



Orange County

Hazard Mitigation Plan Update 2016



Maintaining a Safe, Secure, and Sustainable Community

For more information, visit our website at:

www.co.orange.tx.us/OCOEM

Written comments should be forwarded to:

H2O Partners, Inc.

P. O. Box 160130

Austin, Texas 78716

info@h2opartnersusa.com

www.h2opartnersusa.com

Table of Contents

Section 1 – Introduction

Background	1-1
Scope and Participation	1-2
Purpose.....	1-3
Authority	1-3
Summary of Sections.....	1-4

Section 2 – Planning Process

Plan Preparation and Development.....	2-1
Review and Incorporation of Existing Plans.....	2-7
Timeline for Implementing Mitigation Actions.....	2-10
Public and Stakeholder Involvement.....	2-10

Section 3 – County Profile

Overview	3-1
Population and Demographics	3-4
Future Development.....	3-5
Economic Impact	3-6
Existing and Future Land Use and Development Trends.....	3-6

Section 4 – Risk Overview

Hazard Identification	4-1
Natural Hazards and Climate Change	4-3
Overview of Hazard Analysis	4-4
Hazard Ranking	4-5

Section 5 – Flood

Hazard Description	5-1
Location	5-2
Extent	5-9
Historical Occurrences	5-12
Probability of Future Events	5-16

Table of Contents

Vulnerability and Impact	5-16
NFIP Participation	5-19
NFIP Compliance and Maintenance	5-20
Repetitive Loss	5-21

Section 6 – Lightning

Hazard Description	6-1
Location	6-1
Extent	6-1
Historical Occurrences	6-2
Probability of Future Events	6-3
Vulnerability and Impact	6-3

Section 7 – Hurricane

Hazard Description	7-1
Location	7-2
Extent	7-2
Historical Occurrences	7-4
Probability of Future Events	7-5
Vulnerability and Impact	7-5

Section 8 – Extreme Heat

Hazard Description	8-1
Location	8-1
Extent	8-1
Historical Occurrences	8-4
Probability of Future Events	8-6
Vulnerability and Impact	8-6

Section 9 – Hail

Hazard Description	9-1
Location	9-1
Extent	9-1

Table of Contents

Historical Occurrences	9-2
Probability of Future Events	9-6
Vulnerability and Impact.....	9-6

Section 10 – Thunderstorm Wind

Hazard Description	10-1
Location	10-1
Extent	10-2
Historical Occurrences	10-3
Probability of Future Events	10-8
Vulnerability and Impact.....	10-8

Section 11 – Tornado

Hazard Description	11-1
Location	11-2
Extent	11-2
Historical Occurrences	11-5
Probability of Future Events	11-6
Vulnerability and Impact.....	11-7

Section 12 – Drought

Hazard Description	12-1
Location	12-2
Extent	12-2
Historical Occurrences	12-4
Probability of Future Events	12-5
Vulnerability and Impact	12-5

Section 13 – Wildfire

Hazard Description	13-1
Location	13-1
Extent	13-9
Historical Occurrences	13-19

Table of Contents

Probability of Future Events	13-21
Vulnerability and Impact	13-21

Section 14 – Winter Storm

Hazard Description	14-1
Location	14-3
Extent	14-3
Historical Occurrences	14-4
Probability of Future Events	14-6
Vulnerability and Impact.....	14-6

Section 15 – Dam Failure

Hazard Description	15-1
Location	15-2
Extent	15-4
Historical Occurrences	15-5
Probability of Future Events	15-6
Vulnerability and Impact.....	15-6

Section 16 – Mitigation Strategy

Mitigation Goals	16-1
Goal 1	16-1
Goal 2	16-1
Goal 3	16-2
Goal 4	16-2
Goal 5	16-2
Goal 6	16-3

Section 17 – Previous Actions

Summary.....	17-1
Orange County – Countywide	17-2
Bridge City	17-27
City of Orange	17-30

Table of Contents

Pine Forest.....	17-40
Pinehurst.....	17-43
Rose City.....	17-55
Vidor.....	17-58
West Orange.....	17-75

Section 18 – Mitigation Actions

Summary.....	18-1
Orange County.....	18-6
Bridge City.....	18-40
City of Orange.....	18-49
Pine Forest.....	18-57
Pinehurst.....	18-60
Rose City.....	18-71
Vidor.....	18-74
West Orange.....	18-98

Section 19 – Plan Maintenance

Plan Maintenance Procedures.....	19-1
Incorporation.....	19-1
Monitoring and Evaluation.....	19-3
Updating.....	19-4
Continued Public Involvement.....	19-5

Appendix A – Low Risk and Manmade Hazards

Appendix B – Planning Team

Appendix C – Public Survey Results

Appendix D – Critical Facilities

Appendix E – Dam Locations

Appendix F – Meeting Documentation

Appendix G – Capability Assessment

Section 1: Introduction

Background	1
Scope and Participation	2
Purpose.....	3
Authority.....	3
Summary of Sections	4

Background

Orange County is located in the extreme southeastern corner of Texas along the Texas-Louisiana border. Orange County was formed in 1852 from portions of Jefferson County. It was named after the orange fruit, which was grown by the early settlers of the County near the mouth of the Sabine River; however, due to periodic spells of cold winter weather, the orange trees and citrus orchards were moved southwest into the Rio Grande Valley.

Orange County is bounded by Jasper County and Newton County to the north. The Sabine River and Louisiana are located to the east. To the south is Sabine Lake, which outlets to the Gulf of Mexico, and to the west is the Neches River and Jefferson County. Hardin County is located to the northwest. The City of Orange is the county seat, which is located 110 miles east of Houston and 20 miles northeast of Port Arthur.

Texas is prone to extremely heavy rains and flooding with half of the world record rainfall rates (48 hours or less).¹ While flooding is a well-known risk, Orange County is susceptible to a wide range of natural hazards, including but not limited to extreme heat, tornadoes, hail, and wildfires. These life-threatening hazards can destroy property, disrupt the economy, and lower the overall quality of life for individuals.

While it is impossible to prevent an event from occurring, the effect from many hazards to people and property can be lessened. This concept is known as hazard mitigation, which is defined by the Federal Emergency Management Agency (FEMA) as *sustained actions taken to reduce or eliminate long-term risk to people and property from hazards and their effects.*² Communities participate in hazard mitigation by developing hazard mitigation plans. The Texas Division of Emergency Management (TDEM) and FEMA have the authority to review and approve hazard mitigation plans through the Disaster Mitigation Act of 2000.

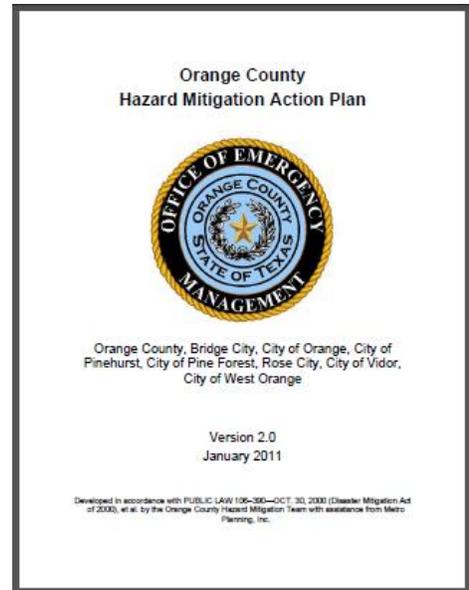
In 2005-2006, Orange County and the participating cities originally developed their Hazard Mitigation Action Plan (HMAP). Then in 2011, information about the planning area and hazard events were updated and incorporated into their HMAP update titled, "Orange County Hazard Mitigation Action Plan Version 2.0". This plan was developed by the Orange County Hazard Mitigation Team with assistance from Metro Planning, Inc.

¹ http://floodsafety.com/texas/regional_info/regional_info/dallas_zone.htm

² <http://www.fema.gov/hazard-mitigation-planning-resources>

Section 1: Introduction

The Disaster Mitigation Act requires that hazard mitigation plans be reviewed and revised every five years to maintain eligibility for Hazard Mitigation Assistance (HMA) grant funding. Since FEMA originally approved the Orange County HMAP in 2006, and then approved an update in 2011, the County began the process of developing a HMAP Update in order to maintain eligibility for grant funding within the five-year window. The South East Texas Regional Planning Commission (SETRPC) coordinated among Orange County, Hardin County, and Jefferson County to update each of their HMAP plans and selected the consultant team of H2O Partners, Inc. to write and develop the HMAP Update 2016 for each of the three counties, including Orange County. The HMAP Update planning process provided an opportunity for Orange County to evaluate successful mitigation actions and explore opportunities to avoid future disaster loss. The 2011 HMAP Update will expire in December of 2016. Therefore, the SETRPC and Orange County has selected H2O Partners, Inc. to write and develop the 2016 HMAP Update, hereinafter titled: “Orange County Hazard Mitigation Plan Update 2016: Maintaining a Safe, Secure and Sustainable Community” (Plan or Plan Update).



Hazard mitigation activities are an investment in a community’s safety and sustainability. It is widely accepted that the most effective hazard mitigation measures are implemented at the local government level, where decisions on the regulation and control of development are ultimately made. A comprehensive update to a hazard mitigation plan addresses hazard vulnerabilities that exist today and in the foreseeable future. Therefore, it is essential that a plan identify projected patterns of how future development will increase or decrease a community’s overall hazard vulnerability.

Scope and Participation

Orange County’s 2016 Plan Update is a multi-jurisdictional Plan. The participating jurisdictions include Orange County, the City of Bridge City, the City of Orange, the City of Pine Forest, the City of Pinehurst, the City of Rose City, the City of Vidor, and the City of West Orange. These jurisdictions provided valuable input into the planning process.

The focus of the 2016 Plan Update is to identify activities to mitigate hazards classified as “high” or “moderate” risk, as determined through a detailed hazard risk assessment conducted for Orange County and the participating jurisdictions. Hazards that pose a “low” or “negligible” risk will continue to be evaluated during future updates to the Plan, but may be included in the appendices and not be fully addressed until they are determined to be a high or moderate risk. The hazard classification enables the County and participating jurisdictions to prioritize mitigation actions based on hazards which can present the greatest risk to lives and property in the geographic scope (i.e., planning area).

Section 1: Introduction

Purpose

The 2016 Plan Update was prepared by Orange County, participating jurisdictions, and H2O Partners, Inc. The purpose of the Plan Update is to protect people and structures, and to minimize the costs of disaster response and recovery. The goal of the Plan Update is to minimize or eliminate long-term risks to human life and property from known hazards by identifying and implementing cost-effective hazard mitigation actions. The planning process is an opportunity for Orange County, the participating jurisdictions, stakeholders, and the general public to evaluate and develop successful hazard mitigation actions to reduce future risk of loss of life, and damage to property resulting from a disaster in the Orange County planning area.

The Mission Statement of the Plan Update is, *“Maintaining a secure and sustainable future through the revision and development of targeted hazard mitigation actions to protect life and property.”*

Orange County, participating jurisdictions, and planning participants identified eleven natural hazards to be addressed by the Plan Update. Additional hazards that have a very low risk or no risk to the planning area are included in Appendix A. The specific goals of the Plan Update are to:

- Provide a comprehensive update to the 2011 HMAP;
- Minimize disruption to Orange County and the participating jurisdictions following a disaster;
- Streamline disaster recovery by articulating actions to be taken before a disaster strikes to reduce or eliminate future damage;
- Demonstrate a firm local commitment to hazard mitigation principles;
- Serve as a basis for future funding that may become available through grant and technical assistance programs offered by the State or Federal government. The Plan Update will enable Orange County and participating jurisdictions to take advantage of rapidly developing mitigation grant opportunities as they arise; and
- Ensure that Orange County and participating jurisdictions maintain eligibility for the full range of future Federal disaster relief.

Authority



The Plan Update is tailored specifically for Orange County, participating jurisdictions, and plan participants including Planning Team members, stakeholders, and the general public who participated in the Plan Update development process. The Plan Update complies with all requirements promulgated by the Texas Division of Emergency Management (TDEM) and all applicable provisions of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, Section 104 of the Disaster Mitigation Act of 2000 (DMA 2000) (P.L. 106-390), and the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004 (P.L. 108-264), which amended the National Flood Insurance Act (NFIA) of 1968 (42 U.S.C. 4001, et al). Additionally, the Plan complies with the Interim Final Rules for the Hazard Mitigation Planning and Hazard Mitigation Grant Program (44 CFR, Part 201), which specify the criteria for approval of mitigation plans required in Section 322 of the DMA 2000 and standards found in FEMA’s “Local Mitigation Plan Review Guide” (October 2011), and the “Local Mitigation Planning Handbook” (March 2013). Additionally, the Plan is developed in accordance with FEMA’s Community Rating System (CRS) Floodplain Management Plan standards and policies.

Section 1: Introduction

Summary of Sections

Sections 1 and 2 of the Plan Update outline the Plan's purpose and development, including how Planning Team members, stakeholders, and members of the general public were involved in the planning process. Section 3 profiles the planning area's population and economy. Sections 4 through 15 present a hazard overview and information on individual natural hazards in the planning area. The hazards generally appear in order of priority based on potential losses to life and property, and other community concerns. For each hazard, the Plan Update presents a description of the hazard, a list of historical hazard events, and the results of the vulnerability and risk assessment process. Section 16 presents hazard mitigation goals and objectives, Section 17 gives an analysis for the previous actions and Section 18 presents hazard mitigation actions for Orange County and the participating jurisdictions. Section 19 identifies Plan maintenance mechanisms.

Several hazards that were included in the previous plans that have very low or no risk to the planning area are included in Appendix A and are updated with any occurrence that have occurred in the past five years. A list of Planning Team members is located in Appendix B. Public survey results are analyzed and presented in Appendix C. Appendix D contains a detailed list of critical facilities for the planning area, and Appendix E provides a list of dam locations. Appendix F contains information regarding workshops, and meeting documentation. The Capability Assessment for Orange County and the participating jurisdictions is located in Appendix G.³

³ Information contained in some of these appendices are exempt from public release under the Freedom of Information Act (FOIA).

Section 2: Planning Process

Plan Preparation and Development	1
Overview of the Plan	1
Planning Team	2
Planning Process.....	4
Kickoff Workshop.....	5
Hazard Identification.....	5
Risk Assessment	5
Mitigation Review and Development.....	5
Review and Incorporation of Existing Plans	7
Review.....	7
Incorporation of Existing Plans into the HMAP Process	7
Incorporation of the HMAP into Other Planning Mechanisms.....	8
Plan Review and Plan Update	10
Timeline for Implementing Mitigation Actions	10
Public and Stakeholder Involvement	10
Stakeholder Involvement	11
Public Meetings	11
Public Participation Survey	12

Plan Preparation and Development

Hazard mitigation planning involves coordination with various constituents and stakeholders to develop a more disaster-resistant community. Section 2 provides an overview of the planning process including the identification of key steps, and a detailed description of how stakeholders and the public were involved.

Overview of the Plan

The Southeast Regional Planning Commission (SETRPC) hired H2O Partners, Inc. (Consultant Team), to provide technical support and oversee the development of the Plan Update 2016 for Orange County. The Consultant Team used the FEMA “Local Mitigation Plan Review Guide” (October 1, 2011), and the “Local Mitigation Planning Handbook” (March 2013) to develop the Plan. The overall planning process is shown in Figure 2-1 below.

Section 2: Planning Process

Figure 2-1. Mitigation Planning Process



Orange County, participating jurisdictions, and the Consultant Team met in March 2016 to begin organizing resources, identify Planning Team members, and conduct a Capability Assessment.

Planning Team

Key members of H2O Partners, Inc. developed the Plan Update in conjunction with the Planning Team. The Planning Team was established using a direct representation model. Some of the responsibilities of the Planning Team included: completing Capability Assessment surveys, providing input regarding the identification of hazards, identifying mitigation goals, and developing mitigation strategies. An Executive Planning Team consisting of key personnel from each of the participating jurisdictions as well as Orange County, shown in Table 2-1, was formed to coordinate planning efforts, and request input and participation in the planning process. Table 2-2 reflects the Advisory Planning Team, consisting of additional representatives from area organizations and departments from the participating jurisdictions and Orange County that participated throughout the planning process.

Table 2-1. Executive Planning Team

ORGANIZATION	TITLE
City of Bridge City	Emergency Management Coordinator
City of Orange	Deputy Chief/Emergency Management Coordinator
City of Pinehurst	Emergency Management Coordinator
City of Pine Forest	Emergency Management Coordinator
City of Rose City	City Secretary
City of Vidor Police Department	Emergency Management Coordinator
City of West Orange	Emergency Management Coordinator

Section 2: Planning Process

ORGANIZATION	TITLE
Orange County	Interim Emergency Management Coordinator
Orange County	Tax Assessor-Collector
Orange County Office of Emergency Management	Emergency Management Coordinator
Orange County Publishing	Writer

Table 2-2. Advisory Planning Team

ORGANIZATION	TITLE
City of Vidor Police Department	Chief
City of West Orange Public Works	Manager
City of West Orange Public Works	Supervisor
Orange County Economic Development Center	Director
Orange County Emergency Services District #1	Chief
Orange County Emergency Services District #2	Chief
Orange County Environmental Health	Director
Orange County Human Resources	Director
Orange County Information Technology	Director
Orange County Maintenance Department	Director
Orange County Public Health	Public Health Emergency Preparedness Planner
Orange County Sheriff	Captain
Orange County Water Control #1	Finance Director
South East Texas Regional Planning Commission	Homeland Security and Emergency Management Planning Director
Vidor Independent School District Police Department	Sergeant
Vidor Independent School District Police Department	Interim Director

Additionally, a Stakeholder Group was invited to participate in the planning process via e-mail. The Consultant Team, Planning Team, and Stakeholder Group coordinated to identify mitigation goals, and develop mitigation strategies and actions for the Plan Update. Appendix B, provides a complete listing of all participating Planning Team members and stakeholders by organization and title.

Based on results of completed Capability Assessment, Orange County and participating jurisdictions described methods for achieving future hazard mitigation measures by expanding existing capabilities.

Section 2: Planning Process

For example, the City of West Orange has a floodplain manager, but no floodplain management plan or storm water management plan in place. Other options for improving capabilities include the following:

- Establishing Planning Team members with the authority to monitor the Plan Update and identify grant funding opportunities for expanding staff.
- Identifying opportunities for cross-training or increasing the technical expertise of staff by attending free training available through FEMA and the Texas Division of Emergency Management (TDEM) by monitoring classes and availability through preparetexas.org.
- Reviewing current floodplain ordinances for opportunities to increase resiliency such as modifying permitting or building codes.
- Developing ordinances that will require all new developments to conform to the highest mitigation standards.

Sample hazard mitigation actions developed with similar hazard risk were shared at the meetings. These important discussions resulted in development of multiple mitigation actions that are included in the Plan Update to further mitigate risk from natural hazards in the future.

The Planning Team developed hazard mitigation actions for mitigating risk from potential flooding and hurricanes, including providing adequate electronic signage at major intersections to warn residents of potential hazards, practicing hazard mitigation techniques, and retrofitting current facilities to mitigate hazard damage, from water and wind. In order to reduce the damage resulting from county-wide flooding that occurs during heavy rain periods, the Plan Update also includes county-wide actions to develop storm water conveyance structures to improve drainage for the county and the participating cities.

Planning Process

The process used to prepare the 2016 Plan Update followed the four major steps included at Figure 2-1. After the Planning Team was organized, a capability assessment was developed and distributed at the Kick-Off Workshop. Hazards were identified and assessed, and results associated with each of the hazards were provided at the Risk Assessment Workshop. Based on Orange County's identified vulnerabilities, specific mitigation strategies were discussed and developed at the Mitigation Strategy Workshop. Finally, Plan maintenance and implementation procedures were developed and are included in Section 19. Participation of Planning Team members, stakeholders, and the public at each of the workshops is documented in Appendix F.

At the Plan Update development workshops held throughout the planning process described herein, the following factors were taken into consideration:

- The nature and magnitude of risks currently affecting the community;
- Hazard mitigation goals to address current and expected conditions;
- Whether current resources will be sufficient for implementing the Plan Update;
- Implementation problems, such as technical, political, legal, and coordination issues that may hinder development;
- Anticipated outcomes; and
- How Orange County, participating jurisdictions, agencies, and partners will participate in implementing the Plan Update.

Section 2: Planning Process

Kickoff Workshop

The Kickoff Workshop was held at the SETRPC Offices on March 30, 2016. The initial workshop informed County officials and key department personnel about how the planning process pertained to their distinct roles and responsibilities, and engaged stakeholder groups such as the Orange County Public Health and area universities and churches. In addition to the kickoff presentation, participants received the following information:

- Project overview regarding the planning process;
- Public survey access information;
- Hazard Ranking form; and
- Capability Assessment survey for completion.

A risk ranking exercise was conducted at the Kickoff Workshop to get input from the Planning Team and stakeholders pertaining to various risks from a list of natural hazards affecting the planning area. Participants ranked hazards high to low in terms of perceived level of risk, frequency of occurrence, and potential impact.

Hazard Identification

At the Kickoff Workshop, and through e-mail and phone correspondence, the Planning Team conducted preliminary hazard identification. The Planning Team in coordination with the Consultant Team reviewed and considered a full range of natural hazards. Once identified, the teams narrowed the list to significant hazards by reviewing hazards affecting the area as a whole, the 2013 State of Texas Hazard Mitigation Plan Update, and initial study results from reputable sources such as federal and state agencies. Based on this initial analysis, the teams identified a total of eleven natural hazards which pose a significant threat to the planning area.

Risk Assessment

An initial risk assessment for Orange County and the participating jurisdictions was completed in May 2016 and results were presented to Planning Team members at the Risk Assessment Workshop held on June 1, 2016. At the workshop, the characteristics and consequences of each hazard were evaluated to determine the extent to which the planning area would be affected in terms of potential danger to property and citizens.

Potential dollar losses from each hazard were estimated by gathering data from the National Centers for Environmental Information. The assessments examined the impact of various hazards on the built environment, critical facilities, crops, and the population. The resulting risk assessment profiled hazard events, provided information on previous occurrences, estimated probability of future events, and detailed the spatial extent and magnitude of impact on people and property. Each participant at the Risk Assessment Workshop was provided a risk ranking sheet that asked participants to rank hazards in terms of the probability or frequency of occurrence, extent of spatial impact, and the magnitude of impact. The results of the ranking sheets identified unique perspectives on varied risks throughout the planning area.

The assessments were also used to set priorities for hazard mitigation actions based on potential loss of lives and dollar losses. A hazard profile and vulnerability analysis for each of the hazards can be found in Sections 4 through 15.

Mitigation Review and Development

Developing the Mitigation Strategy for the Plan Update involved identifying mitigation goals and new mitigation actions. A Mitigation Workshop was held at the SETRPC Offices on August 24, 2016. In

Section 2: Planning Process

addition to the Planning Team, stakeholder groups were invited to attend the workshop. Regarding hazard mitigation actions, Workshop participants emphasized the desire for flood and hurricane projects. Additionally, the County and participating jurisdictions were proactive in identifying mitigation actions to lessen the risk of all the identified hazards included in the Plan Update.

An inclusive and structured process was used to develop and prioritize new hazard mitigation actions for the 2016 Plan Update. The prioritization method was based on FEMA's STAPLE+E criteria and included social, technical, administrative, political, legal, economic and environmental considerations. As a result, each Planning Team Member assigned an overall priority to each hazard mitigation action. The overall priority of each action is reflected in the hazard mitigation actions found in Section 18.

Planning Team Members then developed action plans identifying proposed actions, costs and benefits, the responsible organization(s), effects on new and existing buildings, implementation schedules, priorities, and potential funding sources.

Specifically the process involved:

- Listing optional hazard mitigation actions based on information collected from previous plan reviews, studies, and interviews with federal, state and local officials. Workshop participants reviewed the optional mitigation actions and selected actions that were most applicable to their area of responsibility, cost-effective in reducing risk, easily implemented, and likely to receive institutional and community support.
- Workshop participants inventoried federal and state funding sources that could assist in implementing the proposed hazard mitigation actions. Information was collected, including the program name, authority, purpose of the program, types of assistance and eligible projects, conditions on funding, types of hazards covered, matching requirements, application deadlines, and a point of contact.
- Planning Team Members considered the benefits that would result from implementing the hazard mitigation actions compared to the cost of those projects. Although detailed cost-benefit analyses were beyond the scope of the Plan Update, Planning Team Members utilized economic evaluation as a determining factor between hazard mitigation actions.
- Planning Team Members then selected and prioritized mitigation actions.

Hazard mitigation actions identified in the process were made available to the Planning Team for review. The draft 2016 Plan Update was made available to the general public for review and comment on Orange County's website and the participating jurisdictions' websites, as shown below. A phone number was made available for the public to submit their comments:

- | | | |
|-------------------|--|-----------------------------|
| • Orange County: | www.co.orange.tx.us/OCOEM | 409-745-9717 (EMC) |
| • Bridge City: | www.bridgecitytex.com | 409-735-6801 (Captain) |
| • City of Orange: | www.orangetexas.net | 409-883-1050 (Deputy Chief) |
| • Pine Forest: | www.co.orange.tx.us/OCOEM | 409-745-9717 (EMC) |
| • Pinehurst: | www.cityofpinehursttexas.com | 409-886-2221 (Chief) |
| • Rose City: | www.co.orange.tx.us/OCOEM | 409-745-9717 (EMC) |
| • Vidor: | www.cityofvidor.com | 409-238-6448 (Sergeant) |
| • West Orange: | www.cityofwestorange.com | 409-883-7574 (Chief) |

Additionally, hard copies were made available at the following locations:

- Orange County Office of Emergency Management
- Bridge City Public Library

Section 2: Planning Process

- City of Orange Public Library
- Pine Forest City Hall
- Pinehurst City Hall
- Rose City City Hall
- Vidor Public Library
- West Orange City Hall

Review and Incorporation of Existing Plans

Review

Background information utilized during the planning process included various studies, plans, reports, and technical information from sources such as FEMA, the United States Army Corps of Engineers (USACE), the U.S. Fire Administration, National Oceanic and Atmospheric Administration (NOAA), the Texas Water Development Board (TWDB), the Texas Commission on Environmental Quality (TCEQ), the Texas State Data Center, Texas Forest Service, the Texas Division of Emergency Management (TDEM), and local hazard assessments and plans. Section 4 and the hazard-specific sections of the Plan (Sections 5-15) summarize the relevant background information.

Specific background documents, including those from FEMA, provided information on hazard risk, hazard mitigation actions currently being implemented, and potential mitigation actions. Previous hazard events, occurrences and descriptions were identified through NOAA's National Centers for Environmental Information (NCEI). Results of past hazard events were found through searching the NCEI. The USACE studies were reviewed for their assessment of risk and potential projects in the region. State Data Center documents were used to obtain population projections. The State Demographer webpages were reviewed for population and other projections and included in Section 3 of the Plan Update. Information from the Texas Forest Service was used to appropriately rank the wildfire hazard, and to help identify potential grant opportunities. Materials from FEMA and TDEM were reviewed for guidance on Plan Update development requirements.

Incorporation of Existing Plans into the HMAP Process

A Capability Assessment was completed by key Orange County and participating jurisdictions' departments which provided information pertaining to existing plans, policies, ordinances and regulations to be integrated into the goals and objectives of the Plan Update. The relevant information was included in a master Capability Assessment, Appendix G.

Existing projects and studies were utilized as a starting point for discussing hazard mitigation actions among Planning and Consultant Team members. For example, several of the participating jurisdictions discussed completing drainage studies of the various gullies and basins to identify cost effective improvements to improve drainage capacity within their cities. The Continuity of Operations plan from each participating jurisdiction is incorporated into the Plan Update as many critical facilities were identified to install generators with hardwired quick connections to ensure continuity of operations during a hazard event. Additionally, each participating jurisdiction expressed desire to digitize all of their Departments' records, so that they would not be lost due to a hazard event. Other plans were reviewed, such as Floodplain Management Plans and Storm water Management Plans, to identify any additional mitigation actions. Finally, the 2013 State of Texas Mitigation Plan Update, developed by TDEM, was discussed in the initial planning meeting in order to develop a specific group of hazards

Section 2: Planning Process

to address in the planning effort. The 2013 State Plan Update was also used as a guidance document, along with FEMA materials, in the development of the Orange County Plan Update.

Incorporation of the HMAP into Other Planning Mechanisms

Planning Team members will integrate implementation of the Plan Update with other planning mechanisms for Orange County, such as the Emergency Management Plan. Existing plans for Orange County will be reviewed, and incorporated into the Plan Update, as appropriate. This section discusses how the Plan Update will be implemented by Orange County and the participating jurisdictions. It also addresses how the Plan Update will be evaluated and improved over time, and how the public will continue to be involved in the hazard mitigation planning process.

Orange County and the participating jurisdictions will be responsible for implementing hazard mitigation actions contained in Section 18. Each hazard mitigation action has been assigned to a specific County and City department that is responsible for tracking and implementing the action.

A funding source has been listed for each identified hazard mitigation action and may be utilized to implement the action. An implementation time period has also been assigned to each hazard mitigation action as an incentive and to determine whether actions are implemented on a timely basis.

Orange County and the participating jurisdictions will integrate hazard mitigation actions contained in the Plan Update with existing planning mechanisms such as Master Storm Water and Drainage Plans, Flood and Drainage Studies, Emergency Operations or Management Plans, and other local and area planning efforts. Orange County will work closely with area organizations to coordinate implementation of hazard mitigation actions that benefit the planning area in terms of financial and economic impact.

Upon formal adoption of the 2016 Plan Update, Planning Team members from Orange County and the participating jurisdictions will review existing plans, along with building codes to guide development and ensure that hazard mitigation actions are implemented. Each of the jurisdictions will be responsible for coordinating periodic review of the Plan Update with members of the Advisory Planning Team to ensure integration of hazard mitigation strategies into these planning mechanisms and codes. The Planning Team will also conduct periodic reviews of various existing planning mechanisms and analyze the need for any amendments or updates in light of the approved Plan Update. Orange County and the participating jurisdictions will ensure that future long-term planning objectives will contribute to the goals of the Plan Update to reduce the long-term risk to life and property from moderate and high risk hazards. Within one year of formal adoption of the Plan Update, existing planning mechanisms will be reviewed and analyzed as they pertain to the Plan Update.

Planning Team members will review and revise, as necessary, the long-range goals and objectives in its strategic plan and budgets to ensure that they are consistent with the Plan Update.

Further, Orange County will work with neighboring jurisdictions to advance the goals of the Plan Update as it applies to ongoing, long-range planning goals and actions for mitigating risk to natural hazards throughout the planning area.

Table 2-3 identifies types of planning mechanisms and examples of methods for incorporating the Plan Update into other planning efforts.

