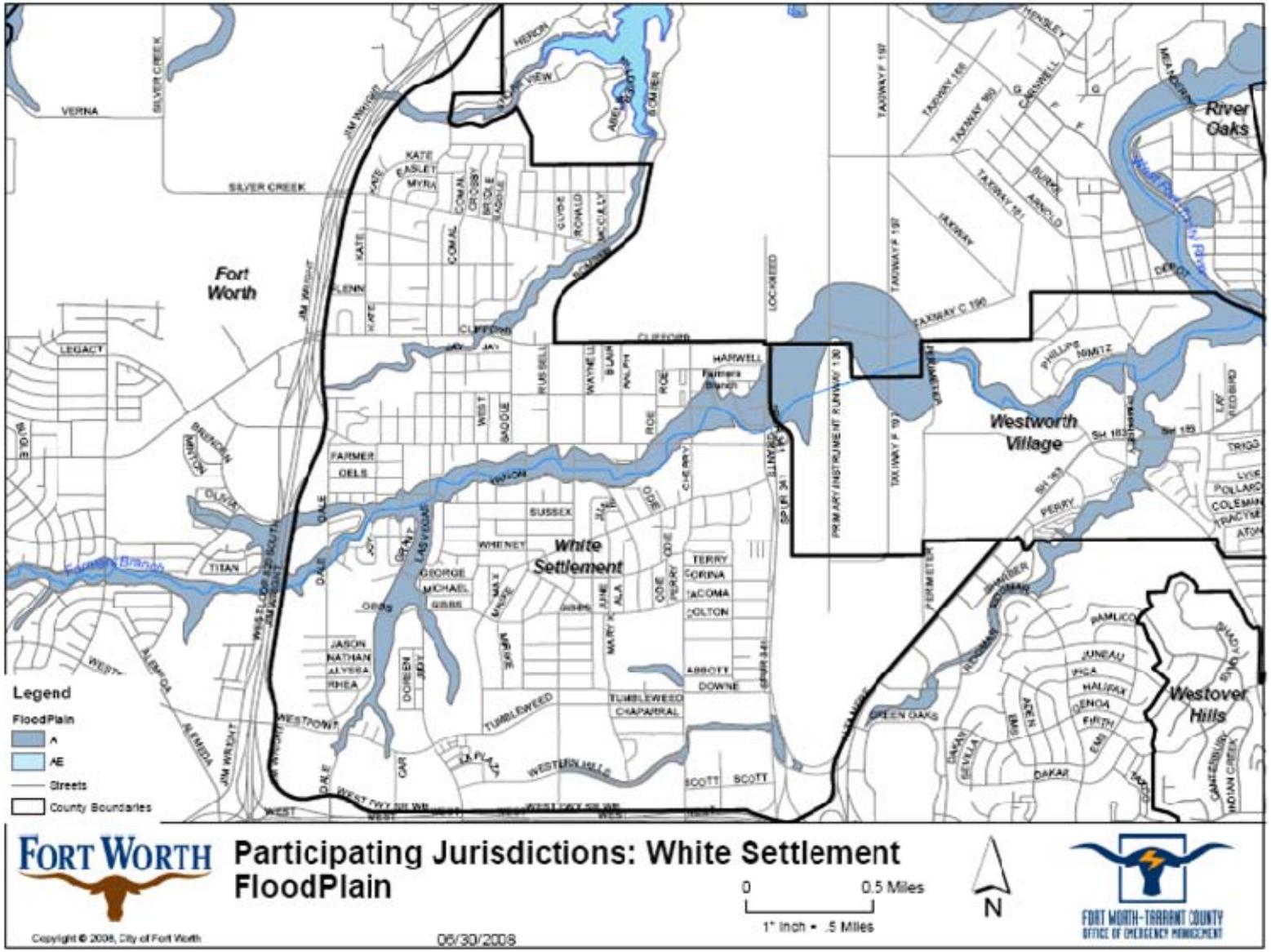
Extent - Flash floods are the most common type of flooding in White Settlement. The flash floods tend to occur and recede very quickly. Flooding has destroyed several homes in White Settlement.

Previous Occurrences - Minor flooding occurs frequently, especially during the spring and early summer. Significant flood events occurred in September 1984 and May 1989. In June of 2000 and June of 2004 flooding on Farmers Branch resulted in SBA Disaster Declarations. Homes, businesses, and roadways were affected by the flooding.

A flood on Farmers Branch in June of 2000 destroyed several homes and damaged many others. City Hall and several roadways also suffered damage.

Probability of Future Events – Based on previous experience White Settlement is certain to suffer flash flood events every year. National Weather Service records indicate an average of 11 flash flood events per year in Tarrant County. Continued development throughout the County and the resulting increase in impervious cover will increase the likelihood and severity of flooding.

Impact - Flash floods kill more people than any other hazard associated with thunderstorms. Property damage from flash flooding is seldom covered by insurance, which makes it very difficult for citizens to recover from the flood. Due to the very rapid rate of development and growth throughout Tarrant County we are experiencing problems with determining actual building footprints within flood plains and will be using planimetric GIS data from the NCTCOG to resolve this issue when it becomes available. At that time we will be able to accurately identify the number and types of buildings vulnerable to flooding; as well as access other data associated with those locations such as appraised value, census data, and owner information.


Fort Worth
White Settlement
Westworth Village
River Oaks
Westover Hills
Legend
FloodPlain
A
AE
Streets
County Boundaries
FORT WORTH
Participating Jurisdictions: White Settlement FloodPlain
0
0.5 Miles
1" Inch = .5 Miles
N
FORT WORTH-TARRANT COUNTY
OFFICE OF EMERGENCY MANAGEMENT
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05/30/2008

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **White Settlement Flood Mitigation Project #1** | Participate in the development of the Tarrant County specific "Flood Preparedness" brochure. |
| **Hazard Addressed** | Flooding |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of Flood events.<br>1. c. Develop effective flood mitigation public education materials. |
| **Priority** | High |
| **Estimated Cost** | Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Private Foundation Grants |
| **Responsible Agency** | • White Settlement Police/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This action will provide flood mitigation techniques for owners of new buildings. |
| **Effect on Existing Buildings** | This action will provide flood mitigation techniques for owners of existing buildings. |
| **Cost Effectiveness** | Cost Effective - This project will provide valuable information to the public in a relatively short time and with relatively low costs. It will also have the added benefit of increasing public awareness of mitigation. The estimated cost could easily be offset by reduced losses to the public in a single small flood event. |

**Discussion**: Develop Tarrant County specific "Flood Preparedness" brochure. Once developed, the brochure will be distributed County-Wide. Historically flood prone areas will be targeted for door-to-door distribution and neighborhood meetings to present the brochure and solicit input for *Fort Worth Hazard Mitigation Action Plan* revisions.