Section 2: Planning Process

Table 2-3. Example of Methods of Incorporation

Planning Mechanism	Incorporation of Plan
Grant Applications	The Plan Update will be evaluated by Orange County and participating jurisdictions when grant funding is sought for mitigation projects. If a project is not in the Plan Update, an amendment may be necessary to include the action in the Plan Update.
Annual Budget Review	Various departments and key personnel that participated in the planning process for Orange County and participating jurisdictions will review the Plan Update and mitigation actions therein when conducting their annual budget review. Allowances will be made in accordance with grant applications sought, and mitigation actions that will be undertaken, according to the implementation schedule of the specific action.
Regulatory Plans	Currently, Orange County and participating jurisdictions have regulatory plans in place, such as Emergency Management Plans, Continuity of Operations Plans, Economic Development, and Evacuation Plans. The Plan Update will be consulted when County and City departments review or revise their current regulatory planning mechanisms, or in the development of regulatory plans that are not currently in place.
Capital Improvement Plans	A few of the participating jurisdictions have a Capital Improvement Plan (CIP) in place. Prior to any revisions to the CIP, the City departments will review the risk assessment and mitigation strategy sections of the HMAP, as limiting public spending in hazardous zones is one of the most effective long-term mitigation actions available to local governments.
Floodplain Management Plans	Floodplain management plans include preventative and corrective actions to address the flood hazard. Therefore, the actions for flooding, and information found in Section 5 of this Plan Update discussing the people and property at risk to flood, will be reviewed and revised when Orange County updates their management plans or develops new plans.

Appendix G provides an overview of Planning Team members' existing planning and regulatory capabilities to support implementation of mitigation strategy objectives. Appendix G also provides further analysis of how each intends to incorporate hazard mitigation actions into existing plans, policies, and the annual budget review as it pertains to prioritizing grant applications for funding and implementation of identified hazard mitigation projects.

Section 2: Planning Process

Plan Review and Plan Update

As with the development of Plan Update, Orange County will oversee the review and update process for relevance and to necessary make adjustments. At the beginning of each fiscal year, Planning Team Members will meet to evaluate the Plan Update and review other planning mechanisms to ensure consistency with long-range planning efforts. In addition, planning participants will also meet twice a year, by conference call or presentation, to re-evaluate prioritization of the hazard mitigation actions.

Timeline for Implementing Mitigation Actions

Both the Executive Planning Team (Table B-1, Appendix B), and the Advisory Planning Team (Table B-2, Appendix B), will engage in discussions regarding a timeframe for how and when to implement each hazard mitigation action. Considerations include when the action will be started, how existing planning mechanisms' timelines affect implementation, and when the action should be fully implemented. Timeframes may be general, and there will be short, medium, and long term goals for implementation based on prioritization of each action, as identified on individual Hazard Mitigation Action worksheets included in the Plan Update for Orange County and participating jurisdictions.

Both the Executive and Advisory Planning Team will evaluate and prioritize the most suitable hazard mitigation actions for the community to implement. The timeline for implementation of actions will partially be directed by Orange County's comprehensive planning process, budgetary constraints, and community needs. Orange County and the participating jurisdictions are committed to addressing and implementing hazard mitigation actions that may be aligned with and integrated into the Plan Update.

Overall, the Planning Team is in agreement that goals and actions of the Plan Update shall be aligned with the timeframe for implementation of hazard mitigation actions with respect to annual review and updates of existing plans and policies.

Public and Stakeholder Involvement

An important component of hazard mitigation planning is public participation and stakeholder involvement. Input from individual citizens and the community as a whole provides the Planning Team with a greater understanding of local concerns, and increases the likelihood of successfully implemented hazard mitigation actions. If citizens and stakeholders, such as local businesses, non-profits, hospitals, and schools are involved, they are more likely to gain a greater appreciation of the risks that hazards may present in their community and take steps to reduce or mitigate their impact.

The public was involved in the development of Orange County's 2016 Plan Update at different stages prior to official Plan Update approval and adoption. Public input was sought using three methods: (1) open public meetings; (2) survey instruments; and (3) making the draft Plan Update available for public review at Orange County's and participating jurisdictions' websites.

The draft 2016 Plan Update was made available to the general public for review and comment on the Orange County's website, as well as the participating jurisdiction's websites, along with hard copies being available at locations within each participating jurisdiction. The public was notified at the public meetings that the draft Plan Update would be available for review. Phone numbers were made available on the websites to field any feedback from the public regarding the draft. No feedback was received on the draft 2016 Plan Update, although it was given on the public survey, and all relevant information was incorporated into the Plan Update.

Section 2: Planning Process

The 2016 Plan Update will be advertised and posted on Orange County’s website and the participating jurisdictions’ websites upon approval from FEMA.

Stakeholder Involvement

Stakeholder involvement is essential to hazard mitigation planning since a wide range of stakeholders can provide input on specific topics and input from various points of view. Throughout the planning process, members of community groups, local businesses, neighboring jurisdictions, schools, and hospitals were invited to participate in development of the 2016 Plan Update. The Stakeholder Group (Table B-3 in Appendix B, and Table 2-4, below), included a broad range of representatives from both the public and private sector, and served as a key component in Orange County’s outreach efforts for development of the Plan Update. Documentation of stakeholder meetings is found in Appendix F. A list of organizations invited to attend via e-mail is found in Table 2-4.

Table 2-4. Stakeholder Working Group

AGENCY	TITLE	PARTICIPATED
Colonial Pipeline	Manager	X
Lamar University	Assistant Professor	X
Local Emergency Planning Committee	Chairperson	X
Orange Church of God	Senior Pastor	X
Orange County Public Health	Public Health Emergency Preparedness Planner	X
RPS	Senior Consulting Engineer	X
South East Texas Disaster Recovery Group	Executive Director	X
Texas House of Representatives	Texas US Representatives	X
Texas State Senate	Texas State Senator	
United Way	Executive Director	X

Stakeholders and participants from neighboring communities that attended the Planning Team and public meetings played a key role in the planning process. For example, flooding was a major concern to the stakeholders, so many of the participating jurisdictions included mitigation actions to improve their drainage systems to reduce flood damages to structures and infrastructure in the area.

Public Meetings

A series of public meetings were held throughout the planning area, to collect public and stakeholder input. Topics of discussion included the purpose of hazard mitigation, discussion of the planning process, and types of natural hazards. Representatives from area neighborhood associations, and area residents were invited to participate. Additionally, Orange County utilized social media sources including Facebook, Twitter, and the local media to increase public participation in the Plan Update development process. Documentation on the public meetings are found in Appendix F.

Public meetings were held on the following dates and locations:

Section 2: Planning Process

- March 30, 2016, SETRPC Homer E Nagel Conference Room
- June 1, 2016, Hardin County Courthouse Commissioners' Courtroom
- June 7, 2016, West Orange Community Center
- August 8, 2016, Orange County Convention Center
- August 24, 2016, Orange County Expo Center

Public Participation Survey

In addition to public meetings, the Planning and Consultant Teams developed a public survey designed to solicit public input during the planning process from citizens and stakeholders, and to obtain data regarding the identification of any potential hazard mitigation actions or problem areas. The survey was promoted by local officials and a link to the survey was posted on Orange County's website. A total of 163 surveys were completed online. The survey results are analyzed in Appendix C. Orange County reviewed the input from the surveys and decided which information to incorporate into the Plan Update as hazard mitigation actions. For example, many citizens mention concerns about flooding, and suggested levee/flood control and drainage help, such as clearing out ditches, as potential steps the jurisdictions could take. In response to public input several hazard mitigation actions were added to the Plan Update to undergo drainage, gully, and basin studies to identify cost effective actions that can be implemented to control flooding and increase drainage capacity to protect structures and infrastructures from flooding.

Section 3: County Profile

Overview	1
Population and Demographics	4
Population Growth	4
Future Development.....	5
Economic Impact.....	6
Existing and Future Land Use and Development Trends	6
Building Permits.....	6

Overview

Orange County was formed in 1852 from portions of Jefferson County and has a total area of 380 square miles. Of this total area, 334 square miles is land and 46 square miles (12%) is water. The County consists of several cities, some unincorporated communities, and a few ghost towns. The County is served by 5 school districts: Bridge City ISD, Little Cypress-Mauriceville Consolidated ISD, Orangefield ISD, Vidor ISD, and West Orange-Cove Consolidated ISD. The following cities are participating within this plan and are considered part of the planning area: the City of Bridge City, the City of Orange, the City of Pine Forest, the City of Pinehurst, the City of Rose City, the City of Vidor, and the City of West Orange. The other unincorporated communities will be considered under Orange County.

Primary waterways within Orange County include the Neches and Sabine Rivers; Adams Bayou, Anderson Gully Caney Creek, Coon Creek, Cow Bayou, Cow Bayou Tributary, Gum Gully, Little Cypress Bayou, Little Cypress Bayou Tributary, Sandy Creek, Ten Mile Creek and West For Ten Mile Creek, Tiger Creek and Walnut Run. Soils in Orange County have high concentrations of clay and loam, with low to moderate infiltration rates, and produce moderate to high runoff potential.

The geography of Orange County varies relatively little, with an elevation that reaches 33 feet above sea level at very few points within the County. The County is heavily wooded, with extensive wetlands along the Neches and Sabine River basins. Large stands of natural cypress in swamps exist north of the City of Orange along the lower Sabine River.



During World War II, Orange County was the home of a large amount of shipbuilding for the navies of the United States and allied countries. The major shipbuilder was located in Orange, which is the County Seat, and employed as many as 20,000 people at its shipyard during the war.

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

Section 3: County Profile

Figure 3-1. Location of Orange County Planning Area

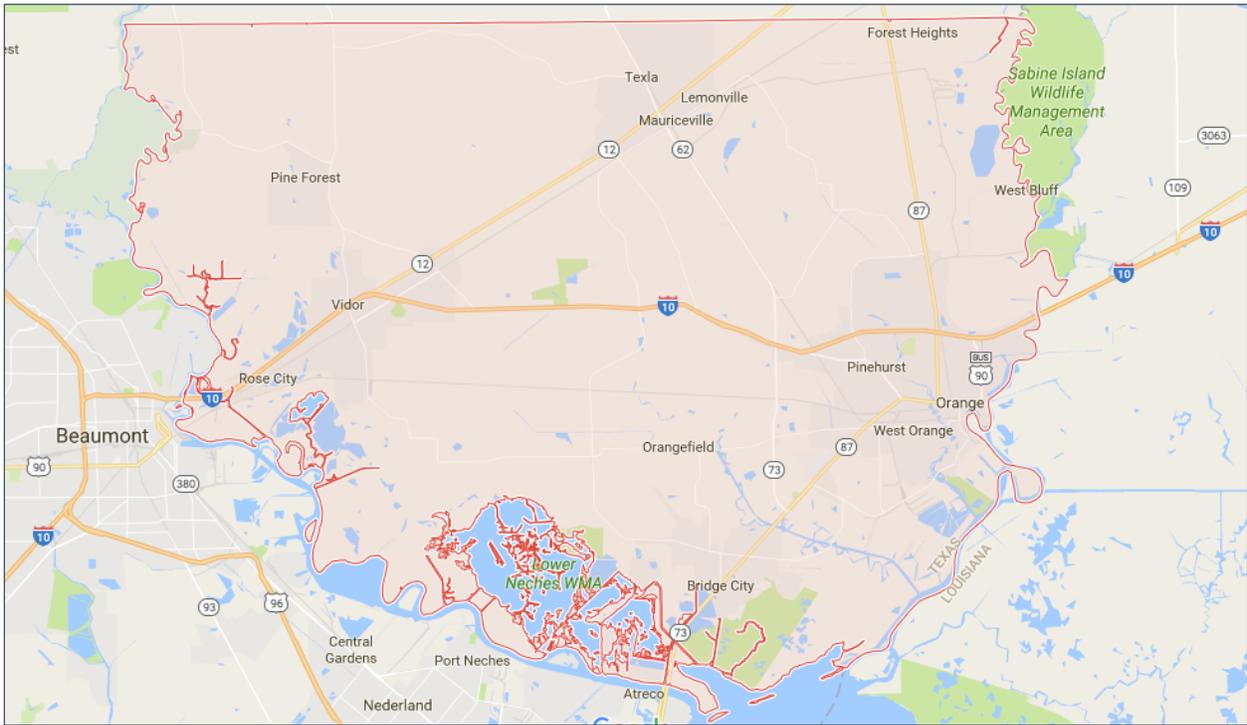
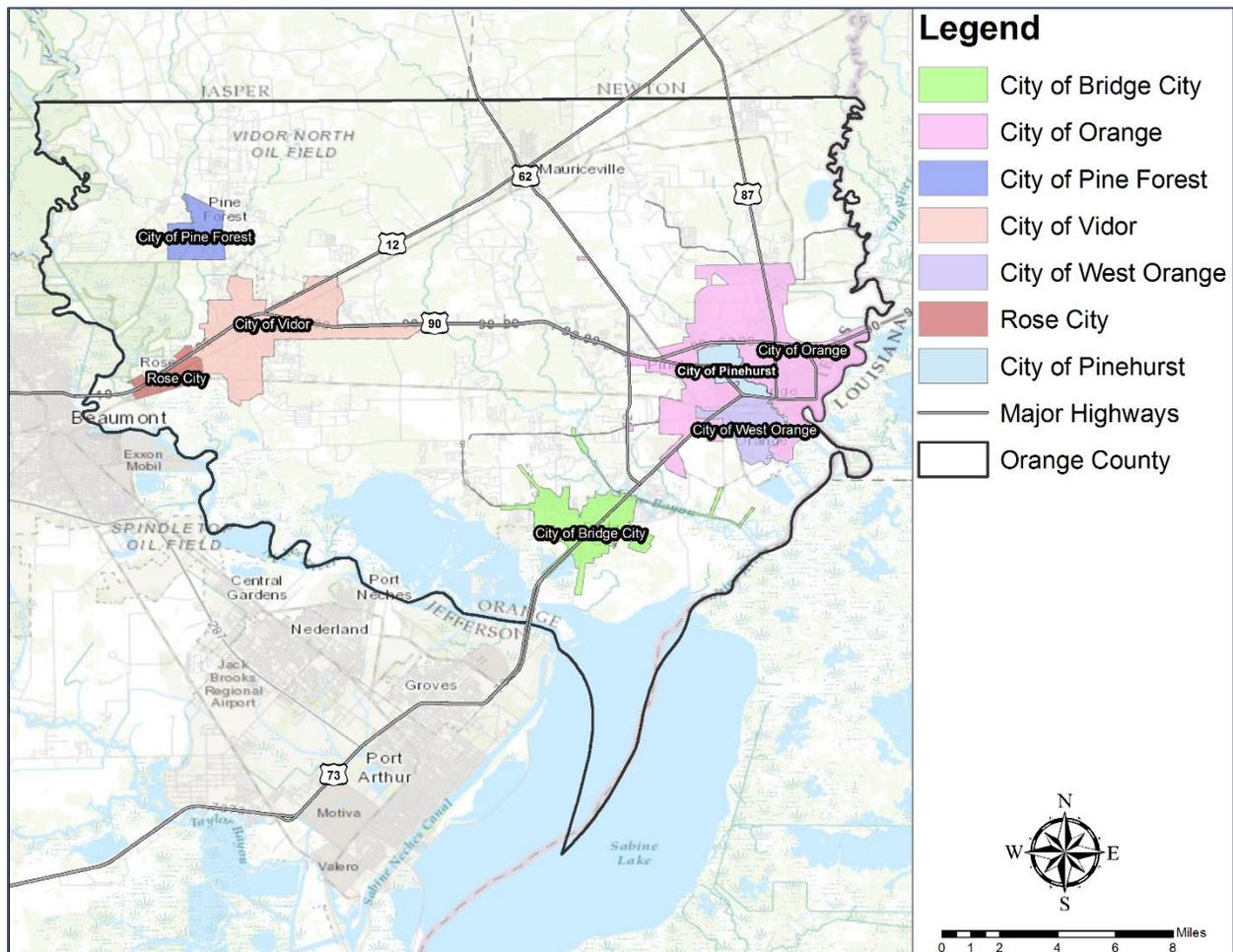


Figure 3-2 shows the Orange County Study Area, including the participating jurisdictions that are covered in the risk assessment analysis of the Plan.

Section 3: County Profile

Figure 3-2. Orange County Study Area



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

Table 3-1. Participating Jurisdictions

Orange County
City of Bridge City
City of Orange
City of Pine Forest
City of Pinehurst
City of Rose City
City of Vidor
City of West Orange

Section 3: County Profile

Population and Demographics

In the official Census population count, as of April 1, 2010, Orange County had a population of 81,837 residents. By July 2014, the number had grown to 83,519, and by July 2015, the population was 84,260. Table 3-2 provides the population distribution by jurisdiction within Orange County.¹

Between official U.S. Census population counts, the estimate uses a formula based on new residential building permits and household size. It is simply an estimate and there are many variables involved in achieving an accurate estimation of people living in a given area at a given time.

Table 3-2. Population Distribution by Jurisdiction

JURISDICTION	TOTAL 2010 POPULATION	PERCENTAGE	ESTIMATED VULNERABLE OR SENSITIVE POPULATIONS	
			Elderly (Over 65)	Below Poverty Level
Bridge City	7,840	9.6%	1,011	1,074
City of Orange	18,595	22.7%	2,957	3,775
Pine Forest	487	0.6%	74	30
Pinehurst	4,624	5.7%	480	1,452
Rose City	502	0.6%	87	60
Vidor	10,579	12.9%	1,470	1,661
West Orange	3,443	4.2%	592	444
Unincorporated Orange County	35,767	43.7%	4,786	4,598
ORANGE COUNTY TOTAL	81,837	100%	11,457	13,094

Population Growth

The official 2010 Orange County population is 81,837. Overall, Orange County experienced a decrease in population between 1980 and 2010 by 2.4%, or a decrease by 2,001 people. Bridge City, Pinehurst, and the unincorporated areas of Orange County experienced a population growth between 1980 and 2010, while the rest of the cities experienced a decrease in their population. Pinehurst was the only city to exhibit an increase in population between 2000 and 2010, while the rest of the cities and the County exhibited a decrease in population during this time period. Table 3-3 provides historic growth rates in Orange County.

¹ <http://www.census.gov/quickfacts/table/PST045215/48361,00>

Section 3: County Profile

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

JURISDICTION	1980	1990	2000	2010	POP CHANGE 1980-2010	PERCENT OF CHANGE	POP CHANGE 2000-2010	PERCENT OF CHANGE
Bridge City	7,667	8,010	8,651	7,840	173	2.3%	-811	-9.4%
City of Orange	23,628	19,336	18,633	18,595	-5,033	-21.3%	-38	-0.2%
Pine Forest	639	709	632	487	-152	-23.8%	-145	-22.9%
Pinehurst	2,928	2,682	2,274	4,624	1,696	57.9%	2,350	103.3%
Rose City	663	572	519	502	-161	-24.3%	-17	-3.3%
Vidor	11,834	10,935	11,440	10,579	-1,255	-10.6%	-861	-7.5%
West Orange	4,610	4,187	4,111	3,443	-1,167	-25.3%	-668	-16.2%
Unincorporated Orange County	31,869	34,078	38,706	35,767	3,898	12.2%	-2,939	-7.6%
COUNTY TOTAL	83,838	80,509	84,966	81,837	-2,001	-2.4%	-3,129	-3.7%

Future Development

To better understand how future growth and development in the County might affect hazard vulnerability, it is useful to consider population growth, occupied and vacant land, the potential for future development in hazard areas, and current planning and growth management efforts. This section includes an analysis of the projected population change, the number of permits that have been issued throughout the county, and economic impacts.

Population projections from 2010 to 2040 are listed in Table 3-4, as provided by the Office of the State Demographer, Texas State Data Center, and the Institute for Demographic and Socioeconomic Research. Population projections are based on a 0.5 scenario growth rate, which is 50 percent of the population growth rate that occurred during 2000-2010. This information is only available at the County level; however, the population projection shows an increase in population density for the County, which would mean overall growth for the County.

Table 3-4. Orange County Population Projects

County	LAND AREA (SQ MI)	2010		2020		2030		2040	
		Population							
		Total Number	Density (Land Area, SQ MI)	Total Number	Density (Land Area, SQ MI)	Total Number	Density (Land Area, SQ MI)	Total Number	Density (Land Area, SQ MI)
Orange	380	81,837	215.4	86,614	227.9	90,934	239.3	94,059	247.5

Section 3: County Profile

Economic Impact

Building and maintaining infrastructure depends on the economy; therefore, protecting infrastructure from risk due to natural hazards in the planning area is important to Orange County. Whether it's expanding culverts under a road that washes out during flash flooding, shuttering a fire station, or flood-proofing a wastewater facility, infrastructure must be mitigated from natural hazards in order to continue providing essential utility and emergency response services in a fast-growing planning area.

Major employers in the area are critical to the health of the economy, as well as effective transportation connectivity.

Existing and Future Land Use and Development Trends

While many of the communities located in Orange County do not yet have a Comprehensive Land Use Plan in place, Orange County is part of the South East Texas Regional Planning Commission (SETRPC) which has many departments to promote intergovernmental cooperation and coordination, conduct comprehensive regional planning, and provide a forum for the discussion and study of area issues. The Community Development Department focus on building a stronger more prosperous region through the focus on an individual community, while the Transportation and Environmental Resources department provides assistance through grants and resources regarding the environment and working with state, city, and county entities to coordinate transportation planning for the Jefferson-Orange-Hardin Regional Transportation Study area.

Building Permits

Building permits indicate what types of buildings are being constructed and their relative uses. Table 3-5 lists the number of residential building permits for Orange County that have been granted between 2010 and 2015. The data includes all sizes of family homes for reported permits, as well as the construction costs, to show the potential increase in vulnerability of structures to the various hazards reviewed in the risk assessment. The increase in vulnerability can be attributed to the higher construction costs that would be factored into repairing or replacing a structure using current market values. Permits are reported annually in September; data reflects permits for years 2010 through 2015 to demonstrate growth rates.

Table 3-5. County Residential Building Permits²

Orange County			
Year	Buildings	Units	Construction Cost
2010	214	226	\$28,355,486
2011	216	363	\$39,345,792
2012	184	184	\$27,778,591
2013	144	144	\$25,867,606
2014	233	428	\$45,117,068
2015	228	301	\$45,860,158

² <http://censtats.census.gov/cgi-bin/bldgprmt/bldgdisp.pl>

Section 4: Risk Overview

Hazard Identification	1
Natural Hazards and Climate Change.....	3
Overview of Hazard Analysis	4
Hazard Ranking	5

Hazard Identification

Section 4 is the first phase of the Risk Assessment, providing background information for the hazard identification process, and descriptions for the hazards identified. The Risk Assessment continues with Sections 5 through 15, which include hazard descriptions and vulnerability assessments.

Upon a review of the full range of natural hazards suggested under FEMA planning guidance, Orange County and the participating jurisdictions identified eleven natural hazards that are addressed in the 2016 Hazard Mitigation Plan Update (Plan or Plan Update). Of the hazards identified, ten natural hazards and one quasi-technological hazard (dam failure) were identified as significant, as shown in Table 4-1. The hazards were identified through input from Planning Team members, and a review of the current 2013 State of Texas Hazard Mitigation Plan Update (State Plan Update). Readily available online information from reputable sources such as federal and state agencies were also evaluated and utilized to supplement information as needed.

In general, there are three main categories of hazards including atmospheric, hydrologic, and technological. Atmospheric hazards, are events or incidents associated with weather generated phenomenon. Atmospheric hazards that have been identified as significant for the Orange County Planning area include extreme heat, hail, hurricane, lightning, thunderstorm wind, tornado, and winter storm (Table 4-1).

Hydrologic hazards, are events or incidents associated with water related damage and account for over 75 percent of Federal disaster declarations in the United States. Hydrologic hazards identified as significant for the planning area include flood and drought.

Technological hazards, refers to the origins of incidents that can arise from human activities, such as the construction and maintenance of dams. Technological hazards are distinct from natural hazards primarily because they originate from human activity. The risks presented by natural hazards may be increased or decreased as a result of human activity, however they are not inherently human-induced. Therefore, dam failure is classified as a quasi-technological hazard, and referred to as “technological,” in Table 4-1 for purposes of description.

For the Risk Assessment, the wildfire hazard is considered “other,” since a wildfire may be natural or human-caused, and is not considered atmospheric or hydrologic.

Section 4: Risk Overview

Table 4-1. Hazard Descriptions

HAZARD	DESCRIPTION
ATMOSPHERIC	
Extreme Heat	Extreme heat is the condition whereby temperatures hover ten degrees or more above the average high temperature in a region for an extended period of time.
Hail	Hailstorms are a potentially damaging outgrowth of severe thunderstorms. Early in the developmental stages of a hailstorm, ice crystals form within a low-pressure front due to the rapid rising of warm air into the upper atmosphere and subsequent cooling of the air mass.
Hurricane	A hurricane is an intense tropical weather system of strong thunderstorms with a well-defined surface circulation and maximum sustained winds of 74 mph or higher.
Lightning	Lightning is a sudden electrostatic discharge that occurs during an electrical storm. This discharge occurs between electrically charged regions of a cloud, between two clouds, or between a cloud and the ground.
Thunderstorm Wind	A thunderstorm occurs when an observer hears thunder. Radar observers use the intensity of the radar echo to distinguish between rain showers and thunderstorms. Lightning detection networks routinely track cloud-to-ground flashes, and therefore thunderstorms.
Tornado	A tornado is a violently rotating column of air that has contact with the ground and is often visible as a funnel cloud. Its vortex rotates cyclonically with wind speeds ranging from as low as 40 mph to as high as 300 mph. The destruction caused by tornadoes ranges from light to catastrophic, depending on the location, intensity, size, and duration of the storm.
Winter Storm	Severe winter storms may include snow, sleet, freezing rain, or a mix of these wintry forms of precipitation. Blizzards, the most dangerous of all winter storms, combine low temperatures, heavy snowfall, and winds of at least 35 miles per hour, reducing visibility to only a few yards. Ice storms occur when moisture falls and freezes immediately upon impact on trees, power lines, communication towers, structures, roads, and other hard surfaces. Winter storms and ice storms can down trees, cause widespread power outages, damage property, and cause fatalities and injuries to human life.
HYDROLOGIC	
Drought	A prolonged period of less than normal precipitation such that the lack of water causes a serious hydrologic imbalance. Common effects of drought include crop failure, water supply shortages, and fish and wildlife mortality.

Section 4: Risk Overview

HAZARD	DESCRIPTION
Flood	The accumulation of water within a body of water, which results in the overflow of excess water onto adjacent lands, usually floodplains. The floodplain is the land adjoining the channel of a river, stream, ocean, lake, or other watercourse or water body that is susceptible to flooding. Most floods fall into the following three categories: riverine flooding, coastal flooding, and shallow flooding.
OTHER	
Wildfire	A wildfire is an uncontrolled fire burning in an area of vegetative fuels such as grasslands, brush, or woodlands. Heavier fuels with high continuity, steep slopes, high temperatures, low humidity, low rainfall, and high winds all work to increase the risk for people and property located within wildfire hazard areas or along the urban/wildland interface. Wildfires are part of the natural management of forest ecosystems, but most are caused by human factors.
TECHNOLOGICAL	
Dam Failure	Dam failure is the collapse, breach, or other failure of a dam structure resulting in downstream flooding. In the event of a dam failure, the energy of the water stored behind even a small dam is capable of causing loss of life and severe property damage if development exists downstream of the dam.

Natural Hazards and Climate Change

Climate change is defined as a long-term hazard which can increase or decrease the risk of other weather hazards; and directly endangers property due to sea level rise, and biological organisms due to habitat destruction.

Global climate change is expected to exacerbate the risks of certain types of natural hazards impacted through rising sea levels, warmer ocean temperatures, higher humidity, the possibility of stronger storms and an increase in wind and flood damages due to storm surges. While sea level rise is a natural phenomenon and has been occurring for several thousand years, the general scientific consensus is that the rate has increased in the past 200 years, from 0.5 millimeters per year to 2 millimeters per year.

Texas is considered one of the more vulnerable states in the U.S. to both abrupt climate changes and to the impact of gradual climate changes to the natural and built environments. Mega-droughts can trigger abrupt changes to regional ecosystems and the water cycle, drastically increase extreme summer temperature and fire risk, and reduce availability of water resources, as Texas experienced during 2011-2012.

Paleoclimate records also show that the climate over Texas had large changes between periods of frequent mega-droughts and the periods of mild droughts that Texas is currently experiencing. While the cause of these fluctuations is unclear, it would be wise to anticipate that such changes could occur again, and may even be occurring now.

Section 4: Risk Overview

Overview of Hazard Analysis

The methodologies utilized to develop the Risk Assessment are FEMA's loss estimation software, Hazards United States Multi-Hazards (HAZUS-MH), and a statistical approach. Both methodologies provide an estimate of potential impact by using a common, systematic framework for evaluation.

Records retrieved from the National Centers for Environmental Information (NCEI) and the National Oceanic and Atmospheric Administration were reported for the Orange County planning area, including the participating jurisdictions. Remaining records identifying the occurrence of hazard events in the planning area and the maximum recorded magnitude of each event were also evaluated.

The use of geographic information system (GIS) technology to identify and assess risks for the Orange County planning area, and evaluate community assets and their vulnerability to the hazards.

The four general parameters that are described for each hazard in the Risk Assessment include frequency of return, approximate annualized losses, a description of general vulnerability, and a statement of the hazard's impact.

Frequency of return was calculated by dividing the number of events in the recorded time period for each hazard by the overall time period that the resource database was recording events. Frequency of return statements are defined in Table 4-2, and impact statements are defined in Table 4-3 below.

Table 4-2. Frequency of Return Statements

PROBABILITY	DESCRIPTION
Highly Likely	Event is probable in the next year.
Likely	Event is probable in the next three years.
Occasional	Event is probable in the next five years.
Unlikely	Event is probable in the next ten years.

Table 4-3. Impact Statements

POTENTIAL SEVERITY	DESCRIPTION
Substantial	Multiple deaths. Complete shutdown of facilities for 30 days or more. More than 50 percent of property destroyed or with major damage.
Major	Injuries and illnesses resulting in permanent disability. Complete shutdown of critical facilities for at least two weeks. More than 25 percent of property destroyed or with major damage.
Minor	Injuries and illnesses do not result in permanent disability. Complete shutdown of critical facilities for more than one week. More than 10 percent of property destroyed or with major damage.

Section 4: Risk Overview

POTENTIAL SEVERITY	DESCRIPTION
Limited	Injuries and illnesses are treatable with first aid. Shutdown of critical facilities and services for 24 hours or less. Less than 10 percent of property destroyed or with major damage.

Each of the hazard profiles includes a description of a general Vulnerability Assessment. Vulnerability is the total of assets that are subject to damages from a hazard, based on historic recorded damages. Assets in the region were inventoried and defined in hazard zones where appropriate. The total amount of damages, including property and crop damages, for each hazard is divided by the total number of assets (building value totals) in that community to determine the percentage of damage that each hazard can cause to the community.

To better understand how future growth and development in the County might affect hazard vulnerability, it is useful to consider population growth, occupied and vacant land, the potential for future development in hazard areas, and current planning and growth management efforts. Hazard vulnerability for Orange County was reviewed based on recent changes in development that occurred throughout the planning area. The Orange County planning area has grown slightly between 2010 and 2015 according to the U.S. Census Bureau, therefore there has been no significant factors or development trends with a consequential effect or increase in vulnerability to the population, infrastructure, and buildings for hazards.

Once loss estimates and vulnerability were known, an impact statement was applied to relate the potential impact of the hazard on the assets within the area of impact.