The brochure will include:

- Description of Tarrant County flood hazards
- "Case Studies" of previous flood events in Tarrant County
- Preparedness and "self-help" mitigation information
- Benefits of city participation in NFIP
- Advantages of flood insurance
- Risks of not having flood insurance
- Warnings that typical homeowner's insurance does not cover rising water
- Solicit input for the *Fort Worth Hazard Mitigation Action Plan*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **White Settlement Flood Mitigation Action #2** | Conduct feasibility study of relocating the City Hall/Fire Station complex out of a flood prone area. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |
| **Priority** | Medium |
| **Estimated Cost** | $15,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | • White Settlement Public Works<br>• White Settlement Police/Emergency Management |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will provide guidance for building a new City Hall/Fire Station Complex. |
| **Effect on Existing Buildings** | This action will provide guidance for relocating the existing City Hall/Fire Station Complex. |
| **Cost Effectiveness** | Cost Effective – This project will provide guidance for relocating critical facilities away from a flood prone area. |
| **Discussion:** The City/Hall Fire Station Complex flooded in 2000 and 2004. This action will consider the feasibility of relocating the complex. | |

**HAILSTORM**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of large hail are a hazard event in White Settlement. Tarrant County averages eleven significant thunderstorm events (large hail, high winds) per year according to National Weather Service records. Most structures in White Settlement can resist the effects of all but the most severe hailstorms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to hailstorms. Vehicles have proven to be vulnerable to hailstorms with widespread severe vehicle damage reported in 1980 and 1995.

Location - Throughout the City.

Extent - White Settlement is subject to the hazards of severe thunderstorms, including large hail. Hail stones up to the size of grapefruit (H9 on the Combined NOAA/TORRO Hailstorm Intensity Scales) have been reported in Tarrant County.

Previous Occurrences – There are no reports of significant hailstorm events in White Settlement other than the 1980 and 1995 county-wide events.

Probability of Future Events - Thunderstorms with hail are certain to continue to occur in White Settlement. Hail falls on about two or three days per year, ordinarily with only slight and scattered damage (*National Weather Service*).

Impact – The impact from hailstorms can be significant in extreme events such as the hailstorms of 1980 and 1995. Thousands of homes and vehicles can be damaged in a single storm with millions of dollars in damages. Vehicles are especially impacted by large hails with windshields being the vulnerable part. A recurring problem following hailstorms is broken windshields in vehicles belonging to populations who do not have vehicle insurance and cannot afford the replacements costs, resulting in the owners having difficulty traveling to work, medical appointments, etc.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **White Settlement Hailstorm Mitigation Action #1** | Develop a public education campaign to encourage "hail resistant" roofing in new construction and roof replacements. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• Building/Permit Fees<br>• City Funds |
| **Responsible Agency** | White Settlement Police/Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will potentially decrease the damage caused by most hailstorms to new buildings. |
| **Effect on Existing Buildings** | This action will potentially decrease the damage caused by most hailstorms to existing buildings. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing hailstorm damage. One long term benefit will be reduced property insurance as claims related to hail damage are reduced. |
| **Discussion**: Public education has proven to be a low cost effective means to achieve changes public behavior. Encouraging hail resistant roofing can benefit citizens through reduced damage, business through reduced damage to their buildings and reduced claims against insurance companies, and government through reduced request for assistance. This campaign can be developed in conjunction with the Tarrant County effort. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **White Settlement Hailstorm Mitigation Action #2** | Evaluate City buildings to determine feasibility of installing hail resistant roofing and window coverings with a focus on critical infrastructure. |

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| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • Insurance Companies<br>• City Funds |
| **Responsible Agency** | White Settlement Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on new City buildings. |
| **Effect on Existing Buildings** | This action will determine feasibility of installing hail resistant roofing and window coverings on existing City buildings. |
| **Cost Effectiveness** | Cost Effective – Although currently undetermined, this project is believed to be cost effective. |
| **Discussion:** Installing hail resistant roofing and window coverings on City buildings could prevent or limit damage to City buildings thus avoiding costs to the City as well as preventing or limiting loss of use of damaged facilities. | |

**HIGH WINDS**

Moderate Vulnerability - Severe thunderstorms and the associated hazard of high winds are a hazard in White Settlement. Tarrant County averages ten reported significant thunderstorm events (large hail, high winds) per year. In addition, strong weather fronts can sometimes be accompanied by high winds which occasionally cause damage. Most structures in White Settlement can resist the effects of all but the most severe high wind events. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to high winds.

Location - Throughout the City.

Extent - Severe thunderstorms with high winds with speeds in excess of 90 mph have been reported in White Settlement.

Previous Occurrences – Storms in June of 2004 caused wind damage throughout the City and flooding along Farmers Branch.

Probability of Future Events – Based on previous experience White Settlement can expect to experience an average of ten significant thunderstorm events with high winds per year.

Impact – Records on high wind events are difficult to separate from severe thunderstorm records. High winds in White Settlement typically cause little damage to commercial buildings. More often high winds cause damage to roofs, trees, and signs.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **White Settlement High Winds Mitigation Action #1** | Enact enhanced building codes to reduce damages from high winds. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined – Staff time only |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | White Settlement Code Compliance |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will potentially identify a means to reduce high wind damage on new buildings. |
| **Effect on Existing Buildings** | This action will potentially identify a means to reduce high wind damage on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Although costs are undetermined, this action is believed to be cost effective since the action will require staff time only. |
| **Discussion:** Enhanced building codes will reduce damages from high wind events. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **White Settlement High Winds Mitigation Action #2** | Educate builders and residents about mitigating wind damage. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Low |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |
| **Responsible Agency** | • White Settlement Code Compliance<br>• White Settlement Police/Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |

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| **Effect on New Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on new buildings. |
| **Effect on Existing Buildings** | This action will provide high wind mitigation education and materials to builders that will reduce the damages of high winds on existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost of developing and providing high wind mitigation compared with savings to the community make this action cost effective. |
| **Discussion:** Public education has proven to be a low cost and effective means to achieve changes public behavior. High winds have not been a focus of severe weather preparedness. | |

**LANDSLIDES**

No Vulnerability - Although there is some relatively steep terrain in portions of White Settlement, the relief is associated with rocky outcrops and not susceptible to landslides. Other than infrequent slumping along highways at overpasses, there is no history of landslides in White Settlement. Based on the lack of vulnerability, landslides will receive no further consideration in this plan for White Settlement. However, landslide hazards will be reviewed during the annual review of this plan and we will continue looking for areas with landslide potential during hazard surveys.

**LEVEE FAILURE**

No Vulnerability – There are no levees or areas that would be affected by levee failure in White Settlement. Based on the lack of vulnerability, levee failure will receive no further consideration in this plan for White Settlement.

**LIGHTNING**

Moderate Vulnerability – Lightning is one of the most common hazards in White Settlement. Thunderstorms (and by definition, lightning) occur an average of 30 – 50 days per year (*Oklahoma Climatological Survey*). Lightning is the second most common cause of weather-related deaths in Texas (*National Weather Service*). Lightning information is available only for Tarrant County on a county-wide basis.

Location – Throughout the City.

Extent – We could find no references to the average number of strikes per storm in White Settlement. However, lightning is by definition associated with thunderstorms.

Previous Occurrences – White Settlement experiences 30 – 50 thunderstorm days per year. From 1995 – 2004 one person was killed and five were injured by lightning in Tarrant County (*National Weather Service*). Throughout Texas 34 people were killed by lightning, there were 184 injuries, and an estimated 23 million dollars in damages due to lightning from 1995 - 2004 (*National Weather Service*).

Probability of Future Events – Based on past experience White Settlement will experience 30 – 50 thunderstorm days each year. Some days will have more than one thunderstorm during a given thunderstorm day.