Hazard Ranking

Table 4-4 portrays the results of the County's self-assessment for hazard ranking, based on the preliminary results of the risk assessment presented at the Risk Assessment Workshop. This table also takes into account local knowledge regarding frequency of occurrence and the potential impact of each hazard.

Table 4-4. Hazard Risk Ranking

HAZARD	FREQUENCY OF OCCURENCE	POTENTIAL SEVERITY	RANKING
Flood	Highly Likely	Limited - Minor	High
Lightning	Likely	Limited	High
Hurricane	Likely	Substantial	High
Extreme Heat	Occasional	Limited	High
Thunderstorm Wind	Highly Likely	Minor	High
Drought	Occasional	Limited	High
Hail	Highly Likely	Limited	Moderate
Tornado	Occasional	Minor	Moderate

Section 4: Risk Overview

HAZARD	FREQUENCY OF OCCURENCE	POTENTIAL SEVERITY	RANKING
Wildfire	Highly Likely	Minor	Moderate
Dam Failure	Unlikely	Limited	Moderate
Winter Storm	Highly Likely	Limited	Low

Section 5: Flood

Hazard Description.....	1
Location.....	2
Extent.....	9
Historical Occurrences	12
Significant Events.....	15
Probability of Future Events	16
Vulnerability and Impact.....	16
Assessment of Impacts	18
National Flood Insurance Program (NFIP) Participation	19
NFIP Compliance and Maintenance.....	20
Repetitive Loss.....	21

Hazard Description

Floods generally result from excessive precipitation. The severity of a flood event is determined by a combination of several major factors, including: stream and river basin topography and physiography; precipitation and weather patterns; recent soil moisture conditions; and the degree of vegetative clearing and impervious surface. Typically, floods are long-term events that may last for several days.

The primary types of general flooding are inland and coastal flooding. Inland or riverine flooding is a result of excessive precipitation levels and water runoff volumes within the watershed of a stream or river. Inland or riverine flooding is overbank flooding of rivers and streams, typically resulting from large-scale weather systems that generate prolonged rainfall over a wide geographic area, thus it is a naturally occurring and inevitable event. Some river floods occur seasonally when winter or spring rainfalls fill river basins with too much water, too quickly. Torrential rains from decaying hurricanes or tropical systems can also produce river flooding.

Coastal flooding occurs when normally dry, low-lying land is flooded by seawater. The extent of coastal flooding is a function of the elevation inland flood waters penetrate which is controlled by the topography of the coastal land exposed to flooding.

Coastal flooding is largely a natural event, however human influence on the coastal environment can exacerbate coastal flooding. Extraction of water from groundwater reservoirs in the coastal zone can enhance subsidence of the land increasing the risk of flooding. Engineered protection structures along the coast such as sea walls alter the natural processes of the beach, often leading to erosion on adjacent stretches of the coast which also increases the risk of flooding. Coastal flooding is covered in detail under the profile for Hurricanes, located in Section 7.

Section 5: Flood

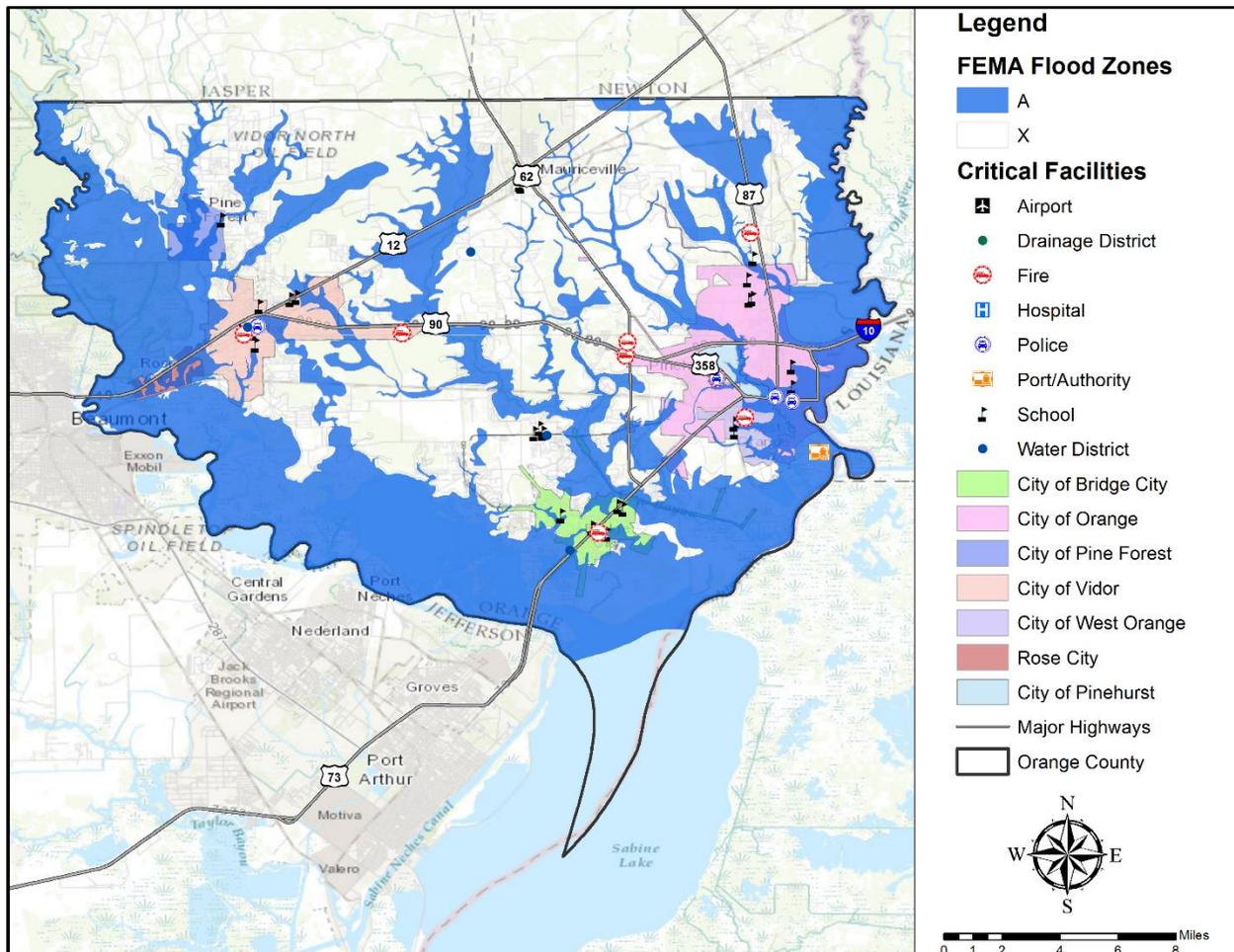
Location

The Digital Flood Insurance Rate Map (DFIRM) data provided by FEMA for Orange County shows the following flood hazard areas:

- Zone A: Areas subject to inundation by the 1-percent-annual-chance flood event generally determined using approximate methodologies. Because detailed hydraulic analyses have not been performed, no Base Flood Elevations (BFEs) or flood depths are shown. Mandatory flood insurance requirements and floodplain management standards apply.
- Zone X: Moderate risk areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than 1 foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1-percent-annual-chance flood by a levee. No BFEs or base flood depths are shown within these zones.

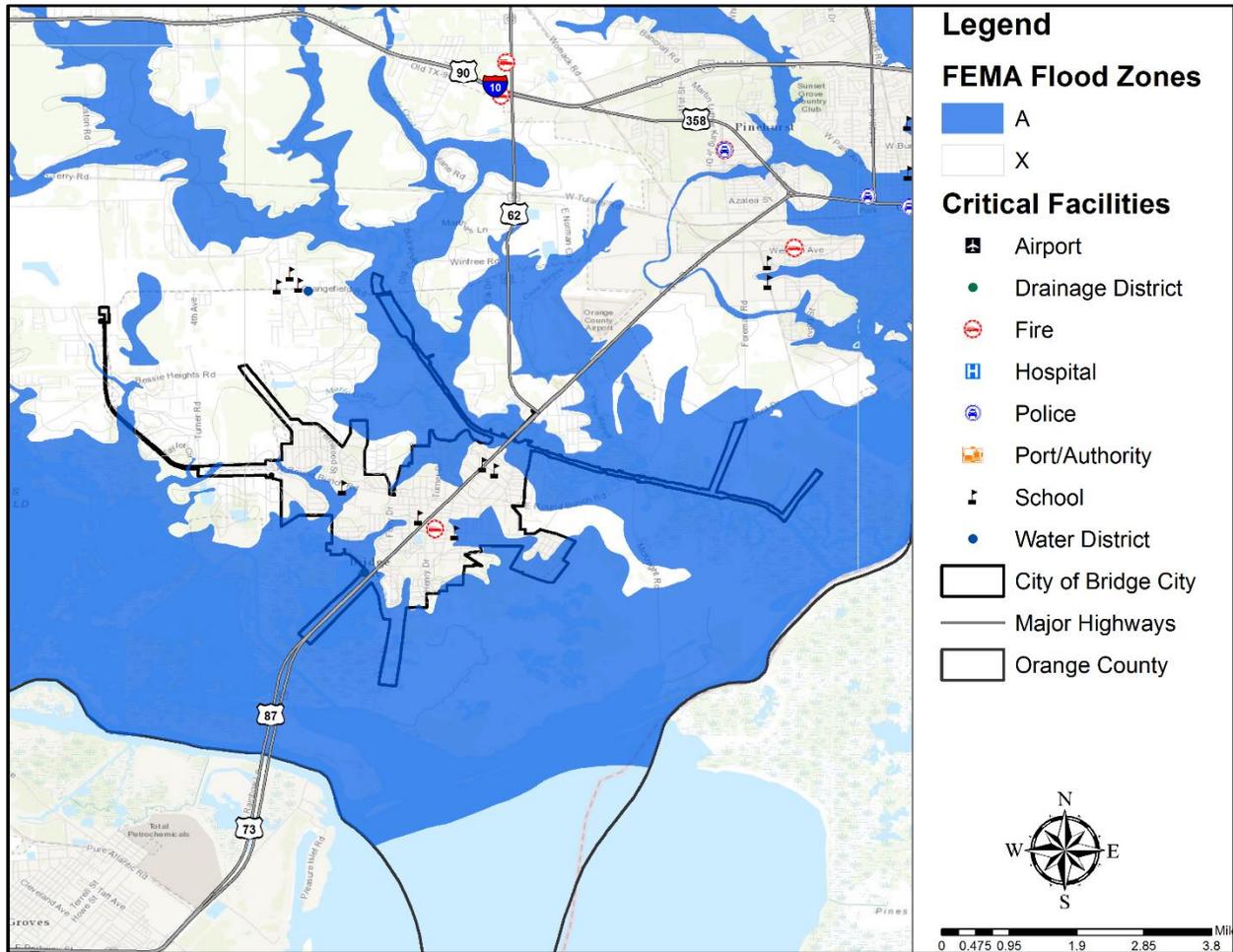
Locations of flood zones in Orange County based on the digital Flood Insurance Rate Map (DFIRM) from FEMA are illustrated in Figures 5-1 to 5-8.

Figure 5-1. Estimated Flood Zones in Orange County



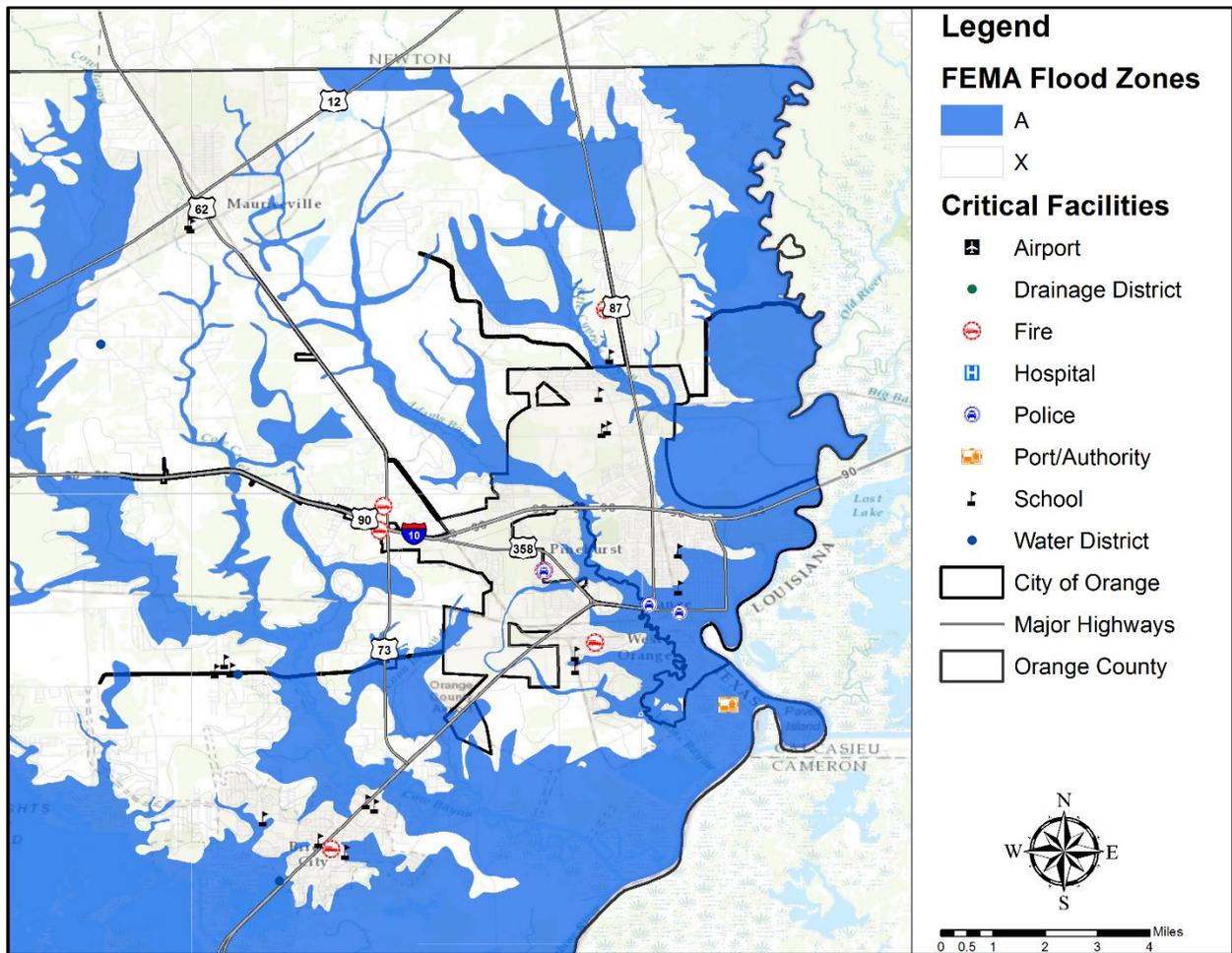
Section 5: Flood

Figure 5-2. Estimated Flood Zones in the City of Bridge City



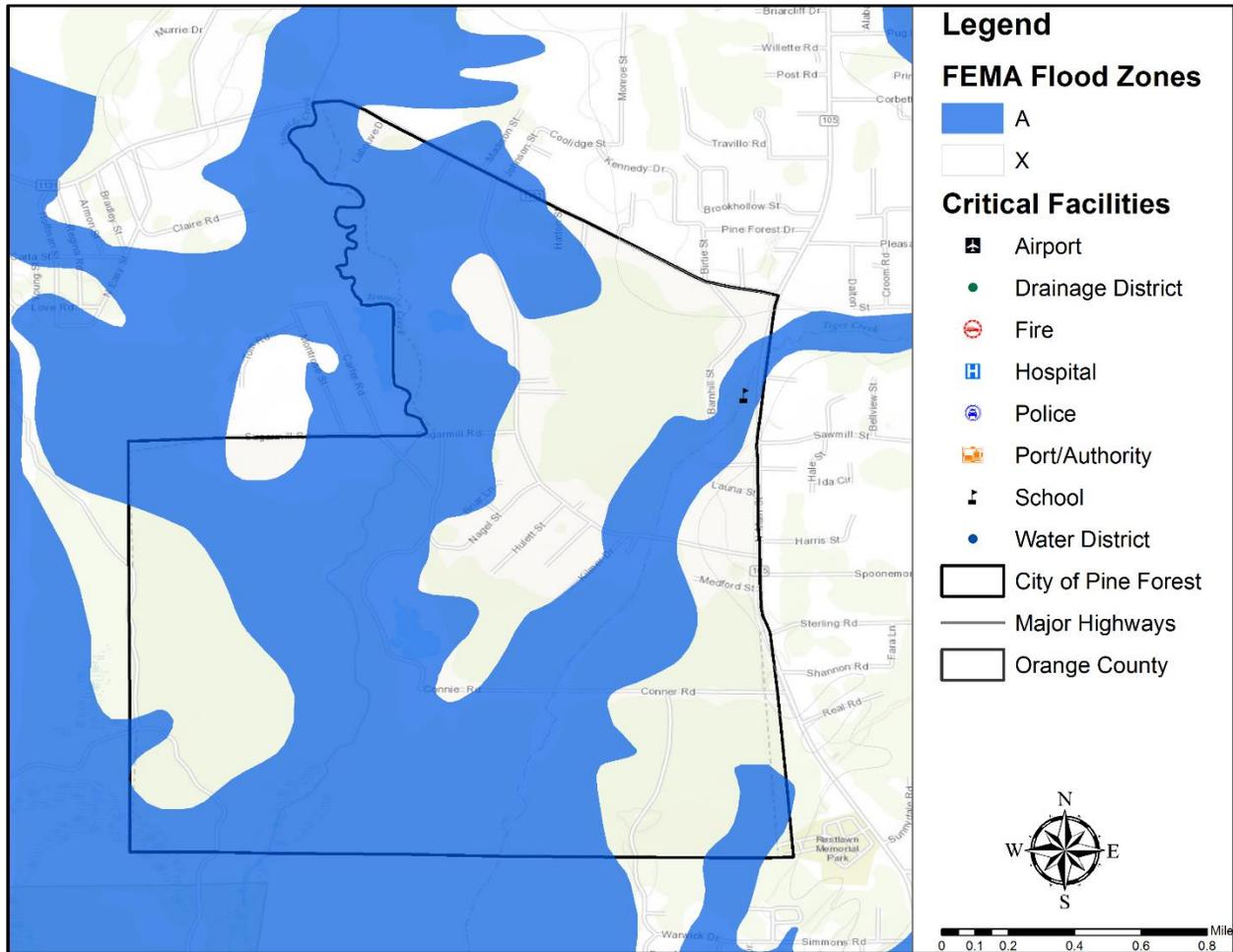
Section 5: Flood

Figure 5-3. Estimated Flood Zones in the City of Orange



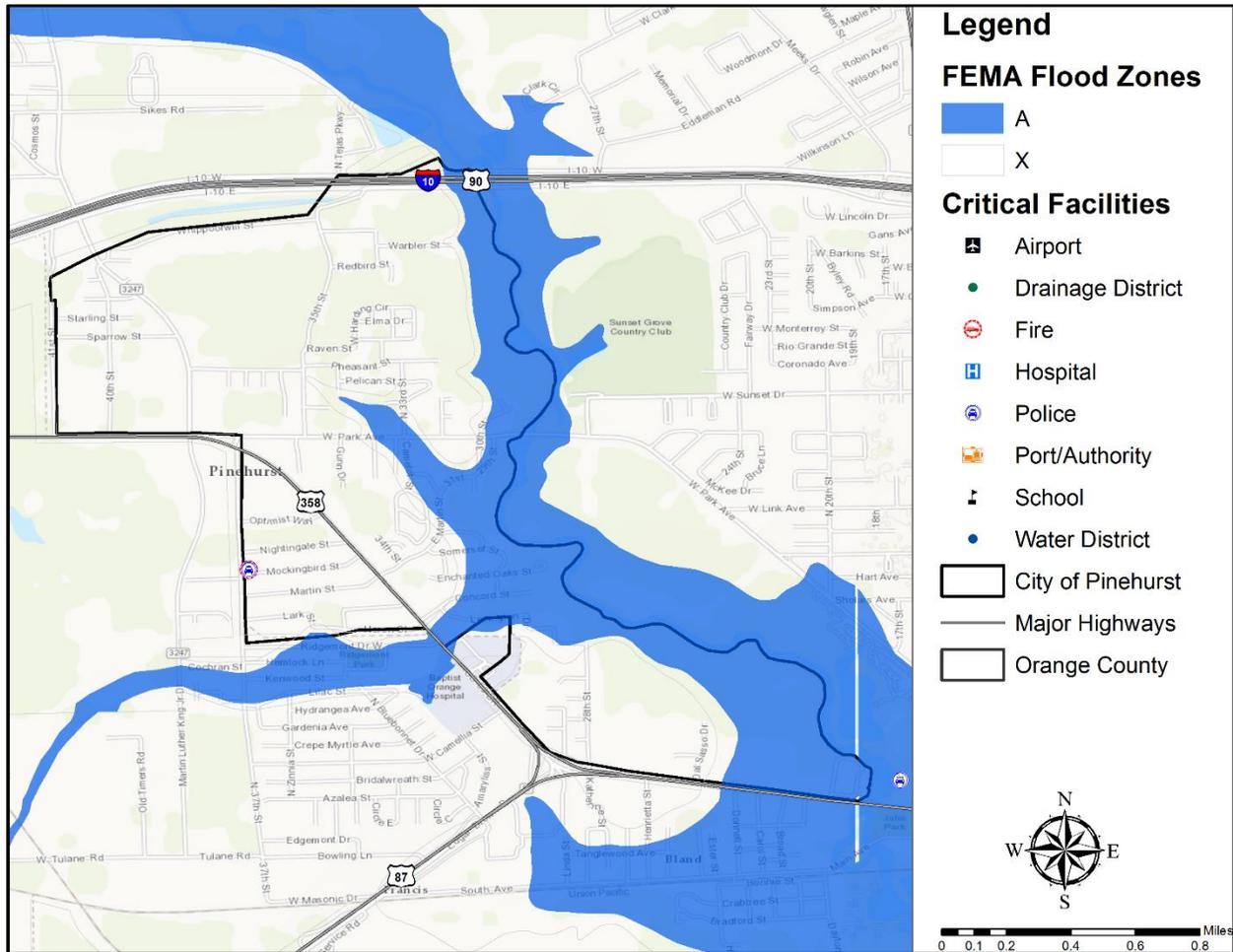
Section 5: Flood

Figure 5-4. Estimated Flood Zones in the City of Pine Forest



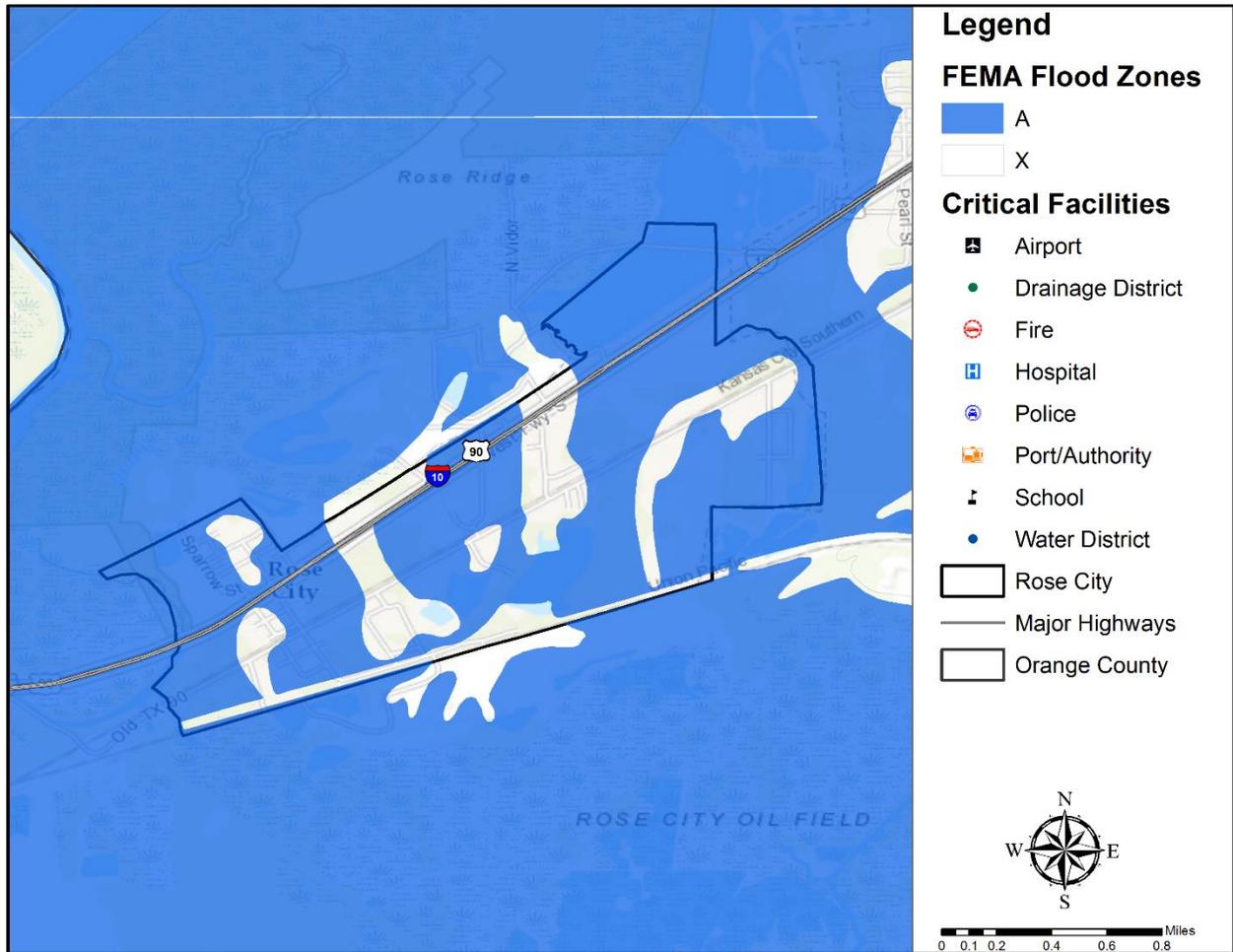
Section 5: Flood

Figure 5-5. Estimated Flood Zones in the City of Pinehurst



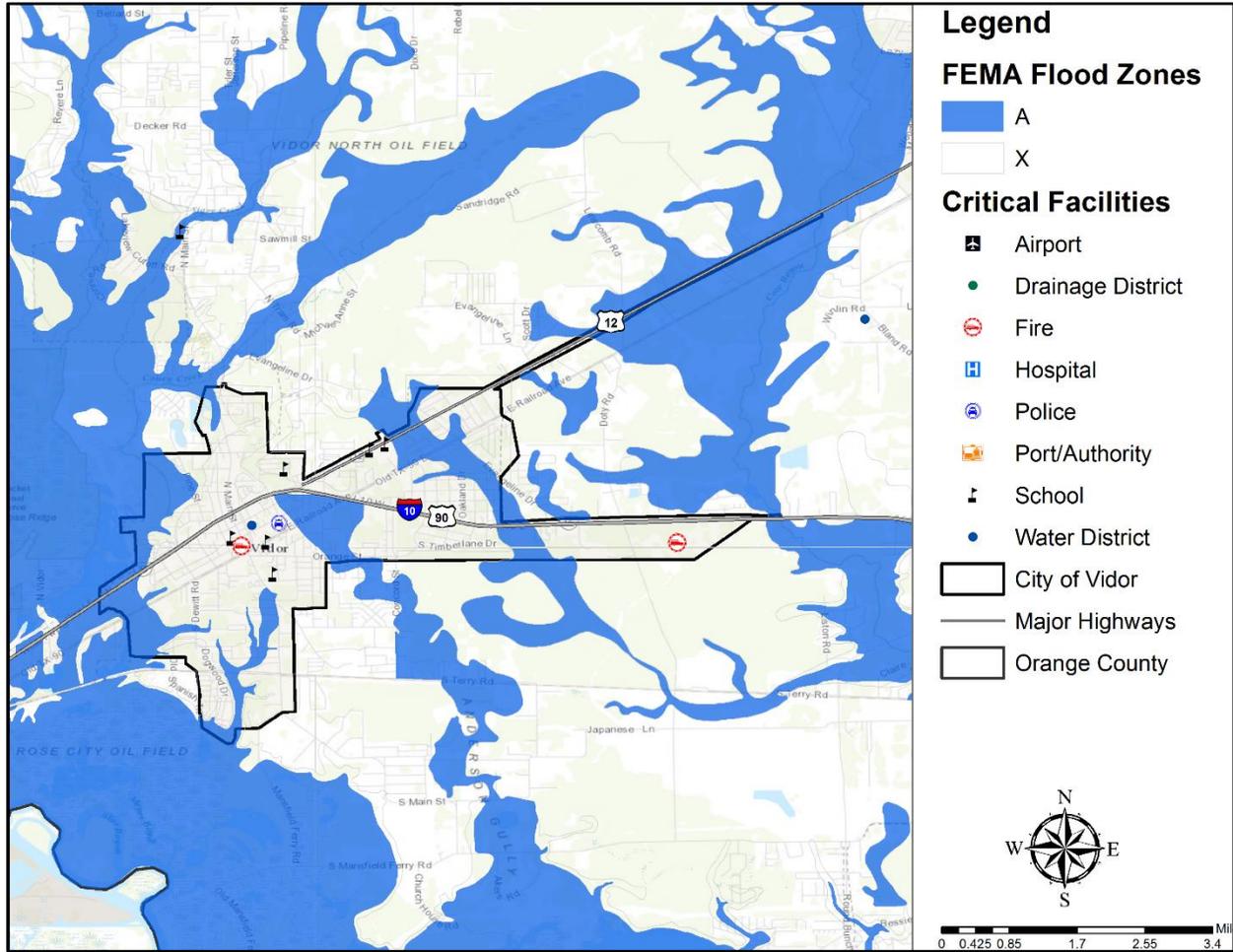
Section 5: Flood

Figure 5-6. Estimated Flood Zones in the City of Rose City



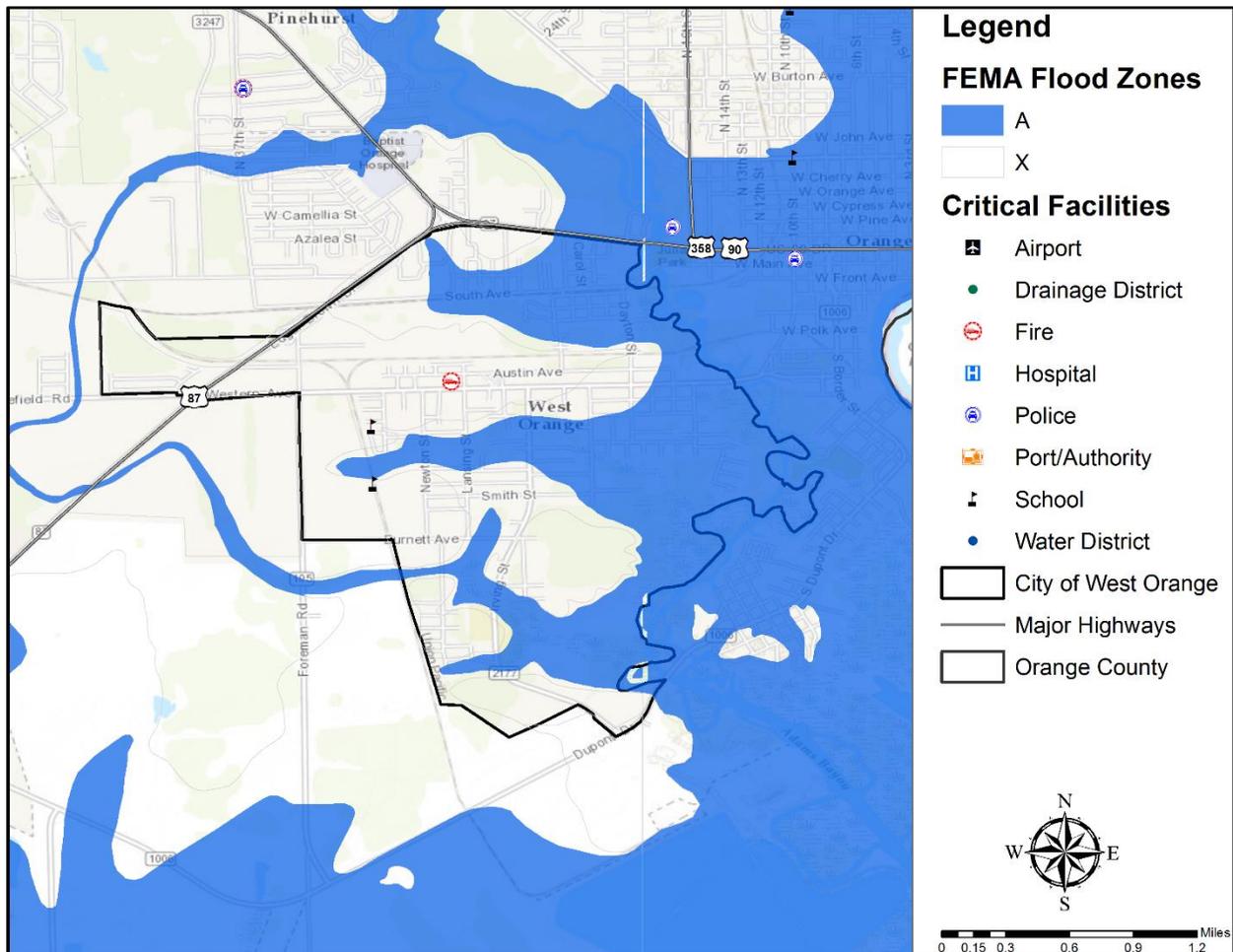
Section 5: Flood

Figure 5-7. Estimated Flood Zones in the City of Vidor



Section 5: Flood

Figure 5-8. Estimated Flood Zones in the City of West Orange



Extent

The severity of a flood event is determined by a combination of several factors including: stream and river basin topography and physiography; precipitation and weather patterns; recent soil moisture conditions; and degree of vegetative clearing and impervious surface. Typically, floods are long-term events that may last for several days.

Determining the intensity and magnitude of a flood event is dependent upon the flood zone and location of the flood hazard area in addition to depths of flood waters. Extent of flood damages can be expected to be more damaging in the areas that will convey a base flood. FEMA categorizes areas on the terrain according to how the area will convey flood water. Flood zones are the categories that are mapped on Flood Insurance Rate Maps. Table 5-1 provides a description of FEMA flood zones and the flood impact in terms of severity or potential harm. Flood Zones A and X are the only hazard areas mapped in the region. Figures 5-1 through 5-8 should be read in conjunction with the extent for flooding in Tables 5-1, 5-2, and 5-3 to determine the intensity of a potential flood event.

Section 5: Flood

Table 5-1. Flood Zones

INTENSITY	ZONE	DESCRIPTION
HIGH	ZONE A	Areas with a one percent annual chance of flooding and a 26 percent chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas, no depths or base flood elevations are shown within these zones.
	ZONE A1-30	These are known as numbered A Zones (e.g., A7 or A14). This is the base floodplain where the FIRM shows a Base Flood Elevation (BFE) (old format).
	ZONE AE	The base floodplain where base flood elevations are provided. AE Zones are now used on the new format FIRMs instead of A1-A30 Zones.
	ZONE AO	River or stream flood hazard areas and areas with a one percent or greater chance of shallow flooding each year, usually in the form of sheet flow, with an average depth ranging from one to three feet. These areas have a 26 percent chance of flooding over the life of a 30-year mortgage. Average flood depths derived from detailed analyses are shown within these zones.
	ZONE AH	Areas with a one percent annual chance of shallow flooding, usually in the form of a pond, with an average depth ranging from one to three feet. These areas have a 26 percent chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.
	ZONE A99	Areas with a one percent annual chance of flooding that will be protected by a federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones.
	ZONE AR	Areas with a temporarily increased flood risk due to the building or restoration of a flood control system (such as a levee or a dam). Mandatory flood insurance purchase requirements will apply, but rates will not exceed the rates for unnumbered A zones if the structure is built or restored in compliance with Zone AR floodplain management regulations.
	ZONE V	Areas along coasts subject to inundation by the 1-percent-annual-chance flood event with additional hazards associated with storm-induced waves. Because detailed hydraulic analyses have not been performed, no Base Flood Elevations (BFEs) or flood depths are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.
	ZONE VE	Areas subject to inundation by the 1-percent-annual-chance flood event with additional hazards due to storm-induced velocity wave action. Base Flood Elevations (BFEs) derived from detailed hydraulic

Section 5: Flood

INTENSITY	ZONE	DESCRIPTION
		analyses are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.
MODERATE to LOW	ZONE X 500	An area inundated by 500-year flooding; an area inundated by 100-year flooding with average depths of less than one foot or with drainage areas less than one square mile; or an area protected by levees from 100-year flooding.

Zone A is interchangeably referred to as the 100-year flood, the one-percent-annual chance flood, or the Special Flood Hazard Area (SFHA), or more commonly, the base flood. This is the area that will convey the base flood and constitutes a threat to the planning area. The impact from a flood event can be more damaging in areas that will convey a base flood.

Structures built in the SFHA are subject to damage by rising waters and floating debris. Moving flood water exerts pressure on everything in its path and causes erosion of soil and solid objects. Utility systems, such as heating, ventilation, air conditioning, fuel, electrical systems, sewage maintenance systems and water systems, if not elevated above base flood elevation, may also be damaged.

The intensity and magnitude of a flood event is also determined by the depth of flood waters. Table 5-2 below describes the category of risk and potential magnitude of an event in correlation to water depth. The water depths depicted in Table 5-2 are an approximation based on elevation data. Table 5-3 describes the extent associated with stream gauge data provided by the United States Geological Survey (USGS).

Table 5-2. Extent Scale – Water Depth

SEVERITY	DEPTH (in feet)	DESCRIPTION
BELOW FLOOD STAGE	0 to 15	Water begins to exceed low sections of banks and the lowest sections of the floodplain.
ACTION STAGE	16 to 23	Flow is well into the floodplain, minor lowland flooding reaches low areas of the floodplain. Livestock should be moved from low lying areas.
FLOOD STAGE	24 to 28	Homes are threatened and properties downstream of river flows or in low lying areas begin to flood.
MODERATE FLOOD STAGE	29 to 32	At this stage the lowest homes downstream flood. Roads and bridges in the floodplain flood severely and are dangerous to motorists.
MAJOR FLOOD STAGE	33 and above	Major flooding approaches homes in the floodplain. Primary and secondary roads and bridges are severely flooded and very dangerous. Major flooding extends well into the floodplain, destroying property, equipment and livestock.

Section 5: Flood

Table 5-3. Extent for Orange County¹

JURISDICTION ²	ESTIMATED SEVERITY PER FLOOD EVENT	PEAK FLOOD EVENT
Orange County	Action Stage, 16 to 23 feet	Action Stage: Cow Bayou reached an overflow elevation of 22.53 feet in October 2006 near Mauriceville, Texas.
City of Orange	Below Flood Stage, 0 to 15 feet	Below Flood Stage: Sabine River reached an overflow elevation of 9.86 feet in September 2008 at Navy Pier in the City of Orange.

The range of flood intensity that the County can experience is high, or Zone A. Based on reporting from the USGS, a flood event can place the County at the extent of “Action Flood Stage” as shown in Tables 5-2 and 5-3. Based on historical occurrences, the planning area could expect to experience from 7 to 14 inches of water within a 24 hour period due to flooding.

The data described in Tables 5-1 through 5-3, together with Figures 5-1 through 5-8, and historical occurrences for the area, provides an estimated potential magnitude and severity for the County. For example the City of West Orange, as shown in Figure 5-8, has areas designated as Zone A. Reading this figure in conjunction with Table 5-1 means the area is an area of high risk for flood.

Historical Occurrences

Historical evidence indicates that areas within the County are susceptible to flooding, especially in the form of flash flooding. It is important to note that only flood events that have been reported have been factored into this risk assessment, therefore it is likely that additional flood occurrences have gone unreported before and during the recording period. Table 5-4 identifies historical flood events that resulted in damages, injuries, or fatalities within the Orange County planning area. Table 5-5 provides the historical flood event summary by jurisdiction. Historical Data is provided by the Storm Prediction Center (NOAA), NCEI database for Orange County.

Table 5-4. Historical Flood Events, 1996-2016³

JURISDICTION	DATE	TIME	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Vidor	9/27/1996	9:00 AM	0	1	\$30,499	\$0
Bridge City	9/23/1997	3:45 PM	0	0	\$14,907	\$0
City of Orange	10/13/1997	4:00 PM	0	0	\$7,454	\$0
Vidor	1/13/1998	11:00 AM	0	0	\$14,679	\$0
Bridge City	1/21/1998	11:20 PM	0	0	\$29,357	\$0

¹ Severity estimated by averaging floods at certain stage level over the history of flood events. Severity and peak events are based on U.S. Geological Survey data.

² Severity is provided for jurisdictions where peak data was provided.

³ Only recorded events with fatalities, injuries, and/or damages are listed, values are in 2016 dollars.

Section 5: Flood

JURISDICTION	DATE	TIME	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
City of Orange	8/14/1998	1:00 PM	0	0	\$14,679	\$0
City of Orange	9/11/1998	1:00 PM	0	0	\$73,393	\$0
City of Orange	9/13/1998	10:00 AM	0	0	\$146,786	\$0
Bridge City	10/18/1998	4:00 PM	0	0	\$29,357	\$0
City of Orange	6/25/1999	12:30 PM	0	0	\$14,361	\$0
Orange County	3/4/2001	12:00 AM	0	0	\$67,550	\$0
Vidor	5/26/2001	3:15 PM	0	0	\$6,755	\$0
Vidor	6/7/2001	4:00 AM	0	0	\$337,748	\$0
Vidor	6/8/2001	6:10 AM	0	0	\$67,550	\$0
City of Orange	8/31/2001	7:30 AM	0	0	\$27,020	\$0
Orange County	9/1/2001	10:00 AM	0	0	\$67,550	\$0
Orange County	9/2/2001	8:00 AM	0	0	\$101,325	\$0
Vidor	11/27/2001	1:00 PM	0	0	\$13,510	\$0
Orange County	6/27/2002	3:00 AM	0	0	\$6,650	\$0
Orange County	8/15/2002	4:00 AM	0	0	\$26,599	\$0
Orange County	10/29/2002	12:10 AM	0	0	\$3,989,900	\$0
Vidor	11/3/2002	12:00 PM	0	0	\$664,983	\$0
City of Orange	12/4/2002	7:30 AM	0	0	\$13,300	\$0
Orange County	9/12/2003	7:00 AM	0	0	\$32,508	\$0
Vidor	10/9/2003	3:35 PM	0	0	\$13,003	\$0
Bridge City	9/23/2004	10:50 PM	0	0	\$12,666	\$0
Vidor	7/7/2005	2:39 AM	0	0	\$6,125	\$0
Vidor	7/14/2005	1:30 PM	0	0	\$2,450	\$0
City of Orange	5/29/2006	6:07 AM	0	0	\$29,670	\$0
Vidor	5/29/2006	3:20 AM	0	0	\$29,670	\$0
West Orange	5/29/2006	9:23 AM	0	0	\$29,670	\$0

Section 5: Flood

JURISDICTION	DATE	TIME	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Orange County	6/19/2006	7:00 AM	0	0	\$5,934	\$0
City of Orange	7/26/2006	9:15 AM	0	0	\$11,868	\$0
Orange County	10/16/2006	12:00 PM	0	0	\$4,747,242	\$0
Orange County	10/26/2006	4:00 PM	0	0	\$593,405	\$0
Vidor	2/12/2007	8:21 PM	0	0	\$5,770	\$0
Vidor	7/6/2007	10:00 AM	0	0	\$11,539	\$0
Vidor	9/13/2007	4:50 AM	0	0	\$11,539	\$0
Vidor	7/24/2008	11:25 AM	0	0	\$11,113	\$0
Bridge City	4/18/2009	5:30 PM	0	0	\$22,305	\$0
Orange County	11/3/2009	12:00 AM	0	0	\$111,524	\$0
Orange County	3/20/2012	2:08 PM	0	0	\$1,979,999	\$0
Bridge City	3/21/2012	2:00 AM	1	0	\$1,042	\$0
Orange County	1/9/2013	3:47 PM	0	0	\$5,135	\$0
Pine Forest	3/11/2016	12:00 AM	0	0	\$500,000	\$0
Orange County	3/14/2016	12:00 PM	0	0	\$6,400,000	\$0
Orange County	6/4/2016	6:00 PM	0	0	\$250,000	\$0

Table 5-5. Summary of Historical Flood Events, 1996-2016⁴

JURISDICTION	Number of Events	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Orange County	18	0	0	\$18,385,321	\$0
Bridge City	6	1	0	\$109,635	\$0
City of Orange	9	0	0	\$338,530	\$0
Pine Forest	1	0	0	\$0	\$0
Pinehurst	1	0	0	\$500,000	\$0
Rose City	1	0	0	\$0	\$0

⁴ Values are in 2016 dollars.

Section 5: Flood

JURISDICTION	Number of Events	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Vidor	18	0	1	\$1,226,934	\$0
West Orange	2	0	0	\$29,670	\$0
TOTAL LOSSES	56	1	1	\$20,590,090	

Based on the list of historical flood events for the Orange County planning area (listed above), including all participating jurisdictions, 12 of the events have occurred since the 2011 Plan.

Significant Events

Flash Flood on June 7, 2001 – Orange County

Tropical Storm Allison caused minor problems along coastal sections of southeast Texas, but eventually resulted in catastrophic flood losses further inland. Wind gusts of 30 to 40 mph resulted in minor roof damage to less than ten homes along the coast in Jefferson County between the evening of June 5th and the early morning hours of June 6th. A two foot storm surge resulted in minor beach erosion and portions of Highway 82 between Sabine Pass and Port Arthur to go under water during high tide during the nighttime high tide of June 5th to 6th. The specific flood events that occurred between June 7th and 9th were a result of the remnants of Tropical Storm Allison, as it meandered across southeast and east Texas. Nearly 20 homes were damaged in rural sections of Orange County, mainly north of Vidor, after ten inches of rain fell in less than six hours. Some roads and bridges were also damaged.

Flash Flood on October 29, 2002 – Orange County, City of Orange, Vidor

Excessive rainfall in a short period of time impacted portions of Orange County on October 29, 2002. Over 600 homes across Orange County had water enter them after 6 to 8 inches of rain fell in less than 6 hours. Of the 600 homes, around 300 were located in Orange, and 150 in Vidor. Damages were estimated at approximately \$3,000,000.

Flood on October 16, 2006 – Orange County

An abundance of moisture and high wind shear resulted in flash floods across southeast Texas. Two day rain totals of 12 to 16 inches resulted in long duration flooding across portions of Orange County. The hardest hit areas were near Mauriceville, and along the Neches River near Lakeview. At least 40 homes were destroyed and another 60 were damaged. Damages were estimated at approximately \$4,000,000.

Flood on March 14, 2016 – Orange County

Flood water from heavy rain on the 9th and 10th gradually flowed down the Sabine River to Orange County. The river at Orange crested on the 17th at 7.62 feet. This was 2.24 feet below the record set during Hurricane Ike in 2008 and was the second highest crest recorded. Areas north of Interstate 10 had much higher levels since the freeway and railroads acted as a damn holding back water. Most homes along the river flooded with some taking several feet of water, especially north of I-10. Roughly 1,500 structures were affected during the event with 190 structures flooded which includes 177 residences. This caused an estimated \$2 million in damage to public infrastructure and roughly \$4.4 million to private structures.

Section 5: Flood

Probability of Future Events

Based on recorded historical occurrences and extent within the Orange County planning area, flooding is highly likely and an event will likely occur within the next year.

Vulnerability and Impact

A property's vulnerability to a flood depends on its location and proximity to the floodplain. Structures that lie along banks of a waterway are the most vulnerable and are often repetitive loss structures.

All participating jurisdictions encourage development outside of the floodplain, although there are some critical facilities, homes, and businesses already located in the floodplain. Table 5-6 includes critical facilities in the planning area that are located in the floodplain and are vulnerable to flooding.

Table 5-6. Critical Facilities in the Floodplain by Jurisdiction

JURISDICTION	CRITICAL FACILITIES
Orange County	Port Authority
Bridge City	2 Schools
City of Orange	3 Schools, 2 Police Stations
Pine Forest	1 School
Pinehurst	None
Rose City	None
Vidor	None
West Orange	None

Historic loss estimates due to flood are presented in Table 5-7 below. Considering 56 flood events over a 21-year period, frequency is approximately two to three events every year.

Table 5-7. Potential Annualized Losses by Jurisdiction, 1996-2016⁵

JURISDICTION	PROPERTY & CROP LOSS	ANNUAL LOSS ESTIMATE
Orange County	\$18,385,321	\$875,491
Bridge City	\$109,635	\$5,221
City of Orange	\$338,530	\$16,120
Pine Forest	\$0	\$0
Pinehurst	\$500,000	\$23,810

⁵ Values are in 2016 dollars.

Section 5: Flood

JURISDICTION	PROPERTY & CROP LOSS	ANNUAL LOSS ESTIMATE
Rose City	\$0	\$0
Vidor	\$1,226,934	\$58,425
West Orange	\$29,670	\$1,413
Planning Area	\$20,590,090	\$980,480

The severity of a flooding event varies depending on the relative risk to citizens and structures located within each city. Table 5-8 depicts the level of impact for Orange County and each participating city.

Table 5-8. Impact by Jurisdiction

JURISDICTION	IMPACT	DESCRIPTION
Orange County	Minor	Any injuries and/or illnesses do not result in permanent disability. Complete shutdown of facilities and services for more than 1 week. More than 10 percent of property is destroyed or with major damage.
Bridge City	Limited	Any injuries or illnesses would be treatable with first aid, with minor quality of life lost. If critical facilities are shut down it would be for 24 hours or less, and it is expected that less than 10 percent of property would be destroyed or damaged in the city.
City of Orange	Limited	Any injuries or illnesses would be treatable with first aid, with minor quality of life lost. If critical facilities are shut down it would be for 24 hours or less, and it is expected that less than 10 percent of property would be destroyed or damaged in the city.
Pine Forest	Limited	Any injuries or illnesses would be treatable with first aid, with minor quality of life lost. If critical facilities are shut down it would be for 24 hours or less, and it is expected that less than 10 percent of property would be destroyed or damaged in the city.
Pinehurst	Limited	Any injuries or illnesses would be treatable with first aid, with minor quality of life lost. If critical facilities are shut down it would be for 24 hours or less, and it is expected that less than 10 percent of property would be destroyed or damaged in the city.
Rose City	Limited	Any injuries or illnesses would be treatable with first aid, with minor quality of life lost. If critical facilities are shut down it would be for 24 hours or less, and it is expected that less than 10 percent of property would be destroyed or damaged in the city.
Vidor	Minor	Any injuries and/or illnesses do not result in permanent disability. Complete shutdown of facilities and services for more than 1 week. More than 10 percent of property is destroyed or with major damage.
West Orange	Limited	Any injuries or illnesses would be treatable with first aid, with minor quality of life lost. If critical facilities are shut down it would be for 24 hours or less, and it is expected that less than 10 percent of property would be destroyed or damaged in the city.

Section 5: Flood

Assessment of Impacts

Flooding is the deadliest natural disaster that occurs in the U.S. each year, and it poses a constant and significant threat to the health and safety of the people in the planning area. Impacts to the planning area can include:

- Recreation activities along the Sabine River or at Sabine Lake may be unavailable and tourism can be unappealing for years following a large flood event, devastating directly related local businesses and negatively impacting economic recovery.
- The Lower Neches Wildlife Management Area may suffer significant wildlife mortality during and following a flood due to damaged or destroyed ecosystems and water contamination.
- The Orange County Airport may be damaged or inaccessible, creating delays in emergency response and supplies.
- Flood-related rescues may be necessary at swift water and low water crossings or in flooded neighborhoods where roads have become impassable, placing first responders in harm's way.
- Evacuations may be required for entire neighborhoods because of rising floodwaters, further taxing limited response capabilities and increasing sheltering needs for displaced residents.
- Health risks and threats to residents are elevated after the flood waters have receded due to contaminated flood waters (untreated sewage and hazardous chemicals) and mold growth typical in flooded buildings and homes.
- Significant flood events often result in widespread power outages increasing the risk to more vulnerable portions of the population who rely on power for health and/or life safety.
- Extended power outage can result in an increase in structure fires and/or carbon monoxide poisoning, as individuals attempt to cook or heat their home with alternate, unsafe cooking or heating devices, such as grills.
- Floods can destroy or make residential structures uninhabitable, requiring shelter or relocation of residents in the aftermath of the event.
- First responders are exposed to downed power lines, contaminated and potentially unstable debris, hazardous materials, and generally unsafe conditions, elevating the risk of injury to first responders and potentially diminishing emergency response capabilities.
- Emergency operations and services may be significantly impacted due to damaged facilities.
- Significant flooding can result in the inability of emergency response vehicles to access areas of the community.
- Critical staff may suffer personal losses or otherwise impacted by a flood event and unable to report for duty, limiting response capabilities.
- County or City departments may be flooded, delaying response and recovery efforts for the entire community.
- Private sector entities that the County or City and its residents rely on, such as utility providers, financial institutions, and medical care providers may not be fully operational and may require assistance from neighboring communities until full services can be restored.
- Damage to infrastructure may slow economic recovery since repairs may be extensive and lengthy.
- Some businesses not directly damaged by the flood may be negatively impacted while utilities are being restored or water recedes, further slowing economic recovery.
- When the community is affected by significant property damage it is anticipated that funding would be required for infrastructure repair and restoration, temporary services and facilities, overtime pay for responders, as well as normal day-to-day operating expenses.
- Displaced residents may not be able to immediately return to work, further slowing economic recovery.

Section 5: Flood

- Residential structures substantially damaged by a flood may not be rebuilt for years and uninsured or underinsured residential structures may never be rebuilt, reducing the tax base for the community.
- Large floods may result in a dramatic population fluctuation, as people are unable to return to their homes or jobs and must seek shelter and/or work outside of the affected area.
- Businesses that are uninsured or underinsured may have difficulty reopening, which results in a net loss of jobs for the community and a potential increase in the unemployment rate.
- Flooding may cause significant disruptions of clean water and sewer services, elevating health risks and delaying recovery efforts.
- The psycho-social effects on flood victims and their families can traumatize them for long periods of time, creating long term increases in medical treatment and services.
- Extensive or repetitive flooding can lead to decreases in property value for the affected community.
- Flood poses a potential catastrophic risk to annual and perennial crop production and overall crop quality leading to higher food costs.
- Flood related declines in production may lead to an increase in unemployment.
- Large floods may result in loss of livestock, potential increased livestock mortality due to stress and water borne disease, and increased cost for feed.

The overall extent of damages caused by floods is dependent on the extent, depth and duration of flooding, and the velocities of flows in the flooded areas. The level of preparedness and pre-event planning done by government, businesses and citizens will contribute to the overall economic and financial conditions in the aftermath of a flood event.

National Flood Insurance Program (NFIP) Participation

Flood insurance offered through the National Flood Insurance Program (NFIP) is the best way for home and business owners to protect themselves financially against the flood hazard. All of the jurisdictions located in Orange County participate in the NFIP.

As an additional indicator of floodplain management responsibility, communities may choose to participate in FEMA's Community Rating System (CRS). This is an incentive-based program that allows communities to undertake flood mitigation activities that go beyond NFIP requirements. Currently, none of the communities in Orange County participate in CRS.

Orange County and participating jurisdictions in the NFIP currently have in place minimum NFIP standards for new construction and substantial Improvements of structures. All jurisdictions are considering adopting additional higher regulatory NFIP standards to limit floodplain development.

The flood hazard areas throughout Orange County are subject to periodic inundation, which may result in loss of life and property, health and safety hazards, disruption of commerce and governmental services, and extraordinary public expenditures for flood protection and relief, of which adversely affect public safety.

These flood losses are created by the cumulative effect of obstructions in floodplains which cause an increase in flood heights and velocities, and by the occupancy of flood hazard areas by uses vulnerable to floods and hazardous to other lands because they are inadequately elevated, flood-proofed or otherwise protected from flood damage. Mitigation actions are included to address flood maintenance issues as well, including routinely clearing debris from roadside ditches and bridges, and expanding drainage culverts and storm water structures to more adequately convey flood waters.

Section 5: Flood

It is the purpose of Orange County and NFIP jurisdictions participating in the Hazard Mitigation plan to continue to promote the public health, safety and general welfare by minimizing public and private losses due to flood conditions in specific areas. Each of the NFIP participating jurisdictions in the Plan Update are guided by their local Flood Damage Prevention Ordinance. These communities will continue to comply with NFIP requirements through their local permitting, inspection, and record-keeping requirements for new and substantially developed construction. Further, the NFIP program for each of the participating jurisdictions promotes sound development in floodplain areas and includes provisions designed to:

- Protect human life and health;
- Minimize expenditure of public money for costly flood control projects;
- Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
- Minimize prolonged business interruptions;
- Minimize damage to public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, streets and bridges located in floodplains;
- Help maintain a stable tax base by providing for the sound use and development of flood-prone areas in such a manner as to minimize future flood blight areas; and
- Ensure that potential buyers are notified that property is in a flood area.

In order to accomplish these tasks, Orange County and participating NFIP jurisdictions seek to follow these guidelines to achieve flood mitigation by:

- Restrict or prohibit uses that are dangerous to health, safety or property in times of flood, such as filling or dumping, that may cause excessive increases in flood heights or velocities;
- Require that uses vulnerable to floods, including facilities, which serve such uses, be protected against flood damage at the time of initial construction, as a method of reducing flood losses;
- Control the alteration of natural floodplains, stream channels, and natural protective barriers, which are involved in the accommodation of floodwaters;
- Control filling, grading, dredging and other development, which may increase flood damage; and
- Prevent or regulate the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards to other lands.

NFIP Compliance and Maintenance

As mentioned, Orange County and participating jurisdictions have developed mitigation actions that relate to either NFIP maintenance or compliance. Compliance and maintenance actions can be found in Section 19.

Flooding was identified by the majority of the communities as a high risk hazard during hazard ranking activities at the Risk Assessment Workshop. As a result, many of the mitigation actions were developed with flood mitigation in mind. A majority of these flood actions address compliance with the NFIP and implementing flood awareness programs. County-wide, communities recognize the need and are working towards adopting higher NFIP regulatory standards to further minimize flood risk in their community. Smaller no-growth communities that typically do not have personnel or funds to implement more stringent NFIP compliance measures are focusing on NFIP public awareness activities. This includes promoting the availability of flood insurance by placing NFIP brochures and flyers in public libraries or public meeting places.

Section 5: Flood

Repetitive Loss

The Severe Repetitive Loss (SRL) Grant Program under FEMA provides federal funding to assist states and communities in implementing mitigation measures to reduce or eliminate the long-term risk of flood damage to severe repetitive loss residential structures insured under the NFIP. The Texas Water Development Board (TWDB) administers the SRL grant program for the State of Texas.

Severe Repetitive Loss properties are defined as residential properties that are:

- Covered under the NFIP and have at least four flood related damage claim payments (building and contents) over \$5,000.00 each, and the cumulative amount of such claims payments exceed \$20,000; or
- At least two separate claim payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.

In either scenario, at least two of the referenced claims must have occurred within any ten-year period, and must be greater than 10 days apart.⁶ Table 5-9 shows repetitive loss and severe repetitive loss properties for Orange County and all participating jurisdictions.

Table 5-9. Repetitive Loss and Severe Repetitive Loss Properties

JURISDICTION	INSURED?	BUILDING TYPE	LOSSES	TOTAL PAID	SRL INDICATOR ⁷
Orange County	NO	SINGLE FMLY	2	\$16,778.01	-
Orange County	YES	SINGLE FMLY	2	\$176,057.45	-
Orange County	YES	SINGLE FMLY	2	\$110,665.94	-
Orange County	NO	SINGLE FMLY	4	\$87,173.75	VU
Orange County	NO	SINGLE FMLY	2	\$13,055.52	-
Orange County	YES	SINGLE FMLY	2	\$87,321.23	-
Orange County	NO	SINGLE FMLY	4	\$27,663.28	-
Orange County	NO	SINGLE FMLY	7	\$107,393.43	VU
Orange County	YES	OTHR-NONRES	4	\$581,683.98	-
Orange County	YES	SINGLE FMLY	2	\$83,869.89	-
Orange County	YES	SINGLE FMLY	3	\$190,484.02	-
Orange County	YES	SINGLE FMLY	2	\$137,516.12	-

⁶ Source: Texas Water Development Board

⁷ In this column: "V" stands for "Validated"; "VN" stands for "Validated Nonresidential"; "VU" stand for "Validated Uninsured"; "VNU" stands for "Validated Nonresidential Uninsured"; "P" stands for "Pending"; "PU" stands for "Pending Uninsured"; and "PN" stands for "Pending Nonresidential".