Impact – Although lightning is the second most common cause of storm related deaths in Texas, lightning deaths remain relatively rare. Lightning does cause property damage several times per year (we could not find statistical data to validate this observation).

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **White Settlement Lightning Mitigation Action #1** | Provide lightning mitigation materials with building permit packets. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | Medium |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | White Settlement Code Compliance |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will provide materials that will reduce the vulnerability of new buildings to lightning. |
| **Effect on Existing Buildings** | This action will provide materials that will reduce the vulnerability of existing buildings that are being remodeled to lightning. |
| **Cost Effectiveness** | Cost Effective – The low cost of this project would be offset by eliminating just one lightning caused building loss. |
| **Discussion:** Lightning mitigation materials will be included in all building permit packets distributed to builders or citizens. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **White Settlement Lightning Mitigation Action #2** | Ensure all City critical infrastructure has adequate lightning mitigation in place and upgrade protection as necessary. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | $2,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |

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| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | White Settlement Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will ensure new City buildings that house critical infrastructure have adequate lightning mitigation. |
| **Effect on Existing Buildings** | This action will ensure existing critical infrastructure has adequate lightning mitigation. |
| **Cost Effectiveness** | Cost Effective – The destructive and sometimes capricious nature of lighting warrant the expense of this action compared with the benefits of avoiding damage to critical infrastructure. |
| **Discussion:** Review and confirmation of the adequacy of lightning protection systems in City buildings housing critical infrastructure is worthwhile considering the number of thunderstorms experienced in White Settlement. | |

**SEVERE THUNDERSTORM**

High Vulnerability - Severe thunderstorms are the most common hazard in White Settlement. From 1950 through August 2007 Tarrant County averaged eleven reported severe thunderstorm events county-wide per year. Most structures in White Settlement can resist the effects of all but the most severe thunderstorms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to thunderstorms.

Location - Throughout the City.

Extent - White Settlement is subject to the hazards of severe thunderstorms of all magnitudes.

Previous Occurrences - Records are available only on a county-wide basis.

Probability of Future Events – Severe thunderstorms will occur in White Settlement an average of eleven times per year.

Impact – A single severe thunderstorm can cause damage from hail, high winds, lightning, and/or tornadoes to thousands of structures.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **White Settlement Severe Thunderstorm Mitigation Project #1** | Conduct technical assessment to determine the feasibility of structurally hardening the White Settlement Fire Station against severe weather. |
| **Hazard Addressed** | Tornado/Severe Thunderstorm |

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| **Mitigation Goal/Objective** | 2. Reduce loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction. |
| **Priority** | High |
| **Estimated Cost** | $5,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • Private Foundation Grants<br>• Other State or Federal Grants<br>• City Funds |
| **Responsible Agency** | White Settlement Public Works |
| **Estimated Completion Time Frame** | 6 Months |
| **Effect on New Buildings** | This project will determine the feasibility of structurally hardening the White Settlement Fire Station against severe weather. |
| **Effect on Existing Buildings** | This project will determine the feasibility of structurally hardening the White Settlement Fire Station against severe weather. |
| **Cost Effectiveness** | Cost Effective - This project will provide the basis for a realistic cost benefit analysis of the feasibility of hardening the White Settlement Fire Station against severe weather events. The relatively low cost of this project compared with the potential benefits of protecting a city's emergency response equipment against the jurisdiction's most likely hazard event result in a favorable cost benefit review. |

**Discussion:**
This project will provide for determining the feasibility of hardening the city's only fire station against severe weather. This project will contribute to protecting emergency response equipment so that it will be available to assist the citizens of White Settlement in responding to and recovering from severe weather or other events. Final project details will be developed in accordance with grant requirements at the time the project is funded.

The cost estimate is a conservative "best guess" based on a structural analysis of the existing fire station. That analysis would require:

- Structural analysis of the building by a Structural Engineer
- Analysis of electrical systems
- Analysis of HVAC systems
- Review of building codes

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **White Settlement Severe Thunderstorm Mitigation Action #2** | Encourage builders to install storm resistant construction such as "hurricane clips". |

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| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | High |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Insurance Companies |
| **Potential Matching Funding Sources** | • City Funds<br>• Insurance Companies |
| **Responsible Agency** | White Settlement Code Compliance |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will encourage storm resistant construction in new buildings. |
| **Effect on Existing Buildings** | This action will encourage storm resistant construction in existing buildings as they are remodeled. |
| **Cost Effectiveness** | Cost Effective – The low cost of this action will be offset by a reduction in damage from severe thunderstorms. |
| **Discussion:** Effective education on storm resistant construction can reduce damage from severe thunderstorms. Insurance companies may be willing to fund or provide educational materials and/or provide discounts to persons who install storm resistant devices. | |

**SEVERE WINTER STORMS**

Moderate Vulnerability - Since 2000 the National Weather Service has reported 14 Winter Storm/Ice events. Winter storms in White Settlement usually consist of short-lived icing events (ice on the roads for a few hours) that primarily affect traffic and cause numerous motor vehicle accidents. Occasionally an ice storm will cause widespread power outages for as long as several days. ONCOR Electric Delivery has an aggressive tree trimming program. Most structures in White Settlement can resist the effects of all but the most severe winter storms. Public safety facilities, infrastructure, and special facilities do not have a history of being vulnerable to winter storms. Electrical service outages are usually the most serious threat in this area. Most public safety and special facilities are equipped with generators.

Location - Throughout the City.

Extent - Severe ice storms have resulted in accumulations in excess of two inches. Most storms leave only a light coating or glaze of ice.

Previous Occurrences – Severe Winter Storms are typically regional events. White Settlement averaged two winter storms per year since 2000. Most winter storms resulting only minor inconveniences and a few motor vehicle accidents.

In 1978 up to an inch of ice coated area trees and roadways causing $14 million in damages region-wide and making travel almost impossible for two days.

In 1996 a winter storm dropped two to four inches of a mixture of sleet, freezing rain, and snow in White Settlement over Thanksgiving weekend causing many motor vehicle accidents and some electrical service outages.

In 2003 a winter storm dropped one inch of sleet across White Settlement resulting in numerous motor vehicle accidents and closing schools for two days.

Probability of Future Events - White Settlement can expect to experience two winter storms per year with a severe winter storm once each ten years.