Section 5: Flood

JURISDICTION	INSURED?	BUILDING TYPE	LOSSES	TOTAL PAID	SRL INDICATOR ⁷
Orange County	NO	SINGLE FMLY	4	\$82,598.47	-
Orange County	NO	SINGLE FMLY	7	\$63,607.43	-
Orange County	YES	SINGLE FMLY	2	\$31,155.57	-
Orange County	NO	SINGLE FMLY	2	\$3,941.28	-
Orange County	NO	SINGLE FMLY	2	\$11,633.58	-
Orange County	NO	SINGLE FMLY	3	\$11,737.08	-
Orange County	NO	SINGLE FMLY	3	\$6,083.55	-
Orange County	NO	SINGLE FMLY	5	\$73,902.29	-
Orange County	NO	SINGLE FMLY	6	\$121,836.51	VU
Orange County	YES	SINGLE FMLY	2	\$302,834.91	-
Orange County	NO	SINGLE FMLY	2	\$11,622.73	-
Orange County	SDF	SINGLE FMLY	4	\$238,549.35	V
Orange County	YES	SINGLE FMLY	2	\$37,980.77	-
Orange County	YES	SINGLE FMLY	2	\$109,375.71	-
Orange County	SDF	SINGLE FMLY	2	\$195,314.72	V
Orange County	NO	SINGLE FMLY	2	\$19,990.77	-
Orange County	NO	SINGLE FMLY	2	\$35,461.89	-
Orange County	NO	SINGLE FMLY	3	\$12,104.05	-
Orange County	YES	SINGLE FMLY	2	\$6,866.00	-
Orange County	YES	SINGLE FMLY	2	\$9,482.95	-
Orange County	YES	SINGLE FMLY	2	\$48,702.39	-
Orange County	NO	SINGLE FMLY	2	\$3,304.80	-
Orange County	YES	SINGLE FMLY	4	\$94,925.90	-
Orange County	NO	SINGLE FMLY	2	\$13,336.14	-
Orange County	NO	SINGLE FMLY	2	\$216,737.58	-
Orange County	NO	SINGLE FMLY	6	\$61,883.12	-

Section 5: Flood

JURISDICTION	INSURED?	BUILDING TYPE	LOSSES	TOTAL PAID	SRL INDICATOR ⁷
Orange County	YES	SINGLE FMLY	3	\$9,887.85	-
Orange County	NO	SINGLE FMLY	3	\$25,330.32	-
Orange County	NO	SINGLE FMLY	12	\$206,699.73	VU
Orange County	YES	SINGLE FMLY	3	\$59,854.85	-
Orange County	SDF	SINGLE FMLY	8	\$132,177.43	V
Orange County	NO	SINGLE FMLY	4	\$271,334.37	VU
Orange County	NO	SINGLE FMLY	2	\$13,131.22	-
Orange County	YES	SINGLE FMLY	2	\$9,571.15	-
Orange County	NO	ASSMD CONDO	2	\$174,329.17	-
Orange County	NO	SINGLE FMLY	2	\$40,834.54	-
Orange County	NO	SINGLE FMLY	4	\$68,988.98	-
Orange County	YES	SINGLE FMLY	2	\$148,513.41	-
Orange County	NO	SINGLE FMLY	3	\$63,927.54	-
Orange County	NO	SINGLE FMLY	2	\$4,268.62	-
Orange County	NO	SINGLE FMLY	3	\$30,237.24	-
Orange County	NO	SINGLE FMLY	2	\$48,038.53	-
Orange County	NO	SINGLE FMLY	2	\$124,574.70	-
Orange County	NO	SINGLE FMLY	2	\$19,684.83	-
Orange County	NO	SINGLE FMLY	5	\$176,205.94	VU
Orange County	NO	SINGLE FMLY	3	\$38,892.68	-
Orange County	YES	SINGLE FMLY	4	\$113,686.10	-
Orange County	YES	SINGLE FMLY	3	\$104,738.32	-
Orange County	NO	SINGLE FMLY	3	\$53,241.10	-
Orange County	YES	SINGLE FMLY	2	\$45,153.36	-
Orange County	NO	OTHR-NONRES	2	\$107,308.34	-
Orange County	NO	OTHR-NONRES	2	\$169,514.66	-

Section 5: Flood

JURISDICTION	INSURED?	BUILDING TYPE	LOSSES	TOTAL PAID	SRL INDICATOR ⁷
Orange County	NO	SINGLE FMLY	2	\$14,399.96	-
Orange County	YES	SINGLE FMLY	6	\$493,822.38	V
Orange County	YES	SINGLE FMLY	3	\$96,450.17	-
Orange County	NO	SINGLE FMLY	2	\$94,295.13	-
Orange County	NO	SINGLE FMLY	4	\$159,795.30	-
Orange County	NO	SINGLE FMLY	7	\$51,068.73	VU
Orange County	YES	SINGLE FMLY	2	\$232,578.83	-
Orange County	NO	SINGLE FMLY	2	\$33,428.25	-
Orange County	NO	SINGLE FMLY	2	\$14,509.39	-
Orange County	YES	SINGLE FMLY	2	\$79,748.21	-
Orange County	NO	SINGLE FMLY	2	\$5,976.91	-
Orange County	SDF	SINGLE FMLY	15	\$290,958.21	V
Orange County	NO	SINGLE FMLY	2	\$106,182.19	-
Orange County	NO	SINGLE FMLY	2	\$40,729.44	-
Orange County	NO	SINGLE FMLY	2	\$3,611.38	-
Orange County	NO	SINGLE FMLY	2	\$16,748.17	-
Orange County	NO	SINGLE FMLY	3	\$40,610.91	-
Orange County	NO	SINGLE FMLY	12	\$184,329.33	VU
Orange County	NO	SINGLE FMLY	9	\$160,872.14	VU
Orange County	NO	SINGLE FMLY	2	\$63,268.69	-
Orange County	NO	SINGLE FMLY	2	\$28,980.44	-
Orange County	YES	SINGLE FMLY	2	\$178,084.04	-
Orange County	NO	SINGLE FMLY	2	\$95,546.05	-
Orange County	YES	OTHR-NONRES	3	\$192,874.07	-
Orange County	NO	SINGLE FMLY	2	\$144,188.63	-
Orange County	SDF	SINGLE FMLY	7	\$163,532.22	V

Section 5: Flood

JURISDICTION	INSURED?	BUILDING TYPE	LOSSES	TOTAL PAID	SRL INDICATOR ⁷
Orange County	NO	SINGLE FMLY	2	\$127,544.03	-
Orange County	YES	SINGLE FMLY	2	\$84,418.15	-
Orange County	NO	SINGLE FMLY	2	\$6,677.51	-
Orange County	NO	SINGLE FMLY	3	\$13,132.15	-
Orange County	NO	SINGLE FMLY	4	\$17,959.46	-
Orange County	NO	SINGLE FMLY	7	\$102,549.08	VU
Orange County	NO	SINGLE FMLY	2	\$20,989.95	-
Orange County	NO	OTHER RESID	2	\$4,156.84	-
Orange County	YES	SINGLE FMLY	2	\$14,327.15	-
Orange County	NO	SINGLE FMLY	5	\$38,891.15	-
Orange County	NO	SINGLE FMLY	2	\$181,735.70	-
Orange County	YES	SINGLE FMLY	2	\$106,209.75	-
Orange County	NO	SINGLE FMLY	2	\$26,600.00	PU
Orange County	YES	SINGLE FMLY	3	\$205,405.43	-
Orange County	NO	OTHR-NONRES	2	\$115,635.72	-
Orange County	YES	SINGLE FMLY	2	\$120,974.21	-
Orange County	YES	SINGLE FMLY	2	\$208,914.63	-
Orange County	YES	SINGLE FMLY	2	\$7,417.31	-
Orange County	NO	SINGLE FMLY	2	\$55,393.15	-
Orange County	SDF	SINGLE FMLY	9	\$81,141.64	V
Orange County	NO	SINGLE FMLY	3	\$66,109.70	-
Orange County	NO	SINGLE FMLY	2	\$8,290.63	-
Orange County	NO	SINGLE FMLY	3	\$35,103.41	-
Orange County	NO	SINGLE FMLY	2	\$87,014.50	-
Orange County	NO	SINGLE FMLY	3	\$34,832.85	-
Orange County	NO	SINGLE FMLY	2	\$30,100.80	-

Section 5: Flood

JURISDICTION	INSURED?	BUILDING TYPE	LOSSES	TOTAL PAID	SRL INDICATOR ⁷
Orange County	NO	SINGLE FMLY	14	\$197,623.88	-
Orange County	NO	SINGLE FMLY	5	\$85,907.15	MVU
Orange County	NO	SINGLE FMLY	5	\$50,748.91	-
Orange County	NO	SINGLE FMLY	11	\$95,863.08	MVU
Orange County	NO	SINGLE FMLY	4	\$65,733.63	-
Orange County	NO	SINGLE FMLY	2	\$138,952.90	-
Orange County	NO	SINGLE FMLY	4	\$177,697.20	-
Orange County	NO	SINGLE FMLY	2	\$94,552.29	-
Orange County	NO	SINGLE FMLY	5	\$53,821.99	MVU
Orange County	NO	SINGLE FMLY	2	\$15,089.01	-
Orange County	NO	SINGLE FMLY	2	\$71,626.76	-
Orange County	NO	SINGLE FMLY	2	\$3,159.02	-
Orange County	NO	SINGLE FMLY	5	\$28,887.29	-
Bridge City	NO	SINGLE FMLY	2	\$43,579.30	-
Bridge City	NO	SINGLE FMLY	4	\$158,713.47	-
Bridge City	YES	SINGLE FMLY	2	\$170,347.33	-
Bridge City	SDF	SINGLE FMLY	2	\$137,355.91	V
Bridge City	NO	SINGLE FMLY	2	\$31,121.15	-
Bridge City	YES	SINGLE FMLY	2	\$47,305.17	-
Bridge City	NO	SINGLE FMLY	3	\$36,173.17	-
Bridge City	NO	SINGLE FMLY	3	\$43,800.29	-
Bridge City	NO	SINGLE FMLY	2	\$151,569.54	-
Bridge City	NO	SINGLE FMLY	2	\$3,598.22	-
Bridge City	YES	SINGLE FMLY	2	\$113,505.91	-
Bridge City	NO	SINGLE FMLY	3	\$194,007.98	-
Bridge City	SDF	SINGLE FMLY	12	\$159,747.15	V

Section 5: Flood

JURISDICTION	INSURED?	BUILDING TYPE	LOSSES	TOTAL PAID	SRL INDICATOR ⁷
Bridge City	NO	SINGLE FMLY	2	\$72,545.13	-
Bridge City	NO	SINGLE FMLY	2	\$110,286.14	-
Bridge City	YES	SINGLE FMLY	4	\$125,494.04	-
Bridge City	YES	SINGLE FMLY	2	\$102,813.50	-
Bridge City	YES	SINGLE FMLY	6	\$110,532.11	-
Bridge City	SDF	SINGLE FMLY	5	\$193,237.10	V
Bridge City	YES	SINGLE FMLY	2	\$123,152.68	-
Bridge City	NO	SINGLE FMLY	3	\$43,884.91	-
Bridge City	YES	SINGLE FMLY	4	\$142,796.73	-
Bridge City	NO	OTHR-NONRES	3	\$198,549.84	-
Bridge City	NO	SINGLE FMLY	4	\$62,715.47	VU
Bridge City	YES	SINGLE FMLY	2	\$36,285.56	-
Bridge City	NO	SINGLE FMLY	2	\$207,317.15	-
Bridge City	YES	SINGLE FMLY	2	\$38,306.03	-
Bridge City	YES	SINGLE FMLY	2	\$151,146.19	-
Bridge City	NO	SINGLE FMLY	3	\$13,048.71	-
Bridge City	YES	SINGLE FMLY	2	\$71,522.34	-
Bridge City	NO	SINGLE FMLY	2	\$121,537.82	-
Bridge City	YES	SINGLE FMLY	2	\$151,236.55	-
Bridge City	YES	SINGLE FMLY	2	\$127,808.11	-
Bridge City	NO	OTHR-NONRES	3	\$223,097.48	-
Bridge City	YES	SINGLE FMLY	2	\$144,367.54	-
Bridge City	YES	SINGLE FMLY	2	\$89,723.44	-
Bridge City	NO	ASSMD CONDO	2	\$394,111.73	VU
Bridge City	NO	SINGLE FMLY	2	\$275,299.44	VU
Bridge City	NO	SINGLE FMLY	2	\$120,858.17	-

Section 5: Flood

JURISDICTION	INSURED?	BUILDING TYPE	LOSSES	TOTAL PAID	SRL INDICATOR ⁷
Bridge City	NO	SINGLE FMLY	2	\$15,273.72	-
Bridge City	YES	SINGLE FMLY	2	\$177,592.22	-
Bridge City	YES	SINGLE FMLY	2	\$106,617.34	-
Bridge City	YES	SINGLE FMLY	2	\$120,696.76	-
Bridge City	NO	SINGLE FMLY	2	\$60,158.19	-
Bridge City	NO	SINGLE FMLY	2	\$59,017.87	-
Bridge City	NO	SINGLE FMLY	2	\$96,972.28	-
Bridge City	NO	OTHR-NONRES	4	\$32,738.39	-
Bridge City	NO	SINGLE FMLY	2	\$134,496.47	-
Bridge City	NO	SINGLE FMLY	2	\$68,975.51	-
Bridge City	NO	SINGLE FMLY	7	\$203,846.85	VU
Bridge City	NO	SINGLE FMLY	2	\$23,035.73	-
Bridge City	NO	SINGLE FMLY	2	\$272,828.39	-
Bridge City	NO	SINGLE FMLY	7	\$179,482.27	MVU
Bridge City	NO	SINGLE FMLY	2	\$193,573.81	-
Bridge City	NO	SINGLE FMLY	2	\$212,151.59	-
Bridge City	NO	SINGLE FMLY	4	\$39,088.43	-
Bridge City	NO	SINGLE FMLY	7	\$250,148.48	MVU
Bridge City	NO	SINGLE FMLY	6	\$174,605.18	MVU
Bridge City	NO	SINGLE FMLY	3	\$254,582.85	MVU
Bridge City	NO	SINGLE FMLY	5	\$240,969.72	MVU
Bridge City	NO	SINGLE FMLY	3	\$73,047.30	-
Bridge City	NO	SINGLE FMLY	7	\$77,560.74	MVU
Bridge City	NO	OTHR-NONRES	2	\$255,097.96	-
Bridge City	NO	SINGLE FMLY	2	\$19,333.10	-
Bridge City	YES	SINGLE FMLY	2	\$121,361.06	-

Section 5: Flood

JURISDICTION	INSURED?	BUILDING TYPE	LOSSES	TOTAL PAID	SRL INDICATOR ⁷
Bridge City	NO	SINGLE FMLY	6	\$173,468.01	MVU
Bridge City	NO	SINGLE FMLY	2	\$205,993.92	-
City of Orange	NO	SINGLE FMLY	2	\$2,259.90	-
City of Orange	NO	SINGLE FMLY	2	\$8,727.81	-
City of Orange	YES	SINGLE FMLY	2	\$55,757.61	-
City of Orange	YES	SINGLE FMLY	3	\$72,352.60	-
City of Orange	NO	SINGLE FMLY	2	\$27,601.17	-
City of Orange	YES	SINGLE FMLY	3	\$46,599.76	-
City of Orange	NO	SINGLE FMLY	2	\$53,334.80	-
City of Orange	YES	SINGLE FMLY	3	\$112,320.42	-
City of Orange	YES	OTHR-NONRES	2	\$143,155.60	-
City of Orange	YES	OTHR-NONRES	2	\$26,064.22	-
City of Orange	YES	SINGLE FMLY	3	\$69,449.50	-
City of Orange	NO	2-4 FAMILY	2	\$64,481.94	-
City of Orange	NO	ASSMD CONDO	2	\$140,940.44	-
City of Orange	YES	SINGLE FMLY	2	\$93,580.20	-
City of Orange	NO	SINGLE FMLY	3	\$25,653.00	-
City of Orange	SDF	SINGLE FMLY	4	\$126,622.76	V
City of Orange	NO	OTHR-NONRES	2	\$55,641.98	-
City of Orange	YES	SINGLE FMLY	2	\$6,586.16	-
City of Orange	NO	SINGLE FMLY	2	\$25,098.00	-
City of Orange	YES	SINGLE FMLY	3	\$57,550.16	-
City of Orange	YES	SINGLE FMLY	2	\$82,064.51	-
City of Orange	YES	SINGLE FMLY	2	\$42,767.89	-
City of Orange	YES	SINGLE FMLY	2	\$42,913.11	-
City of Orange	NO	SINGLE FMLY	2	\$43,521.00	-

Section 5: Flood

JURISDICTION	INSURED?	BUILDING TYPE	LOSSES	TOTAL PAID	SRL INDICATOR ⁷
City of Orange	YES	SINGLE FMLY	2	\$2,747.18	-
City of Orange	NO	SINGLE FMLY	2	\$21,609.81	-
City of Orange	NO	SINGLE FMLY	2	\$19,007.25	-
City of Orange	YES	SINGLE FMLY	2	\$115,170.32	-
City of Orange	YES	OTHR-NONRES	3	\$70,478.92	-
City of Orange	NO	OTHR-NONRES	5	\$606,837.75	VNU
City of Orange	YES	OTHR-NONRES	3	\$119,372.02	-
City of Orange	SDF	SINGLE FMLY	8	\$251,125.50	V
City of Orange	YES	SINGLE FMLY	2	\$83,752.66	-
City of Orange	YES	SINGLE FMLY	2	\$66,749.69	-
City of Orange	YES	SINGLE FMLY	2	\$223,774.43	-
City of Orange	YES	SINGLE FMLY	2	\$41,214.71	-
City of Orange	YES	SINGLE FMLY	2	\$59,145.76	-
City of Orange	NO	OTHR-NONRES	2	\$197,262.04	-
City of Orange	YES	SINGLE FMLY	2	\$87,714.29	-
City of Orange	YES	SINGLE FMLY	2	\$19,716.65	-
City of Orange	NO	SINGLE FMLY	2	\$20,195.63	-
City of Orange	YES	SINGLE FMLY	4	\$81,955.53	-
City of Orange	YES	SINGLE FMLY	4	\$53,218.56	-
City of Orange	YES	SINGLE FMLY	3	\$28,319.00	-
City of Orange	NO	OTHR-NONRES	2	\$74,083.04	-
City of Orange	NO	OTHR-NONRES	2	\$186,240.31	-
City of Orange	NO	SINGLE FMLY	2	\$51,660.45	-
City of Orange	NO	SINGLE FMLY	2	\$8,561.75	-
City of Orange	YES	SINGLE FMLY	2	\$89,865.62	-
City of Orange	NO	SINGLE FMLY	3	\$299,430.89	VU

Section 5: Flood

JURISDICTION	INSURED?	BUILDING TYPE	LOSSES	TOTAL PAID	SRL INDICATOR ⁷
City of Orange	NO	OTHR-NONRES	2	\$171,866.81	-
City of Orange	NO	OTHR-NONRES	2	\$103,460.58	-
City of Orange	YES	SINGLE FMLY	2	\$55,000.00	-
City of Orange	YES	SINGLE FMLY	2	\$41,529.30	-
City of Orange	YES	SINGLE FMLY	2	\$149,360.51	-
City of Orange	YES	SINGLE FMLY	2	\$198,180.84	-
City of Orange	YES	SINGLE FMLY	2	\$156,363.46	-
Pine Forest	YES	SINGLE FMLY	3	\$50,547.63	-
Pine Forest	NO	SINGLE FMLY	6	\$26,461.43	-
Pinehurst	YES	SINGLE FMLY	2	\$57,562.82	-
Pinehurst	YES	SINGLE FMLY	2	\$71,146.17	-
Pinehurst	NO	SINGLE FMLY	2	\$22,139.10	-
Pinehurst	NO	OTHR-NONRES	6	\$267,066.66	-
Vidor	NO	OTHR-NONRES	2	\$28,414.22	-
Vidor	NO	SINGLE FMLY	2	\$32,346.34	-
Vidor	YES	SINGLE FMLY	3	\$132,570.00	-
Vidor	NO	SINGLE FMLY	3	\$29,031.12	-
Vidor	NO	SINGLE FMLY	3	\$4,350.28	-
Vidor	NO	SINGLE FMLY	2	\$35,943.41	-
Vidor	NO	SINGLE FMLY	3	\$16,628.41	-
Vidor	NO	SINGLE FMLY	2	\$9,232.86	-
Vidor	YES	SINGLE FMLY	2	\$43,555.48	-
Vidor	YES	SINGLE FMLY	2	\$49,492.26	-
Vidor	SDF	SINGLE FMLY	14	\$180,174.53	V
Vidor	NO	SINGLE FMLY	5	\$131,913.77	-
Vidor	NO	SINGLE FMLY	7	\$65,465.97	-

Section 5: Flood

JURISDICTION	INSURED?	BUILDING TYPE	LOSSES	TOTAL PAID	SRL INDICATOR ⁷
Vidor	YES	ASSMD CONDO	2	\$129,291.38	-
Vidor	NO	SINGLE FMLY	4	\$55,290.17	-
Vidor	SDF	SINGLE FMLY	4	\$173,919.75	V
Vidor	NO	SINGLE FMLY	5	\$37,182.15	-
Vidor	SDF	SINGLE FMLY	7	\$86,795.97	V
Vidor	NO	SINGLE FMLY	2	\$8,069.24	-
Vidor	NO	SINGLE FMLY	3	\$102,592.01	-
Vidor	NO	SINGLE FMLY	6	\$61,719.97	-
Vidor	NO	SINGLE FMLY	4	\$28,863.72	-
Vidor	NO	SINGLE FMLY	3	\$30,202.03	-
Vidor	NO	SINGLE FMLY	6	\$25,097.41	-
Vidor	NO	SINGLE FMLY	4	\$51,759.97	VU
Vidor	NO	SINGLE FMLY	3	\$13,798.84	-
Vidor	SDF	SINGLE FMLY	5	\$243,780.36	V
Vidor	NO	SINGLE FMLY	2	\$20,997.49	PU
Vidor	NO	SINGLE FMLY	3	\$37,088.88	-
Vidor	SDF	SINGLE FMLY	4	\$53,990.05	V
Vidor	YES	SINGLE FMLY	2	\$114,195.90	-
Vidor	NO	SINGLE FMLY	2	\$61,979.02	-
Vidor	YES	SINGLE FMLY	3	\$15,049.30	-
Vidor	NO	SINGLE FMLY	2	\$23,741.76	-
Vidor	NO	SINGLE FMLY	2	\$26,559.81	-
Vidor	YES	SINGLE FMLY	2	\$42,378.81	-
Vidor	NO	SINGLE FMLY	3	\$113,002.77	-
Vidor	NO	SINGLE FMLY	3	\$12,274.09	-
Vidor	NO	SINGLE FMLY	4	\$15,280.14	-

Section 5: Flood

JURISDICTION	INSURED?	BUILDING TYPE	LOSSES	TOTAL PAID	SRL INDICATOR ⁷
Vidor	YES	SINGLE FMLY	3	\$42,796.77	-
Vidor	NO	SINGLE FMLY	2	\$210,472.63	-
Vidor	NO	SINGLE FMLY	6	\$25,892.42	-
Vidor	SDF	SINGLE FMLY	7	\$76,194.43	V
Vidor	YES	SINGLE FMLY	5	\$82,916.23	-
Vidor	NO	SINGLE FMLY	6	\$132,303.83	VU
Vidor	SDF	SINGLE FMLY	21	\$214,679.99	V
Vidor	SDF	SINGLE FMLY	16	\$156,566.61	V
Vidor	NO	SINGLE FMLY	12	\$73,159.12	VU
Vidor	NO	SINGLE FMLY	2	\$23,280.05	-
Vidor	NO	SINGLE FMLY	2	\$23,758.67	-
Vidor	NO	SINGLE FMLY	2	\$64,132.83	-
Vidor	NO	SINGLE FMLY	3	\$54,765.09	-
Vidor	NO	SINGLE FMLY	3	\$64,032.71	-
Vidor	NO	SINGLE FMLY	2	\$29,916.83	-
Vidor	NO	SINGLE FMLY	4	\$20,827.80	-
Vidor	NO	SINGLE FMLY	2	\$18,818.67	-
Vidor	NO	SINGLE FMLY	2	\$61,972.79	-
Vidor	NO	SINGLE FMLY	2	\$74,888.65	-
Vidor	NO	SINGLE FMLY	8	\$122,772.54	VU
Vidor	NO	SINGLE FMLY	5	\$60,494.09	-
Vidor	NO	SINGLE FMLY	3	\$27,613.17	-
Vidor	YES	SINGLE FMLY	2	\$192,944.02	-
Vidor	NO	SINGLE FMLY	4	\$58,601.78	VU
Vidor	NO	SINGLE FMLY	4	\$76,427.08	-
Vidor	SDF	SINGLE FMLY	2	\$161,983.95	V

Section 5: Flood

JURISDICTION	INSURED?	BUILDING TYPE	LOSSES	TOTAL PAID	SRL INDICATOR ⁷
Vidor	NO	SINGLE FMLY	2	\$12,045.03	-
Vidor	YES	SINGLE FMLY	2	\$57,221.17	-
Vidor	YES	SINGLE FMLY	3	\$10,347.60	-
Vidor	NO	SINGLE FMLY	2	\$78,449.63	-
Vidor	NO	SINGLE FMLY	2	\$95,403.37	-
Vidor	NO	SINGLE FMLY	2	\$23,624.79	-
Vidor	SDF	SINGLE FMLY	9	\$187,059.04	V
Vidor	NO	SINGLE FMLY	2	\$41,292.85	-
Vidor	YES	SINGLE FMLY	5	\$11,797.64	-
Vidor	NO	SINGLE FMLY	2	\$8,226.05	-
Vidor	NO	SINGLE FMLY	4	\$14,440.31	-
Vidor	NO	SINGLE FMLY	3	\$31,790.84	-
Vidor	YES	SINGLE FMLY	2	\$9,806.73	-
Vidor	NO	SINGLE FMLY	2	\$24,677.45	-
Vidor	NO	SINGLE FMLY	2	\$18,233.94	-
Vidor	NO	SINGLE FMLY	2	\$49,172.98	-
Vidor	NO	SINGLE FMLY	7	\$31,205.41	-
Vidor	NO	OTHR-NONRES	3	\$86,075.41	-
Vidor	NO	SINGLE FMLY	2	\$5,828.06	-
Vidor	NO	SINGLE FMLY	2	\$21,584.50	-
Vidor	NO	SINGLE FMLY	2	\$60,806.88	-
Vidor	YES	SINGLE FMLY	2	\$45,241.23	-
Vidor	YES	SINGLE FMLY	3	\$46,593.83	-
Vidor	NO	SINGLE FMLY	2	\$5,962.91	-
Vidor	NO	SINGLE FMLY	2	\$5,749.36	-
Vidor	NO	SINGLE FMLY	5	\$47,172.77	-

Section 5: Flood

JURISDICTION	INSURED?	BUILDING TYPE	LOSSES	TOTAL PAID	SRL INDICATOR ⁷
Vidor	NO	SINGLE FMLY	7	\$118,887.38	MVU
Vidor	NO	SINGLE FMLY	6	\$39,480.32	-
Vidor	NO	SINGLE FMLY	13	\$204,100.07	MVU
Vidor	NO	SINGLE FMLY	5	\$25,846.96	-
Vidor	NO	SINGLE FMLY	7	\$79,608.61	MVU
Vidor	NO	SINGLE FMLY	13	\$287,639.70	MVU
Vidor	NO	SINGLE FMLY	6	\$92,765.74	-
Vidor	NO	SINGLE FMLY	2	\$26,278.20	-
Vidor	NO	SINGLE FMLY	9	\$152,377.41	MVU
Vidor	NO	SINGLE FMLY	9	\$100,842.66	MVU
Vidor	NO	SINGLE FMLY	2	\$46,227.34	-
Vidor	NO	SINGLE FMLY	2	\$19,315.07	-
Vidor	NO	SINGLE FMLY	2	\$28,020.73	-
Vidor	NO	SINGLE FMLY	4	\$61,294.02	-
Vidor	YES	SINGLE FMLY	6	\$36,863.81	-
West Orange	NO	SINGLE FMLY	2	\$57,486.20	-
West Orange	NO	SINGLE FMLY	2	\$31,962.16	-
West Orange	NO	SINGLE FMLY	2	\$31,476.67	-
West Orange	YES	SINGLE FMLY	2	\$20,400.25	-
West Orange	NO	SINGLE FMLY	2	\$129,951.44	-
West Orange	NO	OTHR-NONRES	3	\$335,224.78	PNU
West Orange	NO	OTHR-NONRES	3	\$71,596.85	-

Section 6: Lightning

Hazard Description.....	1
Location.....	1
Extent.....	1
Historical Occurrences.....	2
Significant Past Events.....	3
Probability of Future Events.....	3
Vulnerability and Impact.....	3
Assessment of Impacts.....	5

Hazard Description

Lightning is a discharge of electrical energy resulting from the buildup of positive and negative charges within a thunderstorm, creating a “bolt” when the buildup of charges becomes strong enough. This flash of light usually occurs within the clouds or between the clouds and the ground. A bolt of lightning can reach temperatures approaching 50,000 degrees Fahrenheit. Lightning rapidly heats the sky as it flashes but the surrounding air cools following the bolt. This rapid heating and cooling of the surrounding air causes the thunder which often accompanies lightning strikes. While most often affiliated with severe thunderstorms, lightning often strikes outside of heavy rain and might occur as far as 10 miles away from any rainfall.

According to FEMA, an average of 300 people are injured and 80 people are killed in the United States each year by lightning. Direct lightning strikes also have the ability to cause significant damage to buildings, critical facilities and infrastructure. Lightning is also responsible for igniting wildfires that can result in widespread damages to property before firefighters have the ability to contain and suppress the resultant fire.

Location

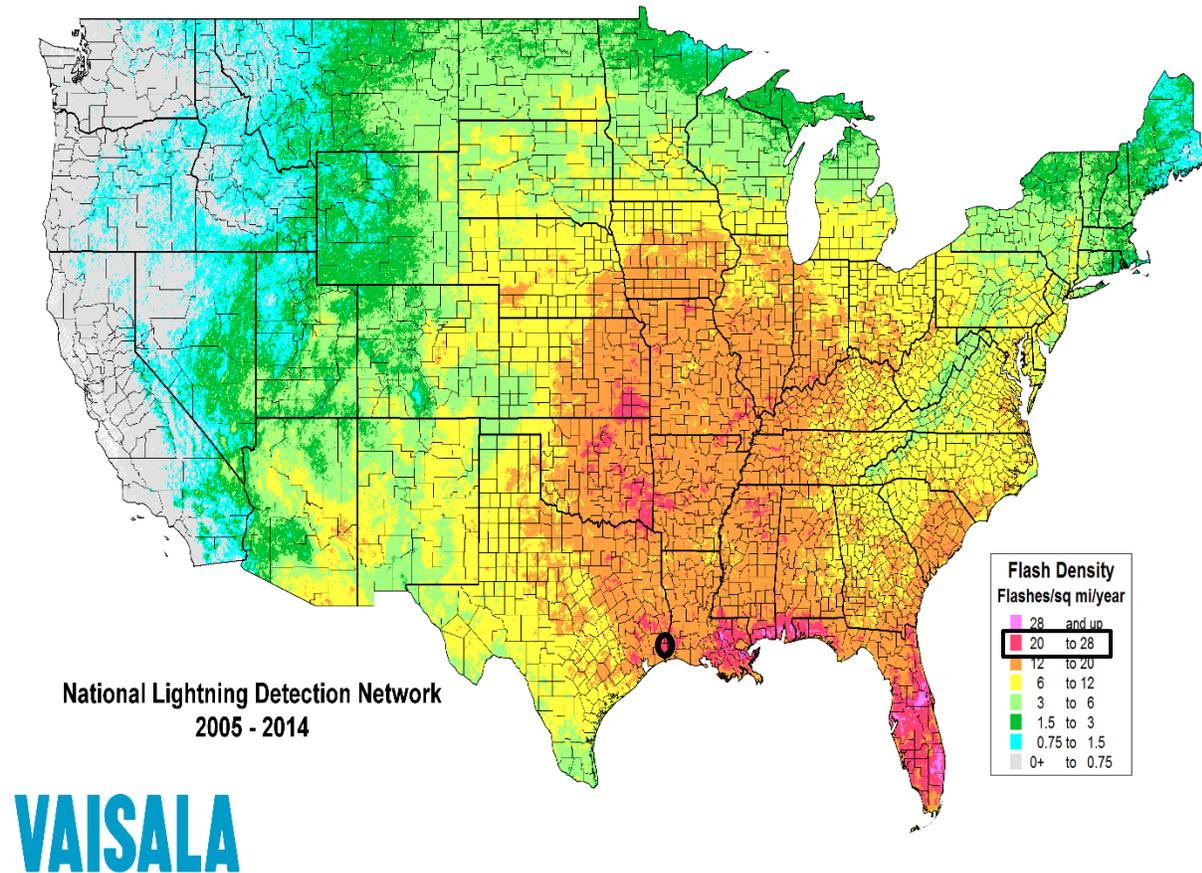
Lightning can strike in any geographic location, and is considered a common occurrence in Texas. The Orange County planning area is located in a region of the country that is moderately susceptible to lightning strike. Therefore lightning could occur at any location within the Orange County planning area. It is assumed that the Orange County planning area is uniformly exposed to the threat of lightning.