Impact - Winter storms can cause widespread electrical and telephone service outages, make travel dangerous or impossible, and damage structures. Deaths and injuries due to vehicle accidents and slips/falls are common during ice storms. Occasional deaths and injuries from carbon monoxide poisoning due to improper heating have occurred. Economic losses due to lost production can be significant. Damage from frozen pipes can lead to significant expenses for homeowners.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **White Settlement Severe Winter Storm Mitigation Action #1** | Increase public education concerning winter storm preparedness and mitigation. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | Medium |
| **Estimated Cost** | $500 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | White Settlement Police/Emergency Management |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into new buildings. |
| **Effect on Existing Buildings** | This action will provide information concerning severe winter storm mitigation that can be incorporated into existing buildings. |
| **Cost Effectiveness** | Cost Effective – The low cost is effective when compared to benefits provided to citizens. |
| **Discussion:** Winter weather preparedness has not been emphasized in White Settlement as much as severe thunderstorms. This action will provide preparedness information to citizens during the fall. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

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| **White Settlement Severe Winter Storm Mitigation Action #2** | Purchase additional street sanding capacity |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | White Settlement Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will have no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings. |
| **Cost Effectiveness** | Cost Effective – Sanding streets is essential to allow emergency vehicles to respond during severe winter events. |
| **Discussion:** Sanding equipment can be mounted on existing equipment to provide sanding capabilities. During severe winter weather events streets around hospitals, fire stations and other critical facilities are sanded along with major intersections and roadways. Additional sanding capacity would allow for quicker sanding of these areas and for more repeat sanding during prolonged winter weather events. This will improve public safety by facilitating emergency response as well as reducing motor vehicle accidents. | |

**STREAM BANK EROSION**

Moderate Vulnerability - Flash floods along Farmers Branch Creek can cause stream bank erosion. Homes, businesses, roadways, and City Hall are vulnerable to stream bank erosion events. Most buildings are a safe distance from the current path of the creek. Further analysis using GIS and field verification can specifically identify vulnerable structures.

Location - Along Farmers Branch Creek through the central part of the City.

Extent - Stream bank erosion along Farmers Branch has washed away several feet of bank during a single flash flood event.

Previous Occurrences - Minor flooding associated erosion occurs frequently, especially during the spring and early summer. In June of 2000 and June of 2004 significant flooding on Farmers Branch caused bank erosion.

Probability of Future Events – White Settlement is certain to experience stream bank erosion in the future. Continued development and the resulting impervious cover will increase the likelihood and severity of flooding and associated erosion. It is likely that flooding will cause some damage in the next five years.

Impact - Extreme stream bank erosion could destroy homes, businesses, and/or roadways. White Settlement is a small city and any loss of business would have a noticeable impact. Roadway damage can restrict access for home/business owners and cause minor to major inconveniences to for drivers.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **White Settlement Stream Bank Erosion Mitigation Action #1** | Stabilize creek banks at road crossings with structures. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |
| **Priority** | Medium |
| **Estimated Cost** | $100,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | White Settlement Public Works |
| **Estimated Completion Time Frame** | 3 years |
| **Effect on New Buildings** | This action will not affect new buildings |
| **Effect on Existing Buildings** | This action will not affect existing buildings. |
| **Cost Effectiveness** | Cost Effective – The action will reduce the adverse effects of flooding. |
| **Discussion:** Stabilizing the creek bank at road crossings will protect roadways. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **White Settlement Stream Bank Erosion Mitigation Action #2** | Determine and implement expedient erosion control techniques along Farmers Branch Creek. |
| **Mitigation Goal/Objective** | 1. Reduce the adverse effects of flood events. |
| **Priority** | Low |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | White Settlement Public Works |
| **Estimated Completion Time Frame** | One Year |
| **Effect on New Buildings** | This action will not have an effect on new buildings. |
| **Effect on Existing Buildings** | This action will protect existing buildings along Farmers Branch Creek. |
| **Cost Effectiveness** | Cost Effective – Although the final project cost is undetermined, it is believed the action will be cost effective. |

| |
|---|
| **Discussion:** This action will review erosion control techniques and implement the most effective technique for controlling erosion along Farmers Branch Creek. |

**TORNADO**

High Vulnerability – All structures in White Settlement are vulnerable to tornadoes. Very few structures can withstand the effects of an F5 tornado. However, the March 28, 2000 F3 tornado that struck Fort Worth provided good evidence that well built structures can protect people who take appropriate shelter inside those buildings.

Location - Tornadoes can occur anywhere in White Settlement.

Extent - White Settlement is subject to tornadoes of all magnitudes, including F5 tornadoes.

Previous Occurrences – We found no reports of tornados causing damage in White Settlement. However, Tarrant County has an average of one tornado reported per year county-wide (Source: National Climatic Data Center). In 2007 there were eight tornadoes reported by storm spotters county-wide. Four of those tornados caused damage, all within incorporated areas. Since 2000 tornadoes have caused damage in Arlington, Benbrook, Euless, Everman, Fort Worth, Grand Prairie, Haltom City, Mansfield, North Richland Hills, and River Oaks.

Probability of Future Events - Tarrant County has averaged one reported tornado per year and can expect that average to continue. White Settlement, based on its relatively small size, has a low likelihood of experiencing a tornado.

Impact - Tornadoes can cause deaths, injuries and property damage/destruction. Special facilities such as hospitals, fire stations, and utilities can be damaged or destroyed. Citizens who live in neighborhoods struck by tornadoes can experience disruption of their life styles and traditions. Areas struck by tornadoes can experience increased demand for mental health services as people deal with grief and stress.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **White Settlement Tornado Mitigation Project #1** | Assist citizens with funding for building tornado safe rooms or in-ground shelters. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. a. Encourage storm resistant construction |
| **Priority** | High |
| **Estimated Cost** | $120,000 (30 Safe Rooms at $4,000 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Community Development Block Grant Funds |
| **Potential Matching Funding Sources** | Home/Building Owner |

| | |
|---|---|
| **Responsible Agency** | • White Settlement Police/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This project will encourage new buildings to be constructed with tornado safe rooms as part of the construction process. The safe room will enhance the overall storm resistance of the building. |
| **Effect on Existing Buildings** | This project will encourage homeowners to construct/install tornado safe rooms in their existing homes. A safe room will enhance the overall storm resistance of the building. |
| **Cost Effectiveness** | Cost Effective - Safe rooms and in-ground shelters have been proven to reduce deaths and injuries during tornadoes and severe thunderstorms. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of safe rooms and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

**Discussion:**
This project will reimburse costs associated with tornado safe room or in-ground shelter installation in new or existing homes. Safe rooms provide increased protection for citizens during severe thunderstorms and tornados. Safe rooms have been proven to save lives and reduce injuries from severe weather events. FEMA publication 320 (*Taking Shelter from the Storm, Building a Safe Room Inside Your House*) provides the standards for safe rooms. As stated on the FEMA website: Although a *"residence may be built "to code," that does not mean it can withstand winds from extreme events such as tornadoes and major hurricanes. The purpose of a safe room or a wind shelter is to provide a space where you and your family can seek refuge that provides a high level of protection. To protect its occupants, a safe room must be built to withstand high winds and flying debris, even if the rest of the residence is severely damaged or destroyed."*

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to home owners will be for no more than $3,000 or 75% of cost, whichever is less
- Eligibility will be limited to individuals who own their home at the time of application
- The safe room or in-ground shelter must be constructed/installed in the primary residence of the applicant
- Each eligible homeowner can only receive one reimbursement, regardless of the number of shelters he/she may purchase/install
- In-ground shelters must meet requirements established in the National Performance Criteria for Tornado Shelters dated May 28, 1999.
- Safe Rooms must meet the requirements of FEMA Publication 320
- Safe Rooms and shelters must meet all applicable city and/or county codes
- Previously owned or used shelters will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **White Settlement Tornado Mitigation Project #2** | Assist citizens with funding for purchase of Weather Alert Radios |
| **Mitigation Goal/Objective** | 4. Increase the effectiveness of warning systems in Tarrant County.<br>4. a. Increase the number of homes and businesses with Weather Alert Radios. |
| **Priority** | High |
| **Estimated Cost** | $4,000 (100 Weather Alert Radios at $40 each) |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• Private Foundations<br>• Private Sector Donations<br>• City Funds |
| **Potential Matching Funding Sources** | Citizen/Business Owner |

| | |
|---|---|
| **Responsible Agency** | • White Settlement Police/Emergency Management<br>• Fort Worth - Tarrant County OEM (Support) |
| **Estimated Completion Time Frame** | 18 Months |
| **Effect on New Buildings** | This action will no effect on new buildings. |
| **Effect on Existing Buildings** | This action will have no effect on existing buildings except for providing additional warning time of severe weather events thus allowing citizens more time to secure their home or business against approaching severe weather. |
| **Cost Effectiveness** | Cost Effective – Weather Alert Radios are a proven means to alert and warn citizens about severe weather and civil emergencies. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. We believe that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project will be to raise awareness of Weather Alert Radios and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program. |

***NOTE**: We are aware that Weather Alert Radios are on the "2007 Ineligible Planning Activities" list. It is our opinion that Weather Alert Radios should be considered eligible due to their very high benefit and very low cost.*

This project will reimburse 75% of the cost for citizens to purchase Weather Alert Radios, with the citizen responsible for the remaining 25%. Weather Alert Radios provide the best means for citizens to receive emergency alerts when they are indoors. Severe weather is the primary hazard in our area. Early alert and warning has proven to be a significant factor in saving lives during severe weather events.

In addition, the Weather Alert Radios can be activated for civil emergencies such as hazardous materials incidents. Effective warning saves lives, especially during severe weather events. Weather alert radios provide a proven means of indoor warning to citizens any time of the day or night and compose the vital indoor portion of our emergency warning system.

Warning systems have been shown to have value beyond the initial warning. Persons receiving warning relay the information to family and friends to ensure they are aware of the hazard. The secondary and tertiary warning can greatly amplify the effectiveness of the warning system.

Proposed guidelines for implementation of the project are as follows:

- Reimbursement to citizens will be for no more than $30 or 75% of cost of the radio, whichever is less
- Eligibility will be limited to residents of White Settlement
- The citizen must sign an agreement to keep the radio operational
- Each eligible homeowner can only receive one reimbursement, regardless of the number of radios purchased
- Previously purchased radios will not be eligible for reimbursement

**NOTE:** *Final guidelines will be developed in accordance with grant requirements and applicable law at the time the project is funded.*

**WILDFIRE**

Moderate Vulnerability - Tarrant County has been cited as having more undeveloped land than any other urban county in the United States. The relatively large rural-urban interface has resulted in significant wildfires. Area fire departments are working to educate home and business owners on means to reduce their exposure to wildfires such as keeping grass mowed, planting fire resistant vegetation, removing wood roofing shingles, etc.

Location - Areas in the north near Lake Worth and in the southwest are most susceptible to wildfires. White Settlement still has many open undeveloped areas with significant brush and tree cover.

Extent - The effects of wildfire are deaths, injuries, loss of structures, loss of wildlands, and loss of wildlife habitat.

Previous Occurrences - December of 2005 was the most recent significant wildfire occurrence.
Probability of Future Events - Wildfires are likely to occur annually and increase in frequency and severity as the population continues to increase and formally rural areas are developed.

Vulnerability - Homes are most vulnerable to wildfires. The tendency to locate homes on tree covered lots and lack of fire breaks (such as parking lots around businesses) can enable fires to spread more easily to homes. Special facilities tend to be less vulnerable due to construction type (brick or metal).

Impact - Wildfires can result in the need for rapid evacuations, casualties, loss of homes and businesses, and loss of wildlife habitat and recreational areas.

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **White Settlement Wildfire Mitigation Action #1** | Increase public education on how to reduce the risks from wildfires (construction, landscaping, etc.) |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events.<br>2. c. Enhance public education concerning severe weather preparedness. |
| **Priority** | High |
| **Estimated Cost** | $1,000 |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds |
| **Responsible Agency** | White Settlement Police/Emergency Management |
| **Estimated Completion Time Frame** | Six Months |
| **Effect on New Buildings** | This action will reduce the effects of wildfire on new buildings through increased use of wildfire mitigation measures. |
| **Effect on Existing Buildings** | This action will reduce the effects of wildfire on existing buildings through increased use of wildfire mitigation measures. |
| **Cost Effectiveness** | Cost Effective – The cost of this project is low compared to the potential benefits of reducing the effects of wildfire. |
| **Discussion:** Wildfire mitigation measures are not widely known in urban areas such as Tarrant County. This action will increase that knowledge and reduce casualties and damages from wildfires. | |

**NOTE:** *All projects are subject to availability of federal and local funding as well as availability of local staff to administer the project.*

| | |
|---|---|
| **White Settlement Wildfire Mitigation Action #2** | Enact building permit process that encourages wildfire resistant construction. |
| **Mitigation Goal/Objective** | 2. Reduce the loss of life and property damage resulting from severe weather events. |
| **Priority** | Medium |
| **Estimated Cost** | Undetermined |
| **Potential Funding Sources** | • Hazard Mitigation Grant Program<br>• City Funds |
| **Potential Matching Funding Sources** | • City Funds<br>• Building Permit Fees |
| **Responsible Agency** | White Settlement Code Compliance |
| **Estimated Completion Time Frame** | 9 Months |
| **Effect on New Buildings** | This action will reduce the vulnerability of new structure to wildfire. |
| **Effect on Existing Buildings** | This action will reduce the vulnerability of existing buildings to wildfire if they are remodeled to the extent a building permit is required. |
| **Cost Effectiveness** | Cost Effective – This action will integrate wildfire mitigation into the building process at minimal cost. |
| **Discussion:** Integrating mitigation into building permitting provides a process to reduce vulnerability with few negative impacts. | |

**Existing Hazard Mitigation Efforts**
Channeling of Farmers Branch

**Texas Standards That Exceed 44 CFR Requirements: Local Capability Assessments**
MAP 1
Projects funded under the following programs. Address the type of project that was funded. If you did not receive money from one of the below grants programs, then state that.
1.1: Hazard Mitigation Grant Program - None
1.2: Pre-Disaster Mitigation Grant Program - None
1.3: Project Impact - None
1.4: Hurricane-Property Protection Mitigation - None
1.5: Flood Mitigation Assistance - None
1.6: 406 Mitigation (through the Public Assistance Program) - None

MAP 2
Current Building Codes. Include the following information:
2.1: Date and type of code: 2006 International Building Code
2.2: How is it being enforced? Plans submitted for review. Projects inspected on site.

MAP 3
Current Fire Codes. Include the following information:

3.1: Date and type of code: 1997 Uniform Fire Code
3.2: How is it being enforced?

- Plans are submitted for review
- Projects inspected on site
- Annual Fire Inspection

MAP 4

4.1: Any other codes, sub-division regulations, etc., that are in effect in your jurisdiction?
Zoning Ordinances
4.2: How are they being enforced?
Code Compliance inspects new construction and responds to complaints.