Extent

The planning area considers a flash density of less than two to be a minor severity and a flash density of three and greater to be a major severity. Any lightning strike that causes death or property damage is considered a major severity. The Vaisala’s U.S. National Lightning Detection Network lightning flash density map (Figure 6-1) shows a range of 20 to 28 lightning flashes per square mile per year for the Orange County planning area.

Section 6: Lightning

Figure 6-1. Lightning Flash Density, 2005-2014



Historical Occurrences

Table 6-1 depicts historical occurrences of lightning for the Orange County planning area, including all participating jurisdictions, with associated damages according to the National Centers for Environmental Information (NCEI) data. Since January 1996, 4 recorded lightning events are known to have impacted Orange County, based upon NCEI records.

The NCEI is a national data source organized under the National Oceanic and Atmospheric Administration. The NCEI is the largest archive available for climate data; however, it is important to note that the only incidents recorded are those that are reported to the NCEI that have been factored into this risk assessment. Damage estimates provided in a table for losses have been modified to reflect the damage in 2016 dollars.

Section 6: Lightning

Table 6-1. Historical Lightning Events, With Reported Damages, 1996-2016¹

JURISDICTION	DATE	TIME	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Orange County	2/10/1998	3:15 PM	0	1	\$14,679	\$0
Orange County	7/18/2009	6:00 PM	0	0	\$5,576	\$0
Orange County	8/10/2010	5:50 PM	0	1	0	\$0
Orange County	7/6/2012	7:10 PM	0	0	\$1,042	\$0
TOTALS			0	2	\$21,297	\$0

Based on the list of historical lightning events for the Orange County planning area (listed above), including all participating jurisdictions, 1 of the events has occurred since the 2011 Plan.

Significant Past Events

February 10, 1998 – Orange County

A freak lightning strike hit a truck on Interstate 10. The engine was damaged, and the driver was shocked by the electricity. He said the charge entered his body through the accelerator, and exited his body through his elbow. He complained of tingles and severe headaches, and his elbow had a red spot.

July 18, 2009 – Orange County

A line of strong to severe thunderstorms developed during the afternoon hours across interior southeast Texas, before moving southward into the Gulf of Mexico. Numerous reports of large hail, damaging winds, and intense lightning were received, with one fatality from a falling tree limb (outside of Orange County). High winds and lightning combined to knock out power to 11000 customers across southeast Texas. Beaumont Enterprise reported the Old First Baptist Church along Interstate 10 in Orange caught fire from a lightning strike.

Probability of Future Events

Based on historical records and input from the planning team the probability of occurrence for future lightning events in the Orange County planning area is considered likely, or an event probable in the next three years. According to NOAA, Orange County is located in an area of the country that experiences 20-28 lightning flashes per square mile per year (approximately 7,600 to 9,800 flashes per year). Given this estimated frequency of occurrence, it can be expected that future lightning events will continue to threaten life and cause minor property damages throughout the planning area.

Vulnerability and Impact

Vulnerability is difficult to evaluate since lightning events can occur at different strength levels, in random locations, and can create a broad range of damages depending on the strike location. Due to the randomness of these events, all existing and future structures, and facilities in the Orange County

¹ Damage values are in 2016 dollars.

Section 6: Lightning

planning area could potentially be impacted and remain vulnerable to possible injury and property loss from lightning strikes.

The direct and indirect losses associated with these events include injury and loss of life, damage to structures and infrastructure, agricultural losses, utility failure (power outages), and stress on community resources. The entire population of Orange County is considered exposed to the lightning hazard. The peak lightning season in the State of Texas is from June to August; however, the most fatalities occur in July. Fatalities occur most often when people are outdoors and/or participating in some form of recreation. Population located outdoors is considered at risk and more vulnerable to a lightning strike compared to being inside a structure. Moving to a lower risk location will decrease a person's vulnerability.

The entire general building stock and all infrastructure of Orange County are considered exposed to the lightning hazard. Lightning can be responsible for damages to buildings; cause electrical, forest and/or wildfires; and damage infrastructure such as power transmission lines and communication towers. Agricultural losses can be extensive due to lightning and resulting fires.

The following critical facilities would be vulnerable to lightning events in each participating jurisdiction:

Table 6-2. Critical Facilities by Jurisdiction

JURISDICTION	CRITICAL FACILITIES
Orange County	Fire Station
Bridge City	Fire Station, Police Station, 5 Schools
City of Orange	Port District Facilities, River Authority Facilities, 5 Fire Stations, 3 Police Stations, 2 Water District Facilities, 14 Schools
Pine Forest	None
Pinehurst	None
Rose City	None
Vidor	Fire Station, Police Station, 2 Water District Facilities, 7 Schools
West Orange	None

Impact of lightning experienced in the Orange County planning area has resulted in two injuries and no fatalities. Impact of lightning events experienced in the Orange County planning area would be "Limited," and injuries and illnesses would be treatable with first aid, the quality of life lost would be minor, and facilities would be shut down for 24 hours or less. Overall, the average loss estimate for Orange County, including all participating jurisdictions, (in 2016 dollars) is \$21,297, having an approximate annual loss estimate of \$1,014 (Table 6-3).

Table 6-3. Potential Annualized Losses for Orange County²

JURISDICTION	PROPERTY & CROP LOSS	ANNUAL LOSS ESTIMATE
Orange County	\$21,297	\$1,014

² Damage values are in 2016 dollars.

Section 6: Lightning

Assessment of Impacts

Lightning events have the potential to pose a significant risk to people, and can create dangerous and difficult situations for public health and safety officials. Impacts to the planning area can include:

- Individuals exposed to the storm can be directly struck, posing significant health risks and potential death.
- Structures can be damaged or crushed by falling trees damaged by lightning, which can result in physical harm to the occupants.
- Lightning strikes can result in widespread power outages increasing the risk to more vulnerable portions of the population who rely on power for health and/or life safety.
- Extended power outage often results in an increase in structure fires and carbon monoxide poisoning, as individuals attempt to cook or heat their homes with alternate, unsafe cooking or heating devices, such as grills.
- Lightning strikes can be associated with structure fires and wildfires, creating additional risk to residents and first responders.
- The Lower Neches Wildlife Management Area may see an elevated risk of wildfire during lightning events.
- Residents and visitors engaged in outdoor recreational activities along Sabine River and Sabine Lake may be at greater risk during lightning events.
- Emergency operations and services may be significantly impacted due to power outages and/or loss of communications.
- City or county departments may be damaged, delaying response and recovery efforts for the entire community.
- Economic disruption due to power outages and fires negatively impacts the programs and services provided by the community due to short and long term loss in revenue.
- Some businesses not directly damaged by lightning events may be negatively impacted while utilities are being restored, further slowing economic recovery.
- Businesses that are more reliant on utility infrastructure than others may suffer greater damages without a backup power source.

The economic and financial impacts of lightning on the area will depend entirely on the scale of the event, what is damaged, and how quickly repairs to critical components of the economy can be implemented. The level of preparedness and pre-event planning done by the county, communities, local businesses and citizens will also contribute to the overall economic and financial conditions in the aftermath of any lightning event.

Section 7: Hurricane

Hazard Description.....	1
Location.....	2
Extent.....	2
Historical Occurrences	4
Significant Past Events.....	5
Probability of Future Events	5
Vulnerability and Impact.....	5
Assessment of Impacts	7

Hazard Description

According to the National Oceanic and Atmospheric Administration (NOAA), a hurricane is an intense tropical weather system of strong thunderstorms with well-defined surface circulation and maximum sustained winds of 74 mph or higher. In the Northern Hemisphere circulation of winds near the Earth’s surface is counterclockwise.

Hurricanes often begin as tropical depressions that intensify into tropical storms when maximum sustained winds increase to between 35 – 64 knots (39 – 73 mph). At these wind speeds, the storm becomes more organized and circular in shape and begins to resemble a hurricane. Tropical storms resulting in high winds and heavy rainfall can be equally problematic without ever becoming a hurricane and can be dangerous to people and property, resulting in high winds and heavy rainfall, as Tropical Storm Frances did for southeast Texas in September 1998. Once sustained winds reach or exceed 74 mph, the storm becomes a hurricane. The intensity of a land falling hurricane is expressed in categories relating wind speeds to potential damage. Tropical storm-force winds are strong enough to be dangerous to those caught in them. For this reason, emergency managers plan to have evacuations completed and personnel sheltered before winds of tropical storm-force arrive, which precedes the arrival of hurricane-force winds.



According to the National Hurricane Center, the greatest potential for loss of life related to a hurricane is from storm surge. This happens when low pressure and high circular winds “pile” the water into a dome shape that can be 50-100 miles wide. The surge travels with the storm and is most severe on the right side of the storm, relative to the direction the storm travels. The surge can be 15 feet deep, topped by waves, and make landfall ahead of the center, or “eye”, of the hurricane. Wind-driven waves are superimposed on the storm tide. This rise in water level can cause severe flooding in coastal areas, particularly when the storm tide coincides with normal high tides.

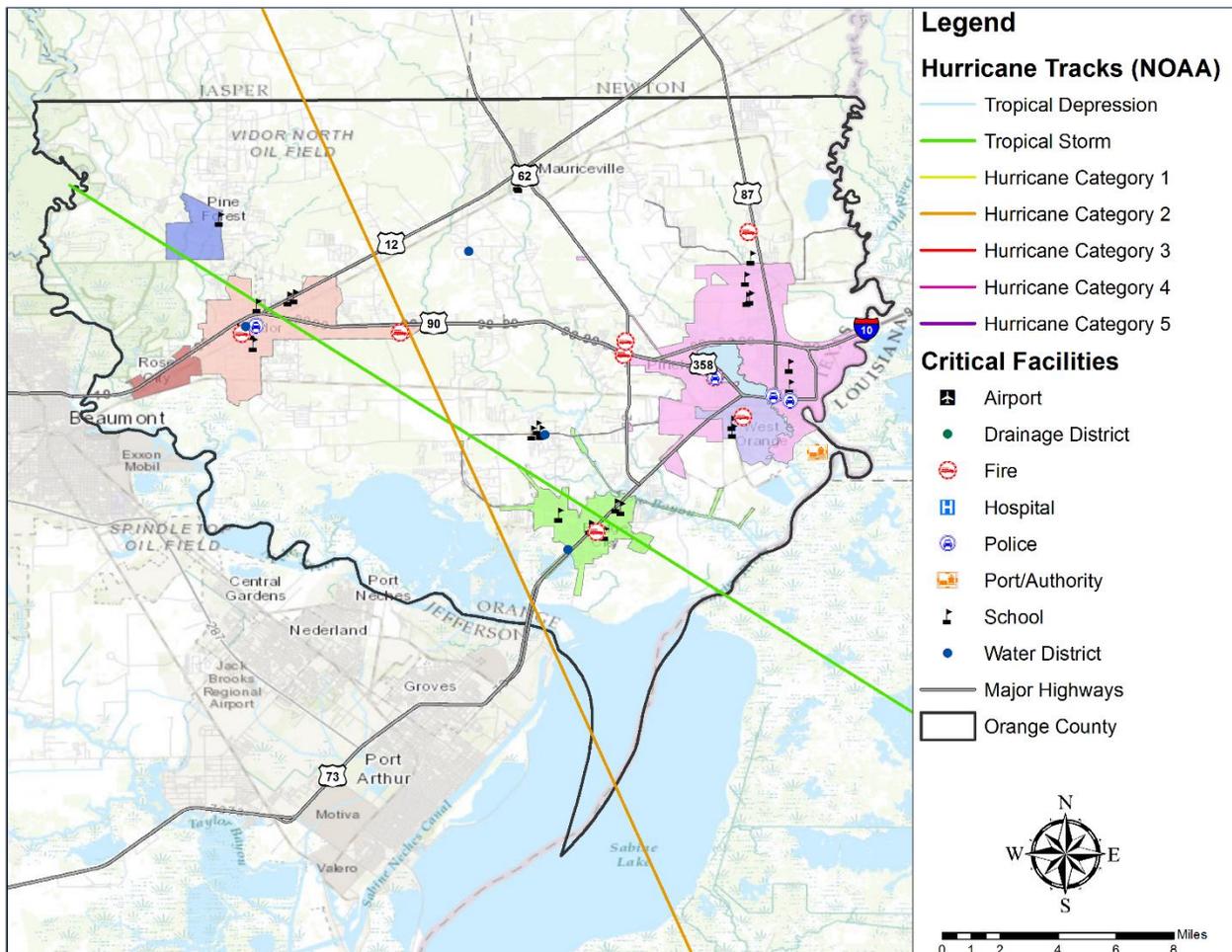
Texas has some of the highest coastal erosion rates in the country, eroding at an average rate of 4.1 feet per year, according to the Texas General Land Office. Coastal erosion is caused by large storms, flooding, sea level rise, and human activities that wear away the beaches and bluffs along the ocean. Erosion can have long-term economic and social consequences.

Section 7: Hurricane

Location

As a semi-coastal community, the Orange County planning area is vulnerable to threats directly and indirectly related to a hurricane event, such as high-force winds, storm surge, flooding, and coastal erosion. While the county is not located along the Gulf coast, it borders saltwater marshes along the south and is located within 15 miles of the Gulf of Mexico coast making it susceptible to hurricanes. Hurricanes and/or tropical storms can impact Orange County from June to November, the official Atlantic U.S. hurricane season. The Orange County planning area is in a moderate to high risk area for hurricane wind speeds up to 155 miles per hour (mph).

Figure 7-1. Location of Historic Hurricane Tracks



Extent

As a hurricane develops, the barometric pressure (measured in millibars or inches) at its center falls and winds increase. If the atmospheric and oceanic conditions are favorable, it can intensify into a tropical depression. When maximum sustained winds reach or exceed 39 miles per hour, the system is designated a tropical storm, given a name, and is closely monitored by the National Hurricane Center in Miami, Florida. When sustained winds reach or exceed 74 miles per hour the storm is deemed a hurricane.

Section 7: Hurricane

Hurricanes are categorized according to the strength and intensity of their winds using the Saffir-Simpson Hurricane Scale (Table 7-1). A Category 1 storm has the lowest wind speeds, while a Category 5 hurricane has the highest. However, a lower category storm can inflict greater damage than higher category storms depending on where they strike, the amount of storm surge, other weather they interact with, and how slow they move.

Table 7-1. Extent Scale for Hurricanes¹

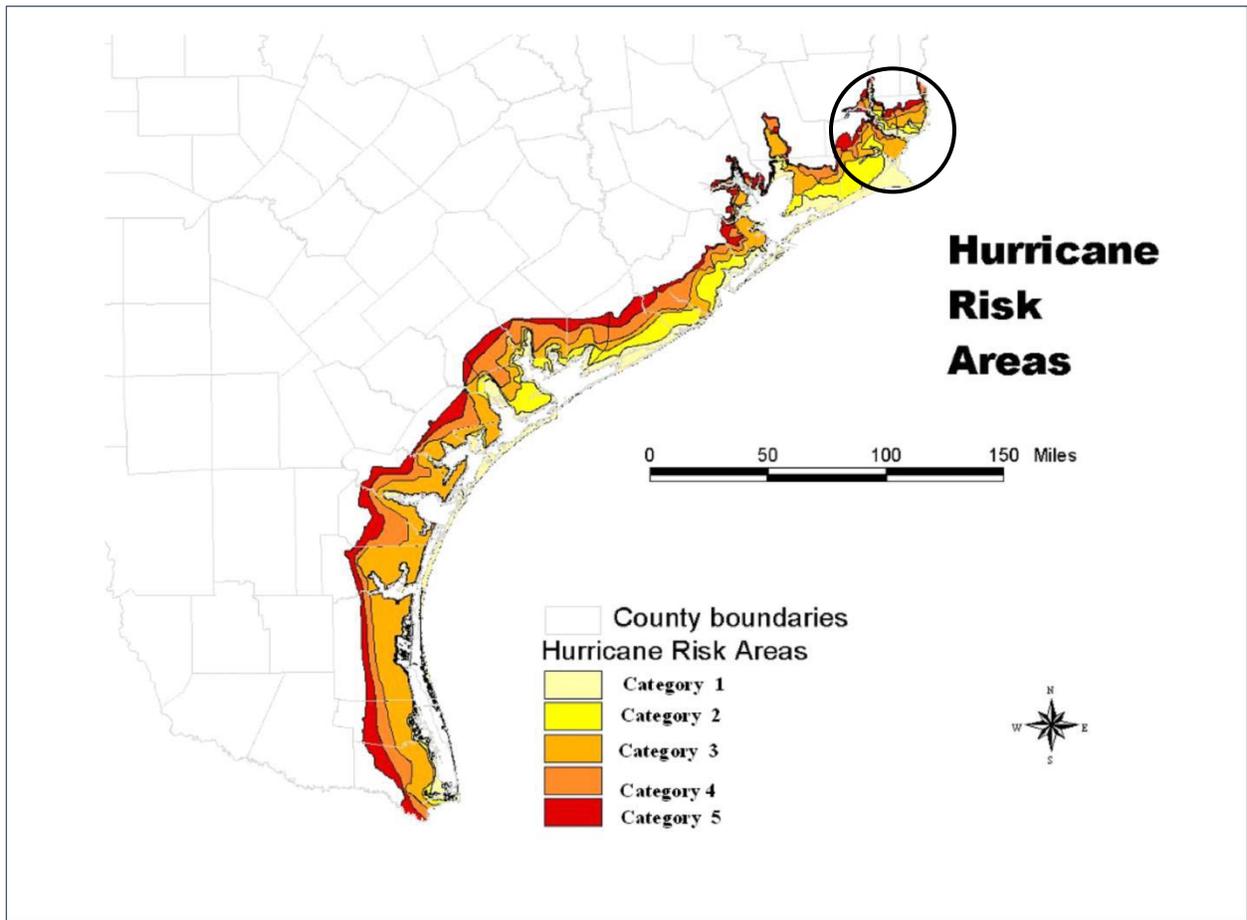
CATEGORY	MAXIMUM SUSTAINED WIND SPEED (Mph)	MINIMUM SURFACE PRESSURE (Millibars)	STORM SURGE (Feet)
1	74 – 95	Greater than 980	3 – 5
2	96 – 110	979 – 965	6 – 8
3	111 – 130	964 – 945	9 – 12
4	131 – 155	944 – 920	13 – 18
5	155 +	Less than 920	19+

Based on the historical storm tracks for hurricanes and tropical storms, as well as the location of Orange County, the average extent to be mitigated for is a Category 4 storm. The Orange County planning area has experienced wind speeds up to 155 mph, therefore a Category 4 should be mitigated in the event of a hurricane. Figure 7-2 displays the location of hurricane risk by storm category along the Gulf Coast.

¹ Source: National Hurricane Center

Section 7: Hurricane

Figure 7-2. Location of Hurricane Risk along the Texas Coast



Historical Occurrences

Previous occurrences include storms that had a direct path through the Orange County study area. Table 7-2 below lists the storms that have impacted the Orange County planning area during the years of 1996-2016.

Table 7-2. Historical Hurricane/Tropical Storms Events, 1996-2016²

YEAR	STORM NAME	CATEGORY	PROPERTY DAMAGE	CROP DAMAGE
1998	Frances	Tropical Storm	\$10,275,012	\$0
2001	Allison	Tropical Storm	\$0	\$0
2005	Rita	Category 3	\$612,547,363	\$0
2007	Humberto	Category 1	\$11,539,437	\$0
2008	Edouard	Tropical Storm	\$277,819	\$0

² Values are in 2016 dollars.

Section 7: Hurricane

YEAR	STORM NAME	CATEGORY	PROPERTY DAMAGE	CROP DAMAGE
2008	Ike	Category 2	\$83,345,680	\$0
TOTALS			\$717,985,311	\$0

Based on the list of historical tornado events for the Orange County planning area (listed above), including all participating jurisdictions, none of the events have occurred since the 2011 Plan.

Significant Past Events

Tropical Storm Frances, September 9-11, 1998 – Orange County

Tropical Storm Frances was the third tropical system to impact southeast Texas in 3 weeks, and caused the worst damage. Wind gusts in excess of 50 mph occurred along the coast on September 11th, but most of the damage occurred from the high tides. At Sabine Pass, the tide reading reached 5.3 ft. MSL, which was one of the highest tides in the last 30 years. On top of the high tides, heavy rain lasting several days dropped 8 to 10 inches of rain across the region.

Millions of dollars in damages throughout neighboring Jefferson County and was primarily a result of road damages. Highway 87 between Sabine Pass and Port Arthur received major damage, as did Highway 87 between Port Arthur and Bridge City, around the Rainbow Bridge. Pleasure Island received significant damage to the levee from the high tides and heavy wave action.

In Orange County, the worst hit areas included Bridge City and Vidor. Several roads were closed from September 11th through the 13th. Over 4,000 sandbags were passed out so homeowners could protect their places from the high water.

Hurricane Rita, September 18-26, 2005 – Orange County

Hurricane Rita made landfall just east of the Texas - Louisiana border. The hurricane moved northwest and across southeast Texas in the morning hours of September 24th as a dangerous category 3 hurricane with sustained winds of 120 mph. Along the coast of neighboring Jefferson County, storm surges near 10 feet occurred near Sabine Pass, where over 90 percent of the homes were severely damaged or destroyed. The storm surge backed up the Sabine River, and flooded a small section of downtown Orange with around 4 to 5 feet of storm surge. Winds blew over 100 mph across the entire region, snapping and uprooting trees, and damaged over 125,000 homes and businesses. Some homes in neighboring Jasper and Newton counties did not have electricity restored for over six weeks. Seven fatalities were attributed to the storm, however none of the deaths occurred in Orange County.

Probability of Future Events

Based on historical occurrences of significant hurricane events, the probability of future events is likely, with a frequency of occurrence of one event every three years for the Orange County planning area.

Vulnerability and Impact

Hurricanes and Tropical storms can cause major damage to large areas; hence all existing buildings, facilities and populations are equally exposed and vulnerable to this hazard and could potentially be impacted. The Orange County planning area features eleven mobile or manufactured home parks including two in Bridge City, three in the City of Orange, one in Pinehurst, three in Vidor and two in

Section 7: Hurricane

West Orange. These parks are typically more vulnerable to hurricane events than typical site built structures. In addition, manufactured homes are located sporadically throughout rural portions of the county which would also be more vulnerable. The US Census data indicates a total of 6,074 manufactured homes located in the Orange County planning area including all participating jurisdictions (Table 7-3). In addition, 53.9% (approximately 19,246 structures) of the single family residential (SFR) structures in the Orange County planning area were built before 1980.³ These structures would typically be built to lower or less stringent construction standards than newer construction and may be more susceptible to damages during significant events.

Table 7-3. Structures at Greater Risk by Jurisdiction

JURISDICTION	MANUFACTURED HOMES	SFR STRUCTURES BUILT BEFORE 1980
Bridge City	339	1,561
City of Orange	283	6112
Pine Forest	49	146
Pinehurst	871	576
Rose City	54	125
Vidor	929	2,867
West Orange	304	1,409
Orange County⁴	6,074	19,269

The following critical facilities would be vulnerable to hurricane events in each participating jurisdiction, respectively.

Table 7-4. Critical Facilities by Jurisdiction

JURISDICTION	CRITICAL FACILITIES
Orange County	Fire Station
Bridge City	Fire Station, Police Station, 5 Schools
City of Orange	Port District Facilities, River Authority Facilities, 5 Fire Stations, 3 Police Stations, 2 Water District Facilities, 14 Schools
Pine Forest	None
Pinehurst	None
Rose City	None
Vidor	Fire Station, Police Station, 2 Water District Facilities, 7 Schools

³ Source: US Census Bureau data estimates for 2014.

⁴ County totals includes all participating jurisdictions and unincorporated areas.

Section 7: Hurricane

JURISDICTION	CRITICAL FACILITIES
West Orange	None

Table 7-5 shows impact or loss estimation for storms impacting the county. Damages are reported on a countywide basis and are not available for each participating jurisdiction. Annual loss estimates were based on the 21 year reporting period for such damages (Table 7-4). The average annual loss estimate for Orange County is approximately \$34.19 million.

Table 7-5. Summary of Hurricane Events and Potential Annualized Losses, 1996-2016⁵

JURISDICTION	NUMBER OF EVENTS	PROPERTY & CROP LOSS	ANNUAL LOSS ESTIMATE
Orange County	6	\$717,985,311	\$34,189,777

The potential severity of impact from a hurricane for the Orange County planning area is classified as substantial; meaning multiple deaths, complete shutdown of critical facilities and services for 30 days or more, and more than 50 percent of property would be destroyed or have major damage.

Assessment of Impacts

Hurricane events have the potential to pose a significant risk to people, and can create dangerous and difficult situations for public health and safety officials. Impacts to the planning area can include:

- Individuals exposed to the storm can be struck by flying debris, falling limbs, or downed trees causing serious injury or death.
- Structures can be damaged or crushed by falling trees, which can result in physical harm to the occupants.
- Coastal communities may suffer substantial damage, requiring immediate shelter and long term displacement assistance.
- Driving conditions in all jurisdictions may be dangerous during a hurricane event, especially over elevated bridges, elevating the risk of injury and accidents during evacuations if not timed properly.
- Additional resources may be required for emergency preparedness and response during the summer months due to increases in populations along the coast.
- Emergency evacuations may be necessary prior to a hurricane landfall, requiring emergency responders, evacuation routing and temporary shelters.
- Significant debris and downed trees can result in emergency response vehicles being unable to access areas of the community.
- Downed power lines may result in roadways being unsafe for use, which may prevent first responders from answering calls for assistance or rescue.
- During hurricane landfall, first responders may be prevented from responding to calls, as the winds may reach a speed in which their vehicles and equipment are unsafe to operate.
- Hurricane events often result in widespread power outages increasing the risk to more vulnerable portions of the population who rely on power for health and/or life safety.

⁵ Values are in 2016 dollars.

Section 7: Hurricane

- Extended power outage often results in an increase in structure fires and carbon monoxide poisoning, as individuals attempt to cook or heat their homes with alternate, unsafe cooking or heating devices, such as grills.
- Extreme hurricane events may rupture gas lines and down trees and power lines, increasing the risk of structure fires during and after a storm event.
- Extreme hurricane events may lead to prolonged evacuations during search and rescue, and immediate recovery efforts requiring additional emergency personnel and resources to prevent entry, and protect citizens and property.
- First responders are exposed to downed power lines, unstable and unusual debris, hazardous materials, and generally unsafe conditions.
- Emergency operations and services may be significantly impacted due to damaged facilities and/or loss of communications.
- Critical staff may be unable to report for duty, limiting response capabilities.
- City or county departments may be damaged, delaying response and recovery efforts for the entire community.
- Private sector entities that the city and its residents rely on, such as utility providers, financial institutions, and medical care providers may not be fully operational and may require assistance from neighboring communities until full services can be restored.
- Economic disruption negatively impacts the programs and services provided by the community due to short and long term loss in revenue.
- Some businesses not directly damaged by the hurricane may be negatively impacted while roads are cleared and utilities are being restored, further slowing economic recovery.
- Older structures built to less stringent building codes may suffer greater damage as they are typically more vulnerable to hurricane damage.
- Large scale hurricanes can have significant economic impact on the affected area, as it must now fund expenses such as infrastructure repair and restoration, temporary services and facilities, overtime pay for responders, as well as normal day-to-day operating expenses.
- Businesses that are more reliant on utility infrastructure than others may suffer greater damages without a backup power source.

The economic and financial impacts of a hurricane on the area will depend entirely on the scale of the event, what is damaged, and how quickly repairs to critical components of the economy can be implemented. The level of preparedness and pre-event planning done by the county, communities, local businesses and citizens will also contribute to the overall economic and financial conditions in the aftermath of any hurricane event.

Section 8: Extreme Heat

Hazard Description.....	1
Location.....	1
Extent.....	1
Historical Occurrences.....	4
Probability of Future Events.....	6
Vulnerability and Impact.....	6
Assessment of Impacts.....	7

Hazard Description

Extreme heat is the condition whereby temperatures hover ten degrees or more above the average high temperature in a region for an extended period. Extreme heat during the summer months is a common occurrence throughout the State of Texas, and Orange County is no exception. Severe, excessive summer heat is characterized by a combination of exceptionally high temperatures and humidity. When these conditions persist over a period of time, it is defined as a heat wave. Orange County and all participating jurisdictions typically experience extended heat waves.



Although heat can damage buildings and facilities, it presents a more significant threat to the safety and welfare of citizens. The major human risks associated with severe summer heat include: heat cramps; sunburn; dehydration; fatigue; heat exhaustion; and even heat stroke. The most vulnerable population to heat casualties are children and the elderly or infirmed, who frequently live on low fixed incomes and cannot afford to run air-conditioning on a regular basis. This population is sometimes isolated, with no immediate family or friends to look out for their well-being.

Location

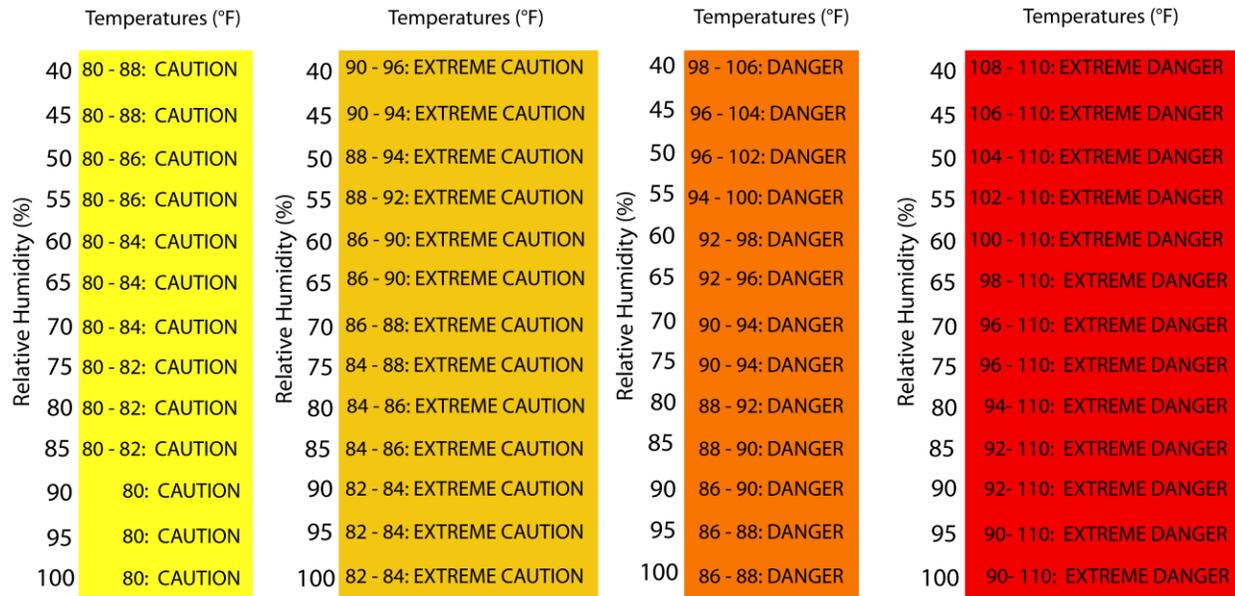
Though no deaths from extreme heat have been recorded in Orange County, there have been heat related deaths reported in neighboring counties including Jefferson and Liberty County. There is no specific geographic scope to the extreme heat hazard. Extreme heat could occur anywhere within the Orange County planning area.