MAP 5

Floodplain Management. Include the following information:
5.1: Ordinance/Order Date: Code of Ordinances Chapter 10 adopted 1987
5.2: Do you have a Floodplain Administrator? Yes
5.3: Is the person a Certified Floodplain Manager (CFM)? Yes
5.4: Date of current floodplain maps. August 23, 2000
5.5: Any codes, regulations, etc. that prohibit development in the floodway and/or floodplain: Code of Ordinances Chapter 10 adopted 1987

MAP 6

Findings/results of Building Code Effectiveness Grading Report (BCEGS). Include date of report and score. Commercial (4), Residential (4), December 5, 2006

MAP 7

Identify other plans that your jurisdiction has or have been done in your jurisdiction.
7.1: Capital Improvement Plans: None
7.2: Comprehensive Plans: Adopted in 2005
7.3: Storm Water Management Plans: Ordinance 3.900 Amended 1987
7.4: Master Drainage Plans: None
7.5: Corps of Engineers: None
7.6: Flood Mitigation Plan: None
7.7: Any other plans, studies, etc. that may have been done in your jurisdiction.

- USACE Farmers Branch White Settlement Section 205 (DRAFT) Detailed Project Report and Integrated Environmental Assessment

## Alexander Scale for Landslide Damage

| Level | Damage | Description |
|---|---|---|
| **0** | None. | Building is intact |
| **1** | Negligible. | Hairline cracks in walls or structural members; no distortion of structure or detachment of external architectural details |
| **2** | Light. | Buildings continue to be habitable; repair not urgent. Settlement of foundations, distortion of structure, and inclination of walls are not sufficient to compromise overall stability. |
| **3** | Moderate. | Walls out of perpendicular by one or two degrees, or there has been substantial cracking in structural members, or the foundations have settled during differential subsidence of at least 15 cm; building requires evacuation and rapid attention to ensure its continued life. |
| **4** | Serious. | Walls out of perpendicular by several degrees; open cracks in walls; fracture of structural members; fragmentation of masonry; differential settlement of at least 25 cm compromising foundations; floors may be inclined by one or two degrees or ruined by heave. Internal partition walls will need to be replaced; door and window frames are too distorted to use; occupants must be evacuated and major repairs carried out. |
| **5** | Very Serious. | Walls out of plumb by five or six degrees; structure grossly distorted; differential settlement has seriously cracked floors and walls or caused major rotation or slewing of the building [wooden buildings are detached completely from their foundations]. Partition walls and brick infill will have at least partly collapsed; roofs may have partially collapsed; outhouses, porches, and patios may have been damaged more seriously than the principal structure itself. Occupants will need to be re-housed on a long-term basis, and rehabilitation of the building will probably not be feasible. |
| **6** | Partial Collapse. | Requires immediate evacuation of the occupants and cordoning of the site to prevent accidents with falling masonry. |
| **7** | Total Collapse. | Requires clearance of the site. |

Source: http://www.es.mq.edu.au/NHRC/web/scales/scalespage14.htm

*Avalanche: European avalanche size table;*

| Size | Run out | Potential Damage | Physical Size |
|---|---|---|---|
| 1 - Slough | Small snow slide that cannot bury a person, though there is a danger of falling. | Relatively harmless to people | length <50 m<br>volume <100 $m^3$ |
| 2 - Small | Stops within the slope. | Could bury, injure or kill a person. | length <100 m<br>volume <1,000 $m^3$ |
| 3 - Medium | Runs to the bottom of the slope. | Could bury and destroy a car, damage a truck, destroy small buildings or break trees. | length <1,000 m<br>volume <10,000 $m^3$ |
| 4 - Large | Runs over flat areas (significantly less than 30°) of at least 50 m in length, may reach the valley bottom. | Could bury and destroy large trucks and trains, large buildings and forested areas. | length >1,000 m<br>volume >10,000 |

Source: http://en.wikipedia.org/wiki/Avalanche

*Tornado: Fujita scale, Enhanced Fujita Scale*

**Fujita Scale**

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

On February 1, 2007, the Fujita scale was decommissioned in favor of the more accurate Enhanced Fujita Scale, which replaces it. None of the tornadoes recorded on or before January 31, 2007 will be re-categorized. Therefore maintaining the Fujita scale will be necessary when referring to previous events.
Source: http://en.wikipedia.org/wiki/Fujita_scale

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

The **Enhanced Fujita Scale**, or **EF Scale**, is the scale for rating the strength of tornadoes in the United States estimated via the damage they cause. Implemented in place of the Fujita scale, it was used starting February 1, 2007. The scale has the same basic design as the original Fujita scale, six categories from zero to five representing increasing degrees of damage. It was revised to reflect better examinations of tornado damage surveys, so as to align wind speeds more closely with associated storm damage. The new scale takes into account how most structures are designed, and is thought to be a much more accurate representation of the surface wind speeds in the most violent tornadoes.
Source: http://en.wikipedia.org/wiki/Enhanced_Fujita_Scale

# Combined NOAA/TORRO Hailstorm Intensity Scales

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

Sources: www.noaa.gov and www.torro.org

## *Fire: Keetch-Byram Drought Index, fire danger rating system, acres burned, fuel load;*

The Keetch-Byram Drought Index (KBDI) is basically a mathematical system for relating current and recent weather conditions to potential or expected fire behavior. This system was originally developed for the southeastern United States and is based primarily on recent rainfall patterns.

The KBDI is the most widely used drought index system by fire managers in the south. It is also one of the only drought index systems specifically developed to equate the effects of drought with potential fire activities.

The result of this system is a drought index number ranging from 0 to 800 that accurately describes the amount of moisture that is **missing**. A rating of zero defines the point where there is no moisture deficiency and 800 is the maximum drought possible.

These numbers correlate with potential fire behavior as follows:

**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 thorough the night and heavier fuels will actively burn and contribute to fire intensity.

Source: http://www.wfas.us/content/view/32/49/

| Fire Danger Rating System | | |
|---|---|---|
| **rating** | **basic description** | **detailed description** |
| CLASS 1: Low Danger (L)<br>COLOR CODE: **Green** | fires not easily started | Fuels do not ignite readily from small firebrands. Fires in open or cured grassland may burn freely a few hours after rain, but wood fires spread slowly by creeping or smoldering and burn in irregular fingers. There is little danger of spotting. |
| CLASS 2: Moderate Danger (M)<br>COLOR CODE: **Blue** | fires start easily and spread at a moderate rate | Fires can start from most accidental causes. Fires in open cured grassland will burn briskly and spread rapidly on windy days. Woods fires spread slowly to moderately fast. The average fire is of moderate intensity, although heavy concentrations of fuel – especially draped fuel -- may burn hot. Short-distance spotting may occur, but is not persistent. Fires are not likely to become serious and control is relatively easy. |
| CLASS 3: High Danger (H)<br>COLOR CODE: **Yellow** | fires start easily and spread at a rapid rate | All fine dead fuels ignite readily and fires start easily from most causes. Unattended brush and campfires are likely to escape. Fires spread rapidly and short-distance spotting is common. High intensity burning may develop on slopes or in concentrations of fine fuel. Fires may become serious and their control difficult, unless they are hit hard and fast while small. |
| CLASS 4: Very High Danger (VH)<br>COLOR CODE: **Orange** | fires start very easily and spread at a vary fast rate | Fires start easily from all causes and immediately after ignition, spread rapidly and increase quickly in intensity. Spot fires are a constant danger. Fires burning in light fuels may quickly develop high-intensity characteristics - such as long-distance spotting - and fire whirlwinds, when they burn into heavier fuels. Direct attack at the head of such fires is rarely possible after they have been burning more than a few minutes. |
| CLASS 5: Extreme (E)<br>COLOR CODE: **Red** | fire situation is explosive and can result in extensive property damage | Fires under extreme conditions start quickly, spread furiously and burn intensely. All fires are potentially serious. Development into high-intensity burning will usually be faster and occur from smaller fires than in the Very High Danger class (4). Direct attack is rarely possible and may be dangerous, except immediately after ignition. Fires that develop headway in heavy slash or in conifer stands may be unmanageable while the extreme burning condition lasts. Under these conditions, the only effective and safe control action is on the flanks, until the weather changes or the fuel supply lessens. |
| source: http://www.wfas.net/content/view/34/51/ | | |

## Mercalli/Richter Scale Comparison

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

Masonry A: Good workmanship, mortar, and design; reinforced, especially laterally, and bound together by using steel, concrete, etc.; designed to resist lateral forces.
Masonry B: Good workmanship and mortar; reinforced, but not designed in detail to resist lateral forces.
Masonry C: Ordinary workmanship and mortar; no extreme weaknesses like failing to tie in at corners, but neither reinforced nor designed against horizontal forces.
Masonry D: Weak materials, such as adobe; poor mortar; low standards of workmanship; weak horizontally.
Source: http://www.abag.ca.gov/bayarea/eqmaps/doc/mmigif/m10.html

*Wind: Beaufort wind scale;*

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

Source: www.wikipedia.org

Source: www.mountwashington.org

## *Winter Storm: wind chill, volume of ice, volume of snow;*

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

### Wind Chill Chart

| Wind (mph) \ Temperature (°F) | 40 | 35 | 30 | 25 | 20 | 15 | 10 | 5 | 0 | -5 | -10 | -15 | -20 | -25 | -30 | -35 | -40 | -45 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 36 | 31 | 25 | 19 | 13 | 7 | 1 | -5 | -11 | -16 | -22 | -28 | -34 | -40 | -46 | -52 | -57 | -63 |
| 10 | 34 | 27 | 21 | 15 | 9 | 3 | -4 | -10 | -16 | -22 | -28 | -35 | -41 | -47 | -53 | -59 | -66 | -72 |
| 15 | 32 | 25 | 19 | 13 | 6 | 0 | -7 | -13 | -19 | -26 | -32 | -39 | -45 | -51 | -58 | -64 | -71 | -77 |
| 20 | 30 | 24 | 17 | 11 | 4 | -2 | -9 | -15 | -22 | -29 | -35 | -42 | -48 | -55 | -61 | -68 | -74 | -81 |
| 25 | 29 | 23 | 16 | 9 | 3 | -4 | -11 | -17 | -24 | -31 | -37 | -44 | -51 | -58 | -64 | -71 | -78 | -84 |
| 30 | 28 | 22 | 15 | 8 | 1 | -5 | -12 | -19 | -26 | -33 | -39 | -46 | -53 | -60 | -67 | -73 | -80 | -87 |
| 35 | 28 | 21 | 14 | 7 | 0 | -7 | -14 | -21 | -27 | -34 | -41 | -48 | -55 | -62 | -69 | -76 | -82 | -89 |
| 40 | 27 | 20 | 13 | 6 | -1 | -8 | -15 | -22 | -29 | -36 | -43 | -50 | -57 | -64 | -71 | -78 | -84 | -91 |
| 45 | 26 | 29 | 12 | 5 | -2 | -9 | -16 | -23 | -30 | -37 | -44 | -51 | -58 | -65 | -72 | -79 | -86 | -93 |
| 50 | 26 | 19 | 12 | 4 | -3 | -10 | -17 | -24 | -31 | -38 | -45 | -52 | -60 | -67 | -74 | -81 | -88 | -95 |
| 55 | 25 | 18 | 11 | 4 | -3 | -11 | -18 | -25 | -32 | -39 | -46 | -54 | -61 | -68 | -75 | -82 | -89 | -97 |
| 60 | 25 | 17 | 10 | 3 | -4 | -11 | -19 | -26 | -33 | -40 | -48 | -55 | -62 | -69 | -76 | -84 | -91 | -98 |

Frostbite Times: 30 minutes; 10 minutes; 5 minutes

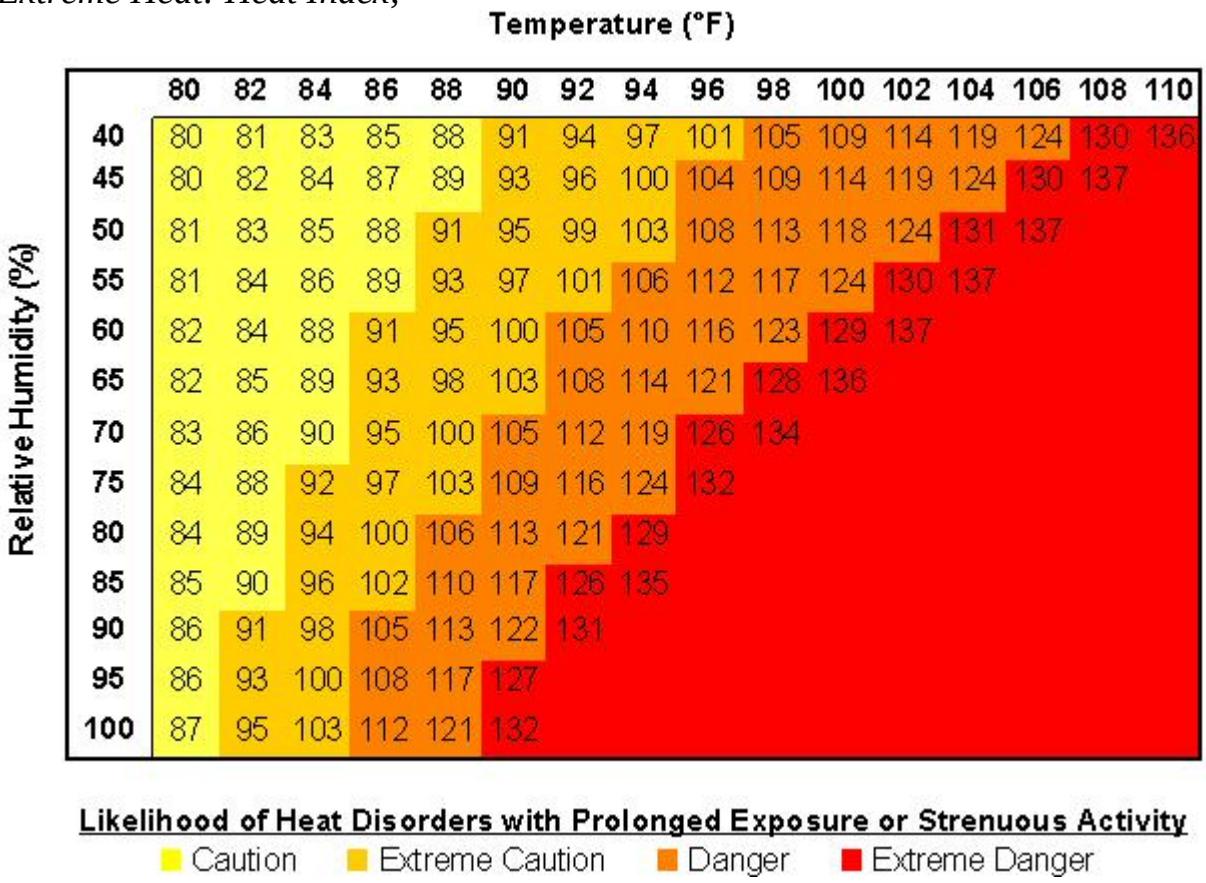
$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