Extent

The magnitude or intensity of an extreme heat event is measured according to temperature in relation to the percentage of humidity. According to the National Oceanic Atmospheric Administration (NOAA), this relationship is referred to as the “Heat Index,” and is depicted in Figure 8-1. This index measures how hot it feels outside when humidity is combined with high temperatures.

Section 8: Extreme Heat

Figure 8-1. Extent Scale for Extreme Summer Heat¹



Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

The Extent Scale in Figure 8-1 displays varying categories of caution depending on the relative humidity combined with the temperature. For example, when the temperature is at 90 degrees Fahrenheit (°F) or lower, caution should be exercised if the humidity level is at or above 40 percent.

The shaded zones on the chart indicate varying symptoms or disorders that could occur depending on the magnitude or intensity of the event. “Caution” is the first category of intensity and it indicates when fatigue due to heat exposure is possible. “Extreme Caution” indicates that sunstroke, muscle cramps or heat exhaustion are possible, and a “Danger” level means that these symptoms are likely. “Extreme Danger” indicates that heat stroke is likely. The National Weather Service (NWS) initiates alerts based on the Heat Index as shown in Table 8-1.

Table 8-1. Heat Index & Warnings

CATEGORY	HEAT INDEX	POSSIBLE HEAT DISORDERS	WARNING TYPE
Extreme Danger	125°F and higher	Heat stroke or sun stroke likely.	A heat advisory will be issued to warn that the Heat Index may exceed 105°F.
Danger	103 – 124°F	Sunstroke, muscle cramps, and/or heat exhaustion are likely. Heatstroke possible with prolonged exposure and/or physical activity.	

¹ Source: NOAA

Section 8: Extreme Heat

CATEGORY	HEAT INDEX	POSSIBLE HEAT DISORDERS	WARNING TYPE
Extreme Caution	90 – 103°F	Sunstroke, muscle cramps, and/or heat exhaustion possible with prolonged exposure and/or physical activity.	An Excessive Heat Warning is issued if the Heat Index rises above 105°F at least 3 hours during the day or above 80°F at night.
Caution	80 – 90°F	Fatigue is possible with prolonged exposure and/or physical activity.	

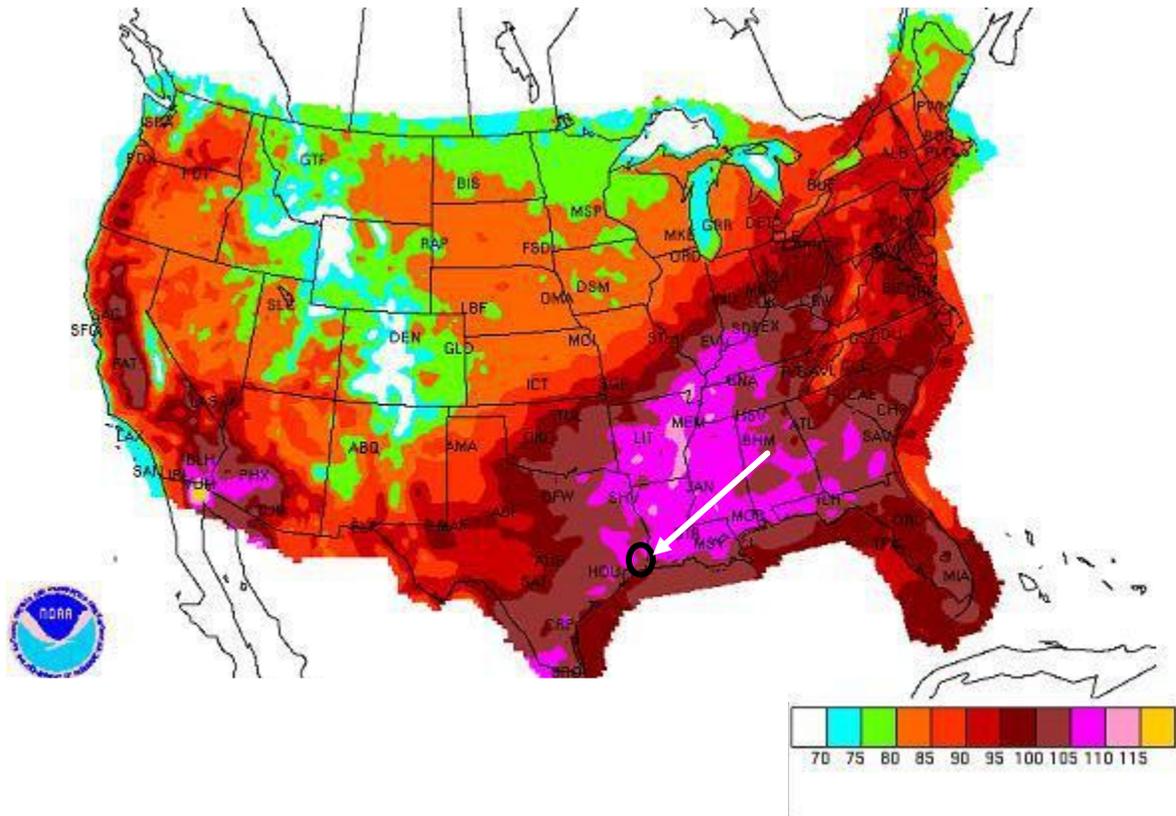
Orange County's terrain is relatively level terrain with limited elevation variations located in Southeast Texas. The county features saltwater marshes in much of the southeastern part of the county that borders the Sabine River and piney woods in the northern part of the county.

Due to its geography, and its warm, sunny, humid subtropical climate, the Orange County planning area can expect an extreme heat event each summer. Citizens, especially children and the elderly should exercise caution by staying out of the heat for prolonged periods when a heat advisory or excessive heat warning is issued. Also at risk are those working or remaining outdoors.

Figure 8-2 displays the daily maximum heat index as derived from NOAA based on data compiled from 1838 to 2015. The black circle shows the Orange County area. The brown and pink colors indicate a daily maximum heat index of 100-110 degrees F. The Orange County planning area could experience extreme heat from 90° to 110° and should mitigate to the extent of "danger", which can include sunstroke, muscle cramps, heat exhaustion and potential heatstroke with prolonged exposure.

Section 8: Extreme Heat

Figure 8-2. Average Daily Maximum Heat Index Days²



Historical Occurrences

Every summer, the hazard of heat-related illness becomes a significant public health issue throughout much of the US. Mortality from all causes increases during heat waves, and excessive heat is an important contributing factor to deaths from other causes, particularly among the elderly. Preliminary data suggest that by August 21, 2009, record high summer temperatures in Texas resulted in more than 120 heat-related deaths statewide. Table 8-2 depicts historical occurrences of mortality from heat from 1994 to 2004 from the Texas Department of State Health Services, and 2005 to 2016 from the NCEI database.

Table 8-2. Extreme Heat Related Deaths in Texas

YEAR	DEATHS
1994	1
1995	12
1996	10
1997	2

² Source: NRDC and the black circle indicates the Orange County planning area.

Section 8: Extreme Heat

YEAR	DEATHS
1998	66
1999	22
2000	71
2001	20
2002	1
2003	0
2004	3
2005	49
2006	2
2007	2
2008	7
2009	6
2010	4
2011	20
2012	2
2013	1
2014	0
2015	5
2016	1

Because the Texas Department of State Health Services reports on total events statewide, previous occurrences for extreme heat are derived from the NCEI database. According to heat related incidents located solely within Orange County, there is one heat wave³ on record for Orange County (Table 8-3). Historical extreme heat information, as provided by the NCEI, shows extreme heat activity across a multi-county forecast area for each event, the appropriate percentage of the total property and crop damage reported for the entire forecast area has been allocated to each county impacted by the event. Only extreme heat events that have been reported have been factored into this Risk Assessment. It is likely additional extreme heat occurrences have gone unreported before and during the recording period.

³ Even though the County experiences heat waves each summer, NCEI data only records events reported. Based on reports, only one event is on record.

Section 8: Extreme Heat

Table 8-3. Historical Extreme Heat Events, 1996-2016⁴

JURISDICTION	DATE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Orange County	8/29/2000	0	0	\$0	\$0
TOTALS		0	0	\$0	\$0

Based on the list of historical extreme heat events for the Orange County planning area (listed above), including all participating jurisdictions, no events have occurred since the 2011 Plan.

Probability of Future Events

According to historical records, the Orange County planning area has experienced 1 event in a twenty-one year reporting period. This provides a frequency of occurrence of 1 event every five years. This frequency supports an occasional probability of future events.

Vulnerability and Impact

There is no defined geographic boundary for extreme heat events. While all of Orange County is exposed to extreme temperatures, existing buildings, infrastructure and critical facilities are not likely to sustain significant damage from extreme heat events. Therefore, any estimated property losses associated with the extreme heat hazard are anticipated to be minimal across the area.

Extreme temperatures do however present a significant threat to life and safety for the population of the County as a whole. Heat casualties for example are typically caused by a lack of adequate air-conditioning or heat exhaustion. The most vulnerable population to heat casualties are the elderly or infirmed, who frequently live on low fixed incomes and cannot afford to run air-conditioning on a regular basis. This population is sometimes isolated, with no immediate family or friends to look out for their well-being.

Populations over 65 in the Orange County planning area exceeds 15% of the total population and children under the age of 5 exceed 6% or an estimated total of 18,706⁵ potentially vulnerable residents in the planning area based on age (Table 8-4).

Table 8-4. Populations at Greater Risk by Jurisdiction

JURISDICTION	POPULATION 65 AND OLDER	POPULATION UNDER 5
Bridge City	875	536
City of Orange	3,054	1,353
Pine Forest	70	48
Pinehurst	871	576

⁴ Values are in 2016 dollars.

⁵ US Census Bureau 2014 data for Orange County

Section 8: Extreme Heat

JURISDICTION	POPULATION 65 AND OLDER	POPULATION UNDER 5
Rose City	60	25
Vidor	1,373	945
West Orange	625	97
Orange County⁶	11,995	5,440

Another segment of the population at risk are those whose jobs consist of strenuous labor outdoors. Livestock and crops can become stressed, decreasing in quality or in production, during times of extreme heat. Extreme high temperatures can have significant secondary impacts, leading to droughts, water shortages, increased fire danger, and prompt excessive demands for energy. The possibility of rolling blackouts increases with unseasonably high temperatures in what is a normally mild month with low power demands.

Typically more than 12 hours of warning time would be given before the onset of an extreme heat event. Only minor property damage would result. The potential impact of excessive summer heat is considered “Limited” as injuries and/or illnesses would be minor and treatable with first aid.

In terms of vulnerability to structures, the impact from extreme heat would be negligible. It is possible that critical facilities and infrastructure could be shut down for 24 hours if cooling units are running constantly, leading to a temporary power outage. Less than ten percent of residential and commercial property could be damaged if extreme heat events lead to structure fires.

The potential impact of extreme heat for the Orange County planning area, including all participating jurisdictions, can be considered “Limited,” resulting in few injuries and minimal disruption to the quality of life. Based on historical records over a 21-year period, annualized losses for the entire Orange County planning area are negligible.

Assessment of Impacts

The greatest risk from extreme heat is to public health and safety. Potential impacts the community may include:

- Vulnerable populations, particularly the elderly and infants, can face serious or life-threatening health problems from exposure to extreme heat including hyperthermia; heat cramps; heat exhaustion; and heat stroke (or sunstroke).
- Response personnel including utility workers, public works personnel, and any other professions where individuals are required to work outside, are more subject to extreme heat related illnesses since their exposure would typically be greater.
- High energy demand periods can outpace the supply of energy, potentially creating the need for rolling brownouts which would elevate the risk of illness to vulnerable residents.
- Highways and roads may be damaged by excessive heat causing asphalt roads to soften and concrete roads to shift or buckle.
- Vehicles engines and cooling systems typically run harder during extreme heat events resulting in increases in mechanical failures.

⁶ County totals includes all participating jurisdictions and unincorporated areas.

Section 8: Extreme Heat

- Extreme heat events during times of drought can exacerbate the environmental impacts associated with drought, decreasing water and air quality and further degrading wildlife habitat.
- Extreme heat increases ground-level ozone (smog), increasing the risk of respiratory illnesses.
- Tourism and recreational activities predominant in the Sabine Lake area may be negatively impacted during extreme heat events, reducing seasonal revenue.
- Food suppliers can anticipate an increase in food costs due to increases in production costs and crop and livestock losses.
- Fisheries may be negatively impacted by extreme heat, suffering damage to fish habitats (either natural or man-made) and a loss of fish and/or other aquatic organisms due to decreased water flows or availability.
- Negatively impacted water suppliers may face increased costs resulting from the transport water or develop supplemental water resources.
- Outdoor activities may see an increase in injury or illness during extreme heat events.

The economic and financial impacts of extreme heat on the community will depend on the duration of the event, demand for energy, drought associated with extreme heat, and many other factors. The level of preparedness and the amount of planning done by the jurisdiction, local businesses and citizens will impact the overall economic and financial conditions before, during, and after an extreme heat event.

Section 9: Hail

Hazard Description.....	1
Location.....	1
Extent.....	1
Historical Occurrences.....	2
Significant Past Events.....	6
Probability of Future Events.....	6
Vulnerability and Impact.....	6
Assessment of Impacts.....	8

Hazard Description



Hailstorm events are a potentially damaging outgrowth of severe thunderstorms. During the developmental stages of a hailstorm, ice crystals form within a low pressure front due to the rapid rising of warm air into the upper atmosphere, and the subsequent cooling of the air mass. Frozen droplets gradually accumulate into ice crystals until they fall as precipitation that is round or irregularly shaped masses of ice greater than 0.75 inches in diameter. The size of hailstones is a direct result of the size and severity of the storm. High velocity updraft winds are required to keep hail in suspension in thunderclouds. The strength of the updraft is a by-product of heating on the Earth’s surface. Higher temperature gradients above Earth’s surface result in increased suspension time and hailstone size.

Location

Hailstorms are an extension of severe thunderstorms that could potentially cause severe damage. As a result, they are not confined to any specific geographic location, and can vary greatly in size, location, intensity and duration. Therefore, the Orange County planning area is equally at risk to the hazard of hail.

Extent

The National Weather Service (NWS) classifies a storm as “severe” if there is hail three-quarters of an inch in diameter (approximately the size of a penny) or greater, based on radar intensity or as seen by observers. The intensity category of a hailstorm depends on hail size and the potential damage it could cause, as depicted in the National Centers for Environmental Information (NCEI) Intensity Scale in Table 9-1.

Section 9: Hail

Table 9-1. Hail Intensity and Magnitude¹

SIZE CODE	INTENSITY CATEGORY	SIZE (Diameter Inches)	DESCRIPTIVE TERM	TYPICAL DAMAGE
H0	Hard Hail	Up to 0.33	Pea	No damage
H1	Potentially Damaging	0.33 – 0.60	Marble	Slight damage to plants and crops
H2	Potentially Damaging	0.60 – 0.80	Dime	Significant damage to plants and crops
H3	Severe	0.80 – 1.20	Nickel	Severe damage to plants and crops
H4	Severe	1.2 – 1.6	Quarter	Widespread glass and auto damage
H5	Destructive	1.6 – 2.0	Half Dollar	Widespread destruction of glass, roofs, and risk of injuries
H6	Destructive	2.0 – 2.4	Ping Pong Ball	Aircraft bodywork dented and brick walls pitted
H7	Very Destructive	2.4 – 3.0	Golf Ball	Severe roof damage and risk of serious injuries
H8	Very Destructive	3.0 – 3.5	Hen Egg	Severe damage to all structures
H9	Super Hailstorms	3.5 – 4.0	Tennis Ball	Extensive structural damage, could cause fatal injuries
H10	Super Hailstorms	4.0 +	Baseball	Extensive structural damage, could cause fatal injuries

The intensity scale in Table 9-1 ranges from H0 to H10, with increments of intensity or damage potential in relation to hail size (distribution and maximum), texture, fall speed, speed of storm translation, and strength of the accompanying wind. Based on available data regarding the previous occurrences for the area, the Orange County planning area may experience hailstorms ranging from an H0 to an H7. The County can mitigate a storm from low risk or hard hail to a serious hailstorm with golf ball size hail that leads to severe roof damage and could cause serious injuries.

Historical Occurrences

Historical evidence shown in Figure 9-1 demonstrates that the planning area is vulnerable to hail events overall, which typically result from severe thunderstorm activity. Historical events with reported damages, injuries or fatalities are shown in Table 9-2. A total of 53 reported historical hail events impacted Orange County between 1996 and June 2016 (Summary Table 9-3). These events were reported to NCEI and NOAA databases, and may not represent all hail events to have occurred during the past 60 years. Only those events for Orange County with latitude and longitude available were plotted (Figure 9-1).

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

Section 9: Hail

Figure 9-1. Spatial Historical Hail Events, 1996–2016

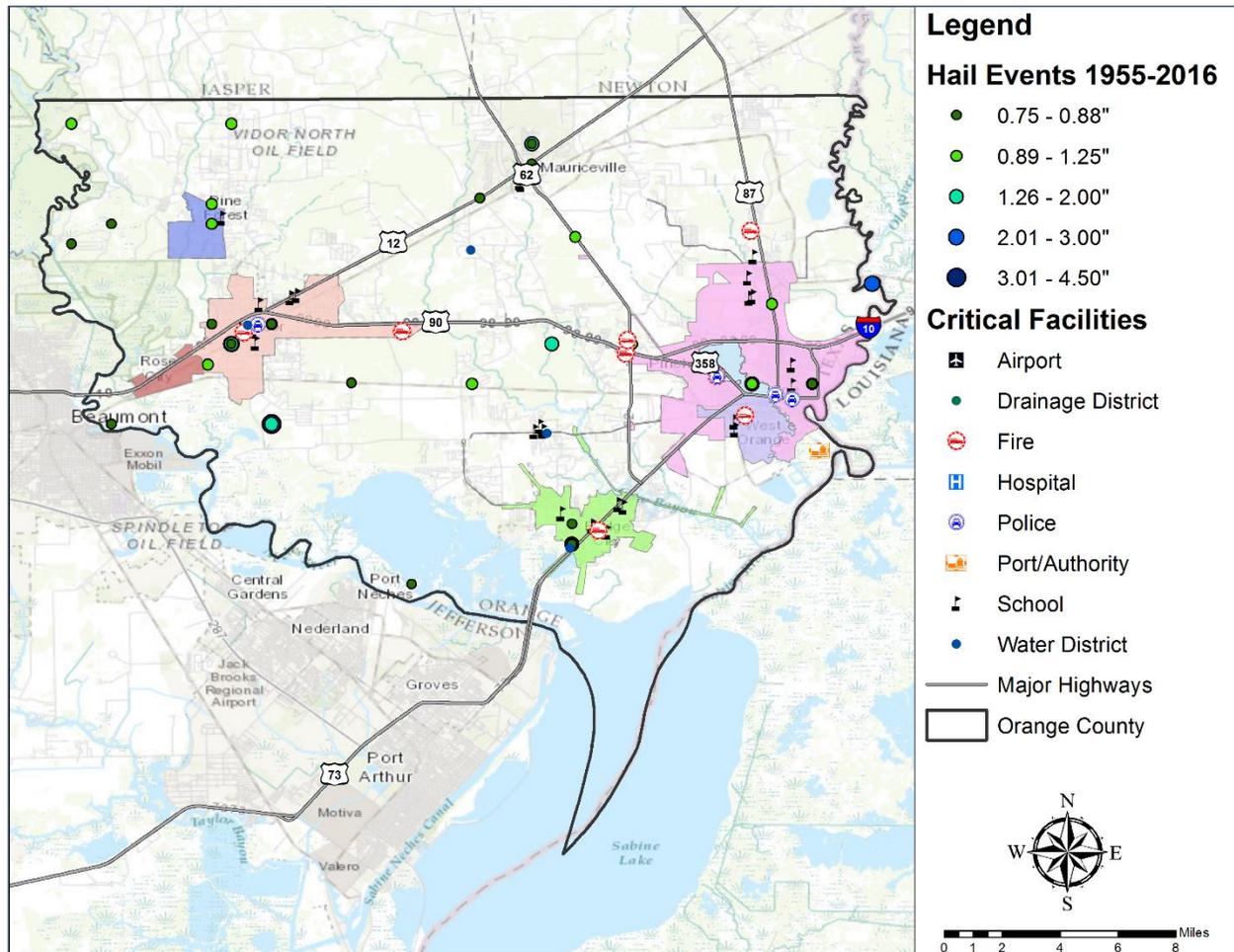


Table 9-2. Historical Hail Events, 1996-2016²

JURISDICTION	DATE	TIME	MAGNITUDE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Vidor	5/29/1996	7:10 PM	1.75	0	0	\$0	\$0
Bridge City	1/21/1998	10:50 PM	0.75	0	0	\$0	\$0
City of Orange	2/10/1998	3:00 PM	1	0	0	\$0	\$0
Bridge City	3/7/1998	6:05 AM	0.75	0	0	\$0	\$0
Bridge City	5/11/1999	6:30 AM	1	0	0	\$0	\$0
Bridge City	5/11/1999	7:40 AM	1	0	0	\$0	\$0
Vidor	8/20/1999	5:43 PM	0.75	0	0	\$0	\$0

² Damages reported in 2016 dollars.

Section 9: Hail

JURISDICTION	DATE	TIME	MAGNITUDE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
City of Orange	4/2/2000	3:30 PM	1.25	0	0	\$6,947	\$0
City of Orange	4/3/2000	3:35 AM	0.88	0	0	\$0	\$0
Vidor	4/3/2000	8:50 AM	0.75	0	0	\$0	\$0
Vidor	8/11/2000	4:25 PM	0.75	0	0	\$0	\$0
Vidor	5/26/2001	2:45 PM	1.75	0	0	\$0	\$0
City of Orange	11/28/2001	5:03 PM	0.75	0	0	\$0	\$0
Vidor	8/26/2002	5:52 PM	0.75	0	0	\$0	\$0
Bridge City	3/13/2003	9:35 AM	0.75	0	0	\$0	\$0
Bridge City	8/12/2003	6:20 PM	1	0	0	\$0	\$0
Pine Forest	10/25/2003	10:50 AM	1	0	0	\$0	\$0
Vidor	5/1/2004	1:50 AM	1.75	0	0	\$0	\$0
Pine Forest	6/15/2004	8:27 AM	0.75	0	0	\$0	\$0
Vidor	9/18/2004	4:40 PM	0.88	0	0	\$0	\$0
Vidor	5/29/2005	8:10 PM	1.75	0	0	\$0	\$0
Vidor	5/29/2005	9:33 PM	2.75	0	0	\$0	\$0
Vidor	12/4/2005	1:39 PM	0.75	0	0	\$0	\$0
Vidor	2/12/2007	8:30 PM	0.75	0	0	\$0	\$0
Vidor	2/12/2007	8:41 PM	1	0	0	\$0	\$0
Orange County	6/13/2007	3:15 PM	1.5	0	0	\$0	\$0
Bridge City	12/20/2007	9:45 AM	0.75	0	0	\$0	\$0
Vidor	1/31/2008	10:40 AM	0.75	0	0	\$0	\$0
City of Orange	5/11/2008	4:10 AM	1.75	0	0	\$0	\$0
Vidor	5/11/2008	3:51 AM	0.75	0	0	\$0	\$0
City of Orange	5/22/2008	12:06 PM	0.75	0	0	\$0	\$0
Orange County	6/25/2008	8:14 PM	0.75	0	0	\$0	\$0
Orange County	2/1/2009	4:10 PM	0.88	0	0	\$0	\$0
Vidor	2/1/2009	3:15 PM	0.88	0	0	\$0	\$0
Vidor	2/1/2009	3:38 PM	1.75	0	0	\$0	\$0

Section 9: Hail

JURISDICTION	DATE	TIME	MAGNITUDE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Bridge City	4/12/2009	11:08 AM	0.75	0	0	\$0	\$0
Orange County	7/8/2009	4:35 PM	0.88	0	0	\$0	\$0
Orange County	5/30/2010	3:42 PM	1	0	0	\$0	\$0
Vidor	5/30/2010	4:09 PM	0.88	0	0	\$0	\$0
Vidor	5/30/2010	4:10 PM	1	0	0	\$0	\$0
West Orange	3/29/2011	10:03 PM	1	0	0	\$0	\$0
Pine Forest	6/6/2011	2:34 PM	1	0	0	\$0	\$0
Pine Forest	6/6/2011	2:47 PM	1	0	0	\$0	\$0
Vidor	6/6/2011	2:56 PM	1	0	0	\$0	\$0
Vidor	6/6/2011	3:12 PM	1	0	0	\$0	\$0
City of Orange	5/9/2013	11:01 PM	0.88	0	0	\$0	\$0
City of Orange	5/9/2013	11:45 PM	1	0	0	\$0	\$0
Vidor	6/8/2013	3:20 PM	0.88	0	0	\$0	\$0
Vidor	6/9/2013	12:10 PM	0.88	0	0	\$0	\$0
Orange County	2/20/2014	7:06 PM	1	0	0	\$0	\$0
Bridge City	2/20/2014	7:10 PM	0.88	0	0	\$0	\$0
Orange County	4/27/2015	5:12 PM	1	0	0	\$0	\$0
Pine Forest	3/18/2016	3:52 PM	1	0	0	\$0	\$0

Table 9-3. Historical Hail Events Summary, 1996-2016³

JURISDICTION	NUMBER OF EVENTS	MAGNITUDE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Orange County	7	1.5 inches	0	0	\$0	\$0
Bridge City	9	0.88 inches	0	0	\$0	\$0
City of Orange	8	1.75 inches	0	0	\$6,947	\$0
Pine Forest	4	1.00 inches	0	0	\$0	\$0
Pinehurst	0	N/A	0	0	\$0	\$0

³ Values are in 2016 dollars.

Section 9: Hail

JURISDICTION	NUMBER OF EVENTS	MAGNITUDE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Rose City	0	N/A	0	0	\$0	\$0
Vidor	23	2.75 inches	0	0	\$0	\$0
West Orange	1	1.00 inches	0	0	\$0	\$0
TOTAL LOSSES	52	(Max Extent)	0	0	\$6,947	

Based on the list of historical hail events for the Orange County planning area (listed above), including all participating jurisdictions, 13 of the events have occurred since the 2011 Plan.

Significant Past Events

April 2, 2000 – City of Orange

On April 2, 2000 a hail storm brought quarter size hail to the City of Orange. Hail in sizes up to 1.25 inches damaged cars and broke windshields.

February 1, 2009 – City of Vidor

Scattered thunderstorms, including some supercells, developed across southeast Texas during the afternoon on February 1st and continued into the early morning hours on February 2nd. Several reports of large hail were received with one report of damaging winds. Half dollar size hail was reported in the City of Vidor.

Probability of Future Events

Based on available records of historic events, 52 events in a 21 year reporting period for the Orange County planning area provides a frequency of occurrence of two to three events every year. This frequency supports a “highly likely” probability of future events. The numbers listed for the jurisdictions within the County are historical events that are known to have specifically impacted those jurisdictions.

Vulnerability and Impact

Damage from hail approaches \$1 billion in the U.S. each year. Much of the damage inflicted by hail is to crops. Even relatively small hail can shred plants to ribbons in a matter of minutes. Vehicles, roofs of buildings and homes, and landscaping are most commonly damaged by hail.

Utility systems on roofs at school districts and critical facilities would be vulnerable and could be damaged. Hail could cause a significant threat to people as they could be struck by hail and falling trees and branches. Outdoor activities and events may elevate the risk to residents and visitors in the planning area when a hailstorm strikes with little warning. Older structures not built to current codes may be more vulnerable to damages than newer structures.

The Orange County planning area features eleven mobile or manufactured home parks including two in Bridge City, three in Orange, one in Pinehurst, three in Vidor and two in West Orange. In addition, manufactured homes are located sporadically throughout rural portions of the county. Manufactured homes are typically more vulnerable to hail damage than site built structures. The US Census data indicates a total of 6,074 manufactured homes located in the Orange County planning area including all participating jurisdictions (Table 9-4). In addition, 53.9% (approximately 19,246 structures) of the

Section 9: Hail

residential structures in the Orange County planning area were built before 1980.⁴ These structures would typically be built to lower or less stringent construction standards than newer construction and may be more susceptible to damages during significant hail events.

Table 9-4. Structures at Greater Risk by Jurisdiction

JURISDICTION	MANUFACTURED HOMES	SFR STRUCTURES BUILT BEFORE 1980
Bridge City	339	1,561
City of Orange	283	6,112
Pine Forest	49	146
Pinehurst	871	576
Rose City	54	125
Vidor	929	2,867
West Orange	304	1,409
Orange County⁵	6,074	19,269

The following critical facilities would be vulnerable to hail events in each participating jurisdiction:

Table 9-5. Critical Facilities by Jurisdiction

JURISDICTION	CRITICAL FACILITIES
Orange County	Fire Station
Bridge City	Fire Station, Police Station, 5 Schools
City of Orange	Port District Facilities, River Authority Facilities, 5 Fire Stations, 3 Police Stations, 2 Water District Facilities, 14 Schools
Pine Forest	None
Pinehurst	None
Rose City	None
Vidor	Fire Station, Police Station, 2 Water District Facilities, 7 Schools
West Orange	None

First responders could not be able to respond to calls due to blocked roads. Also, hail could cause power outages which could cause health and safety risks to more vulnerable populations in the planning area.

⁴ Source: US Census Bureau data estimates for 2014.

⁵ County totals includes all participating jurisdictions and unincorporated areas.

Section 9: Hail

Hail has been known to cause injury to humans, and occasionally has been fatal. Overall, the average loss estimate of property and crop (in 2016 dollars) is \$6,947, having an approximate annual loss estimate of \$331. Based on historic loss and damages, the impact of hail damages on the Orange County planning area, including all participating jurisdictions, can be considered “Limited” severity of impact meaning minor injuries that are treatable with first aid, County area facilities shut down for 24 hours or less, and less than ten percent of property destroyed or with major damage.