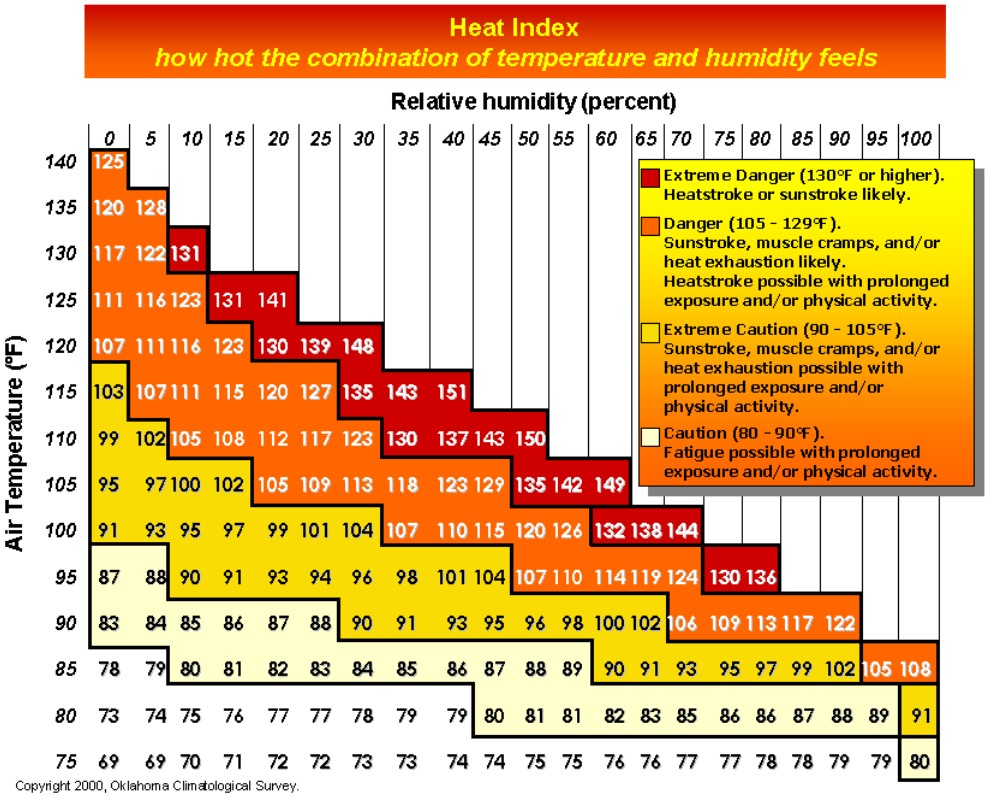
*Effective 11/01/01*

Source: National Weather Service and NOAA

*Extreme Heat: Heat Index;*




Source: National Weather Service




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

Drought: Palmer Index;

## I. Palmer Drought Severity Index (PDSI)

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

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

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

**PDSI Classifications for Dry and Wet Periods**

| | |
|---|---|
| 4.00 or more | Extremely wet |
| 3.00 to 3.99 | Very wet |
| 2.00 to 2.99 | Moderately wet |
| 1.00 to 1.99 | Slightly wet |
| 0.50 to 0.99 | Incipient wet spell |
| 0.49 to -0.49 | Near normal |
| -0.50 to -0.99 | Incipient dry spell |
| -1.00 to -1.99 | Mild drought |
| -2.00 to -2.99 | Moderate drought |
| -3.00 to -3.99 | Severe drought |
| -4.00 or less | Extreme drought |

Source: http://drought.unl.edu/whatis/indices.htm

*Flood: 100 year flood area;*

Use the local flood maps.

| Flood Zones | | |
|---|---|---|
| **Zone A** | The 100-year or Base Floodplain. There are six types of A zones: | |
| | **A** | The base floodplain mapped by approximate methods, i.e., BFEs are not determined. This is often called an unnumbered A zone or an approximate A zone. |
| | **A1-30** | These are known as numbered A zones (e.g., A7 or A14). This is the base floodplain where the firm shows a BFE (old format). |
| | **AE** | The base floodplain where base flood elevations are provided. AE zones are now used on new format FIRMs instead of A1-30 zones. |
| | **AO** | The base floodplain with sheet flow, ponding, or shallow flooding. Base flood depths (feet above ground) are provided. |
| | **AH** | Shallow flooding base floodplain. BFE's are provided. |
| | **A99** | Area to be protected from base flood by levees or Federal flood protection systems under construction. BFEs are not determined. |
| | **AR** | The base floodplain that results from the de-certification of a previously accredited flood protection system that is in the process of being restored to provide a 100-year or greater level of flood protection |
| **Zone V and VE** | **V** | The coastal area subject to velocity hazard (wave action) where BFEs are not determined on the FIRM. |
| | **VE** | The coastal area subject to velocity hazard (wave action) where BFEs are provided on the FIRM. |
| **Zone B and Zone X (shaded)** | Area of moderate flood hazard, usually the area between the limits of the 100-year and the 500-year floods. B zones are also used to designate base floodplains or lesser hazards, such as areas protected by levees from the 100-year flood, or shallow flooding areas with average depths of less than one foot or drainage areas less than 1 square mile. | |
| **Zone C and Zone X (unshaded)** | Area of minimal flood hazard, usually depiction FIRMs as exceeding the 500-year flood level. Zone C may have ponding and local drainage problems that do not warrant a detailed study or designation as base floodplain. Zone X is the area determined to be outside the 500-year flood. | |
| **Zone D** | Area of undetermined but possible flood hazards. | |
| Source: Understanding Your Risks, identifying hazards and estimating losses, FEMA 386-2 | | |

*Dam Failure: Use inundation zones (actual or estimated)*

*Land Subsidence: show number of feet lost*

*Expansive soils: percent of change*

Expansion Index (in %)
0–20 Very Low
21-50 Low
51-90 Medium
91-130 High
>130 Very High

*Lightning: show numbers of strikes per storm etc.*

It is difficult determine just how extensive lightning can be. Recent storms monitored by New Mexico Tech, generated between 65 and 1062 lightning flashes per minute. Lightning flashes per storm in New Mexico average up to 435 flashes per minute. Additionally, lightning strikes the ground or objects once for every five to 10 cloud flashes. (Source: http://www.ghcc.msfc.nasa.gov/sport/publications/karen_conf_paper_2.pdf; http://ams.confex.com/ams/pdfpapers/103103.pdf)

An average bolt of negative lightning carries a current of 30-to-50 kilo-amperes (kA), although some bolts can be up to 120 kA, and transfers a charge of 500 mega-joules (enough to light a 100 watt light bulb for 2 months). A bolt of lightning can reach temperatures approaching 28,000 degrees Celsius (50,000 degrees Fahrenheit) in a split second. This is about five times hotter than the surface of the sun.