Table 9-4. Potential Annualized Losses for Orange County

JURISDICTION	PROPERTY & CROP DAMAGE	ANNUAL LOSS ESTIMATE
Orange County	\$0	\$0
Bridge City	\$0	\$0
City of Orange	\$6,947	\$331
Pine Forest	\$0	\$0
Pinehurst	\$0	\$0
Rose City	\$0	\$0
Vidor	\$0	\$0
West Orange	\$0	\$0
Planning Area	\$6,947	\$331

Assessment of Impacts

Hail events have the potential to pose a significant risk to people, and can create dangerous situations. Impacts to the planning area can include:

- Hail may create hazardous road conditions during and immediately following an event, delaying first responders from providing for or preserving public health and safety.
- Individuals and first responders who are exposed to the storm may be struck by hail, falling branches, or downed trees resulting in injuries or possible fatalities.
- Residential structures can be damaged by falling trees, which can result in physical harm to occupants.
- Large hail events will likely cause extensive roof damage to residential structures along with siding damage and broken windows, creating a spike in insurance claims and a rise in premiums.
- Automobile damage may be extensive depending on the size of the hail and length of the storm.
- Hail events can result in power outages over widespread areas increasing the risk to more vulnerable portions of the population who rely on power for health and/or life safety.
- Extended power outage can result in an increase in structure fires and/or carbon monoxide poisoning, as individuals attempt to cook or heat their home with alternate, unsafe cooking or heating devices, such as grills.
- First responders are exposed to downed power lines, damaged structures, hazardous spills, and debris that often accompany hail events, elevating the risk of injury to first responders and potentially diminishing emergency response capabilities.

Section 9: Hail

- Downed power lines and large debris, such as downed trees, can result in the inability of emergency response vehicles to access areas of the community.
- Hazardous road conditions may prevent critical staff from reporting for duty, limiting response capabilities.
- Economic disruption negatively impacts the programs and services provided by the community due to short and long term loss in revenue.
- Some businesses not directly damaged by the hail event may be negatively impacted while roads are cleared and utilities are being restored, further slowing economic recovery.
- Businesses that are more reliant on utility infrastructure than others may suffer greater damages without a backup power source.
- Hazardous road conditions will likely lead to increases in automobile accidents, further straining emergency response capabilities.
- Depending on the severity and scale of damage caused by large hail events, damage to power transmission and distribution infrastructure can require days or weeks to repair.
- A significant hail event could significantly damage agricultural crops, resulting in extensive economic losses for the community and surrounding area.
- Hail events may injure or kill livestock and wildlife.
- A large hail event could impact the accessibility of recreational areas and parks due to extended power outages or debris clogged access roads.

The economic and financial impacts of hail will depend entirely on the scale of the event, what is damaged, and how quickly repairs to critical components of the economy can be implemented. The level of preparedness and pre-event planning conducted by the community, local businesses and citizens will contribute to the overall economic and financial conditions in the aftermath of any hail event.

Section 10: Thunderstorm Wind

Hazard Description.....	1
Location.....	1
Extent.....	2
Historical Occurrences	3
Significant Past Events.....	7
Probability of Future Events	8
Vulnerability and Impact.....	8
Assessment of Impacts	10

Hazard Description

Thunderstorms create extreme wind events which includes straight line winds. Wind, is the horizontal motion of the air past a given point, beginning with differences in air pressures. Pressure that is higher at one place than another sets up a force pushing from the high toward the low pressure; the greater the difference in pressures, the stronger the force. The distance between the area of high pressure and the area of low pressure also determines how fast the moving air is accelerated.

Thunderstorms are created when heat and moisture near the Earth's surface are transported to the upper levels of the atmosphere. By-products of this process are the clouds, precipitation, and wind that become the thunderstorm.

According to the National Weather Service (NWS), a thunderstorm occurs when thunder accompanies rainfall. Radar observers use the intensity of radar echoes to distinguish between rain showers and thunderstorms.



Straight line winds can have gusts of 100 mph or more. Unlike tornadoes, windstorms have a broader path that is several miles wide and can cover several counties. Straight line wind may down trees and power lines, overturn mobile homes, and cause damage to well-built structures.

Straight line winds are responsible for most thunderstorm wind damages. One type of straight line wind, the downburst, is a small area of rapidly descending air beneath a thunderstorm. A downburst can cause damage equivalent to a strong tornado and make air travel extremely hazardous.

Location

Thunderstorm wind events can develop in any geographic location, and are considered a common occurrence in Texas. Therefore a thunderstorm wind event could occur at any location within Orange County's planning area, as these storms develop randomly and are not confined to any geographic area within the County. It is assumed that the Orange County planning area, including all participating jurisdictions, is uniformly exposed to the threat of thunderstorm winds.

Section 10: Thunderstorm Wind

Extent

The extent or magnitude of a thunderstorm wind event is measured by the Beaufort Wind Scale. Table 10-1 describes the different intensities of wind in terms of speed and effects, from calm to violent and destructive.

Table 10-1. Beaufort Wind Scale¹

FORCE	WIND (KNOTS)	WMO CLASSIFICATION	APPEARANCE OF WIND EFFECTS
0	Less than 1	Calm	Calm, smoke rises vertically
1	1-3	Light Air	Smoke drift indicates wind direction, still wind vanes
2	4-7	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	8-12	Gentle Breeze	Leaves and small twigs constantly moving, light flags extended
4	13-18	Moderate Breeze	Dust, leaves and loose paper lifted, small tree branches move
5	19-24	Fresh Breeze	Small trees in leaf begin to sway
6	25-31	Strong Breeze	Larger tree branches moving, whistling in wires
7	32-38	Near Gale	Whole trees moving, resistance felt walking against wind
8	39-46	Gale	Whole trees in motion, resistance felt walking against wind
9	47-54	Strong Gale	Slight structural damage occurs, slate blows off roofs
10	55-63	Storm	Seldom experienced on land, trees broken or uprooted, "considerable structural damage"
11	64-72	Violent Storm	If experienced on land, widespread damage
12	73+	Hurricane	Violence and destruction

Figure 10-1 displays the wind zones as derived from NOAA.

¹ Source: World Meteorological Organization

Section 10: Thunderstorm Wind

Figure 10-1. Wind Zones in the United States²



On average, the planning area experiences one to two thunderstorm wind events every year. The County is located within the Zone III, meaning they can experience winds up to 200 mph. Orange County has experienced a significant wind event, or an event with winds in the range of “Force 10” on the Beaufort Wind Scale with winds above 55 knots.

Historical Occurrences

Tables 10-2, 10-3 and 10-4 depict historical occurrences of thunderstorm wind events for the Orange County planning area according to the National Centers for Environmental Information (NCEI) data. Since January 1996, 62 thunderstorm wind events are known to have impacted Orange County, based upon NCEI records. Table 10-3 presents information on known historical events impacting the Orange County planning area, with resulting damages. It is important to note that high wind events associated with other hazards, such as tornadoes, are not accounted for in this section.

The NCEI is a national data source organized under the National Oceanic and Atmospheric Administration. The NCEI is the largest archive available for climate data; however, it is important to note that the only incidents recorded are those that are reported to the NCEI that have been factored

² Orange County is indicated by the circle.

Section 10: Thunderstorm Wind

into this risk assessment. In the tables that follow throughout this section, some occurrences seem to appear multiple times in one table. This is due to reports from various locations throughout the County. In addition, property damage estimates are not always available. When this occurs, estimates are provided. Where an estimate has been provided in a table for losses, the dollar amounts have been altered to indicate the damage in 2016 dollars.

Table 10-2. Historical Thunderstorm Wind Events, With Reported Damages, 1996-2016

MAXIMUM WIND SPEED RECORDED (KNOTS)	NUMBER OF REPORTED EVENTS
0-30	0
31-40	0
41-50	19
51-60	14
61-70	0
71-80	0
81-90	0
91-100	0
Unknown	29

Table 10-3. Historical Thunderstorm Wind Events, 1996-2016³

JURISDICTION	DATE	TIME	MAGNITUDE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
City of Orange	7/4/1996	3:00 PM	Unknown	0	0	\$15,249	\$0
City of Orange	8/21/1997	4:30 PM	Unknown	0	0	\$52,175	\$0
Orange County	12/3/1997	5:30 AM	Unknown	0	0	\$37,268	\$0
Orange County	2/10/1998	2:00 PM	Unknown	0	0	\$14,679	\$0
Vidor	2/22/1998	12:45 AM	Unknown	0	0	\$14,679	\$0
Bridge City	7/17/1998	4:41 PM	Unknown	0	0	\$44,036	\$0
City of Orange	8/29/1998	7:15 PM	Unknown	0	0	\$36,696	\$0
Vidor	8/30/1998	5:40 PM	Unknown	0	0	\$14,679	\$0
Vidor	8/31/1998	5:23 PM	Unknown	0	0	\$14,679	\$0
City of Orange	5/10/1999	7:30 AM	Unknown	0	0	\$14,361	\$0

³ Only recorded events with fatalities, injuries or damages are listed. Magnitude is listed when available. Damage values are in 2016 dollars.

Section 10: Thunderstorm Wind

JURISDICTION	DATE	TIME	MAGNITUDE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
City of Orange	7/12/1999	1:43 PM	Unknown	0	0	\$2,872	\$0
City of Orange	3/26/2000	7:10 AM	Unknown	0	0	\$13,894	\$0
Orange County	7/23/2000	1:30 PM	Unknown	0	0	\$6,947	\$0
Orange County	8/11/2000	4:30 PM	Unknown	0	0	\$2,779	\$0
Orange County	9/2/2000	5:00 PM	Unknown	0	0	\$2,779	\$0
Orange County	9/2/2000	5:45 PM	Unknown	0	0	\$6,947	\$0
City of Orange	5/26/2001	3:45 PM	Unknown	0	0	\$13,510	\$0
Orange County	6/29/2001	1:15 PM	Unknown	0	0	\$6,755	\$0
City of Orange	7/6/2001	5:20 PM	Unknown	0	0	\$6,755	\$0
Vidor	8/6/2001	2:30 PM	Unknown	0	0	\$6,755	\$0
Rose City	9/21/2001	4:00 PM	Unknown	0	0	\$6,755	\$0
Orange County	10/13/2001	4:00 AM	Unknown	0	0	\$27,020	\$0
Vidor	4/8/2002	2:37 AM	Unknown	0	0	\$6,650	\$0
Vidor	8/27/2002	11:50 AM	Unknown	0	0	\$6,650	\$0
Vidor	10/28/2002	11:52 PM	Unknown	0	0	\$6,650	\$0
City of Orange	10/29/2002	12:17 AM	Unknown	0	0	\$6,650	\$0
City of Orange	12/23/2002	11:10 PM	Unknown	0	0	\$6,650	\$0
Vidor	12/30/2002	10:50 PM	Unknown	0	0	\$6,650	\$0
City of Orange	8/26/2003	1:25 PM	50	0	0	\$6,502	\$0
Vidor	6/28/2004	2:45 PM	50	0	0	\$6,333	\$0
Vidor	8/28/2004	11:49 AM	50	0	0	\$6,333	\$0
Vidor	5/29/2005	8:10 PM	50	0	0	\$30,627	\$0
Orange County	6/15/2005	4:50 PM	50	0	0	\$2,450	\$0
City of Orange	4/29/2006	12:45 PM	50	0	0	\$2,374	\$0
City of Orange	5/10/2006	5:45 PM	50	0	0	\$2,374	\$0
City of Orange	8/16/2006	6:50 PM	50	0	0	\$2,374	\$0
Vidor	3/31/2007	8:19 AM	50	0	0	\$2,308	\$0
Orange County	3/3/2008	2:41 PM	50	0	0	\$27,782	\$0

Section 10: Thunderstorm Wind

JURISDICTION	DATE	TIME	MAGNITUDE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Pine Forest	6/17/2008	3:40 PM	50	0	0	\$11,113	\$0
Bridge City	7/8/2009	4:20 PM	52	0	0	\$1,115	\$0
Pine Forest	7/18/2009	3:40 PM	52	1	0	\$3,346	\$0
Vidor	7/18/2009	3:45 PM	52	0	0	\$2,230	\$0
Vidor	7/18/2009	12:50 PM	52	0	0	\$5,576	\$0
Vidor	8/16/2010	12:45 PM	52	0	0	\$2,194	\$0
Orange County	2/1/2011	8:40 AM	52	0	0	\$2,127	\$0
Orange County	2/1/2011	8:46 AM	52	0	0	\$2,127	\$0
Vidor	2/1/2011	8:44 AM	52	0	0	\$2,127	\$0
Orange County	4/26/2011	2:59 AM	52	0	0	\$2,127	\$0
Orange County	4/2/2012	8:41 AM	50	0	0	\$208,421	\$0
City of Orange	7/28/2012	5:02 PM	50	0	0	\$2,084	\$0
Vidor	12/25/2012	12:48 PM	50	0	0	\$781,579	\$0
City of Orange	10/13/2014	11:30 AM	50	0	0	\$5,053	\$0
Vidor	4/27/2015	5:14 AM	50	0	0	\$2,019	\$0
City of Orange	5/27/2015	5:17 AM	50	0	0	\$2,019	\$0
City of Orange	3/24/2016	6:06 AM	50	0	0	\$2,000	\$0

Section 10: Thunderstorm Wind

Table 10-4. Summary of Historical Thunderstorm Wind Events, 1996-2016⁴

JURISDICTION	NUMBER OF EVENTS	MAGNITUDE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Orange County	15	52 knots	0	0	\$350,209	\$0
Bridge City	3	54 knots	0	0	\$45,151	\$0
City of Orange	19	52 knots	0	0	\$193,593	\$0
Pine Forest	3	52 knots	1	0	\$14,458	\$0
Pinehurst	0	N/A	0	0	\$0	\$0
Rose City	2	Unknown	0	0	\$6,755	\$0
Vidor	19	52 knots	0	0	\$918,717	\$0
West Orange	1	56 knots	0	0	\$0	\$0
TOTAL LOSSES	62	(Max Extent)	1	0	\$1,528,883	

Based on the list of historical thunderstorm wind events for the Orange County planning area (listed above), including all participating jurisdictions, 14 of the events have occurred since the 2011 Plan.

Significant Past Events

July 17, 1998 – Bridge City, Southern Orange County

Severe thunderstorm winds produced widespread damage across southern Orange County. Trees and power lines were downed across much of the area. Bridge City received the majority of damages.

March 3, 2008 – Orange County

Strong winds, in excess of 50 knots, blew through the Little Cypress area damaging a barn. Several roofs were damaged in the area.

July 18, 2009 – Pine Forest

A line of strong to severe thunderstorms developed during the afternoon hours across interior southeast Texas, before moving southward into the Gulf of Mexico. Numerous reports of large hail, damaging winds, and intense lightning were received. High winds and lightning combined to knock out power to 11,000 customers across southeast Texas. An 84 year old Pine Forest resident was killed at his residence on Hulett Street by a fallen tree limb. As the man arrived home at his residence and exited a vehicle, a tree limb as large as a car was blown out of a 60 foot tall pine tree and crushed both him and the vehicle.

April 2, 2012 – Orange County

An upper level disturbance crossed southeast Texas while a front remained in the area. This resulted in severe thunderstorms, including a tornado in Newton. In Orange County several trees were snapped and at least 5-6 homes received roof damage in Orangefield area on 3rd and 4th Street. One large garage was destroyed.

⁴ Values are in 2016 dollars.

Section 10: Thunderstorm Wind

December 25, 2012 – Vidor

A strong cold front moved through Southeast Texas during Christmas Day with strong winds and small hail in storms along the boundary, strong gradient winds behind the boundary, and low tides caused by persistent strong north winds behind the front. Winds in Orange County damaged several structures in the Vidor area. An apartment complex with multiple buildings had roof damage to three different structures with one roof completely destroyed. An outlet mall had roof and sign damage. A large tree limb fell on one home damaging the roof and porch. In a near-by trailer park multiple mobile homes had damage with one truck being crushed by a fallen tree.

Probability of Future Events

Most thunderstorm winds occur during the spring, in the months of March, April and May, and in the fall, during the month of September. Based on available records of historic events, 62 events in a 21 year reporting period provides a frequency of occurrence of 2 to 3 events every year. Even though the intensity of thunderstorm wind events is not always damaging for the Orange County planning area, the frequency of occurrence for a thunderstorm wind event is highly likely, meaning that an event is probable within the next year for the Orange County planning area, including all participating jurisdictions.

Vulnerability and Impact

Vulnerability is difficult to evaluate since thunderstorm wind events can occur at different strength levels, in random locations, and can create relatively narrow paths of destruction. Due to the randomness of these events, all existing and future structures, and facilities in Orange County could potentially be impacted and remain vulnerable to possible injury and property loss from strong winds.

Trees, power lines and poles, signage, manufactured housing, radio towers, concrete block walls, storage barns, windows, garbage receptacles, brick facades, and vehicles, unless reinforced, are vulnerable to thunderstorm wind events. The Orange County planning area features eleven mobile or manufactured home parks including two in Bridge City, three in Orange, one in Pinehurst, three in Vidor and two in West Orange. In addition, manufactured homes are located sporadically throughout rural portions of the county. Manufactured homes are typically more vulnerable to wind damage than site built structures. The US Census data indicates a total of 6,074 manufactured homes located in the Orange County planning area including all participating jurisdictions (Table 10-5). In addition, 53.9% (approximately 19,269 structures) of the residential structures in the Orange County planning area were built before 1980. These structures would typically be built to lower or less stringent construction standards than newer construction and may be more susceptible to damages during significant wind events.

Table 10-5. Structures at Greater Risk by Jurisdiction

JURISDICTION	MANUFACTURED HOMES	SFR STRUCTURES BUILT BEFORE 1980
Bridge City	339	1,561
City of Orange	283	6112
Pine Forest	49	146

Section 10: Thunderstorm Wind

JURISDICTION	MANUFACTURED HOMES	SFR STRUCTURES BUILT BEFORE 1980
Pinehurst	871	576
Rose City	54	125
Vidor	929	2,867
West Orange	304	1,409
Orange County⁵	6,074	19,269

More severe damage involves windborne debris, in some instances, patio furniture and other lawn items have been reported to have been blown around by wind and, very commonly, debris from damaged structures in turn have caused damage to other buildings not directly impacted by the event.

The following critical facilities would be vulnerable to thunderstorm wind events in each participating jurisdiction:

Table 10-6. Critical Facilities by Jurisdiction

JURISDICTION	CRITICAL FACILITIES
Orange County	Fire Station
Bridge City	Fire Station, Police Station, 5 Schools
City of Orange	Port District Facilities, River Authority Facilities, 5 Fire Stations, 3 Police Stations, 2 Water District Facilities, 14 Schools
Pine Forest	None
Pinehurst	None
Rose City	None
Vidor	Fire Station, Police Station, 2 Water District Facilities, 7 Schools
West Orange	None

A thunderstorm wind event can also result in traffic disruptions, injuries and in rare cases, fatalities. Impact of extreme winds experienced in the Orange County planning area has resulted in no injuries and one fatality. Impact of thunderstorm wind events experienced in the Orange County planning area would be “Minor,” and injuries and illnesses do not result in permanent disability, the quality of life lost would be minor, and facilities would be shut down for more than 1 week. Overall, the average loss estimate (in 2016 dollars) is \$1,528,883, having an approximate annual loss estimate of \$172,804 (Table 10-7).

⁵ County totals includes all participating jurisdictions and unincorporated areas.

Section 10: Thunderstorm Wind

Table 10-7. Potential Annualized Losses for Orange County⁶

JURISDICTION	PROPERTY & CROP LOSS	ANNUAL LOSS ESTIMATE
Orange County	\$350,209	\$16,678
Bridge City	\$45,151	\$2,150
City of Orange	\$193,593	\$9,219
Pine Forest	\$14,458	\$689
Pinehurst	\$0	\$0
Rose City	\$6,755	\$322
Vidor	\$918,717	\$43,749
West Orange	\$0	\$0
Planning Area	\$1,528,883	\$72,804

Assessment of Impacts

Thunderstorm wind events have the potential to pose a significant risk to people, and can create dangerous and difficult situations for public health and safety officials. Impacts to the planning area can include:

- Individuals exposed to the storm can be struck by flying debris, falling limbs, or downed trees causing serious injury or death.
- Structures can be damaged or crushed by falling trees, which can result in physical harm to the occupants.
- Significant debris and downed trees can result in emergency response vehicles being unable to access areas of the community.
- Downed power lines may result in roadways being unsafe for use, which may prevent first responders from answering calls for assistance or rescue.
- During exceptionally heavy wind events, first responders may be prevented from responding to calls, as the winds may reach a speed in which their vehicles and equipment are unsafe to operate.
- Thunderstorm wind events often result in widespread power outages increasing the risk to more vulnerable portions of the population who rely on power for health and/or life safety.
- Extended power outage often results in an increase in structure fires and carbon monoxide poisoning, as individuals attempt to cook or heat their homes with alternate, unsafe cooking or heating devices, such as grills.
- First responders are exposed to downed power lines, unstable and unusual debris, hazardous materials, and generally unsafe conditions.
- Emergency operations and services may be significantly impacted due to damaged facilities and/or loss of communications.
- Critical staff may be unable to report for duty, limiting response capabilities.

⁶ Values are in 2016 dollars.

Section 10: Thunderstorm Wind

- County or City departments may be damaged, delaying response and recovery efforts for the entire community.
- Private sector entities that the County or City and its residents rely on, such as utility providers, financial institutions, and medical care providers may not be fully operational and may require assistance from neighboring communities until full services can be restored.
- Economic disruption negatively impacts the programs and services provided by the community due to short and long term loss in revenue.
- Some businesses not directly damaged by extreme wind events may be negatively impacted while roads are cleared and utilities are being restored, further slowing economic recovery.
- Older structures built to less stringent building codes may suffer greater damage as they are typically more vulnerable to extreme winds.
- Large scale wind events can have significant economic impact on the affected area, as it must now fund expenses such as infrastructure repair and restoration, temporary services and facilities, overtime pay for responders, as well as normal day-to-day operating expenses.
- Businesses that are more reliant on utility infrastructure than others may suffer greater damages without a backup power source.
- Sabine Lake is a large recreational lake that attracts fishing and boating activities throughout the year. A large thunderstorm wind event could impact recreational water activities, placing boaters and campers in imminent danger, potentially requiring emergency services or lake evacuation.
- Recreational areas and parks may be damaged or inaccessible due to downed trees or debris, causing temporary impacts to area businesses.

The economic and financial impacts of thunderstorm winds on the area will depend entirely on the scale of the event, what is damaged, and how quickly repairs to critical components of the economy can be implemented. The level of preparedness and pre-event planning done by the community, local businesses and citizens will also contribute to the overall economic and financial conditions in the aftermath of any thunderstorm wind event.

Section 11: Tornado

Hazard Description.....	1
Location.....	2
Extent.....	2
Historical Occurrences	5
Significant Past Events.....	6
Probability of Future Events	6
Vulnerability and Impact.....	7
Assessment of Impacts	8

Hazard Description



Tornadoes are among the most violent storms on the planet. A tornado is a rapidly rotating column of air extending between, and in contact with, a cloud and the surface of the earth. The most violent tornadoes are capable of tremendous destruction, with wind speeds of 250 miles per hour or more. In extreme cases, winds may approach 300 miles per hour. Damage paths can be in excess of one mile wide and 50 miles long.

The most powerful tornadoes are produced by “Supercell Thunderstorms.” Supercell Thunderstorms are created when horizontal wind shears (winds moving in different directions at different altitudes) begin to rotate the storm. This horizontal rotation can be tilted vertically by violent updrafts, and the rotation radius can shrink, forming a vertical column of very quickly swirling air. This rotating air can eventually reach the ground, forming a tornado.

Table 11-1. Tornado Variations

WEAK TORNADOES	STRONG TORNADOES	VIOLENT TORNADOES
<ul style="list-style-type: none"> • 69% of all tornadoes • Less than 5% of tornado deaths • Lifetime 1-10+ minutes • Winds less than 110 mph 	<ul style="list-style-type: none"> • 29% of all tornadoes • Nearly 30% of all tornado deaths • May last 20 minutes or longer • Winds 110 – 205 mph 	<ul style="list-style-type: none"> • 2% of all tornadoes • 70% of all tornado deaths • Lifetime can exceed one hour • Winds greater than 205 mph

Section 11: Tornado

Location

As with thunderstorms, tornadoes do not have any specific geographic boundary and can occur throughout the Orange County planning area, including all participating jurisdictions, uniformly. It is assumed that the Orange County planning area is uniformly exposed to tornado activity. Orange County is located in Wind Zone III (Figure 11-1), where tornado winds can be as high as 200 mph.

Figure 11-1. FEMA Wind Zones in the United States¹



Extent

The destruction caused by tornadoes ranges from light to inconceivable depending on the intensity, size and duration of the storm. Typically, tornadoes cause the greatest damage to structures of light construction, such as residential homes (particularly mobile homes).

Tornado magnitudes prior to 2005 were determined using the traditional version of the Fujita Scale (Table 11-2). Since February 2007, the Fujita Scale has been replaced by the Enhanced Fujita Scale (Table 11-3), which retains the same basic design and six strength categories as the previous scale. The newer scale reflects more refined assessments of tornado damage surveys, standardization, and damage consideration to a wider range of structures.

¹ Orange County is indicated by the star.

Section 11: Tornado

Table 11-2. The Fujita Tornado Scale²

F-SCALE NUMBER	INTENSITY	WIND SPEED (MPH)	TYPE OF DAMAGE DONE	PERCENT OF APPRAISED STRUCTURE VALUE LOST DUE TO DAMAGE
F0	Gale Tornado	40 – 72	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages sign boards.	None Estimated
F1	Moderate Tornado	73 – 112	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off roads; attached garages may be destroyed.	0% – 20%
F2	Significant Tornado	113 – 157	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.	50% – 100%
F3	Severe Tornado	158 – 206	Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.	100%
F4	Devastating Tornado	207 – 260	Well-constructed homes leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.	100%
F5	Incredible Tornado	261 – 318	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles flying through the air in excess of 330 yards; trees debarked; steel reinforced concrete badly damaged.	100%

² Source: <http://www.tornadoproject.com/fscale/fscale.htm>

Section 11: Tornado

Table 11-3. Enhanced Fujita Scale for Tornadoes

STORM CATEGORY	DAMAGE LEVEL	3 SECOND GUST (MPH)	DESCRIPTION OF DAMAGES	PHOTO EXAMPLE
EF0	Gale	65 – 85	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages sign boards.	
EF1	Weak	86 – 110	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off roads; attached garages may be destroyed.	
EF2	Strong	111 – 135	Considerable damage; roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.	
EF3	Severe	136 – 165	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.	
EF4	Devastating	166 – 200	Well-constructed homes leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.	
EF5	Incredible	200+	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles flying through the air in excess of 330 yards; trees debarked; steel reinforced concrete badly damaged.	

Both the Fujita Scale and Enhanced Fujita Scale should be referenced in reviewing previous occurrences since tornado events prior to 2007 will follow the original Fujita Scale. The largest magnitude reported within the planning area is EF2 on the Fujita Scale, a “Strong Tornado.” Based on the planning areas location in wind zone III, the planning area could experience anywhere from an EF0 to an EF4 depending on the wind speed.

The events in Orange County have been between EF0 to an EF2 (Table 11-4). Therefore, the range of intensity that the Orange County planning area would be expected to mitigate is a tornado event that would be a low to high risk, an EF0 to EF4.

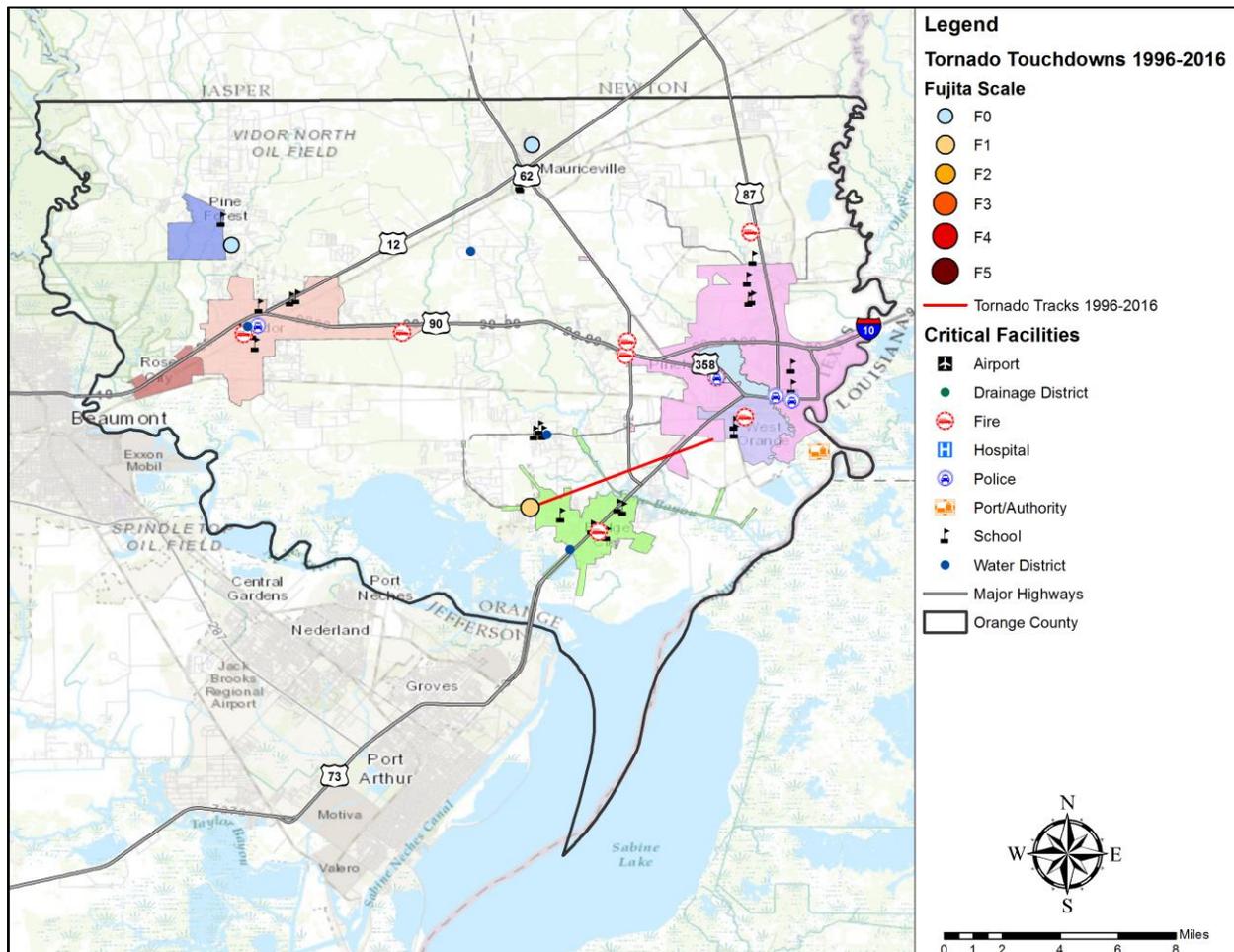
Section 11: Tornado

Historical Occurrences

Only reported tornadoes were factored into the Risk Assessment. It is likely that a number of occurrences have gone unreported over the past 21 years.

Figure 11-2 identifies the locations of previous occurrences in the Orange County planning area from 1996 to 2016. A total of 3 events have been recorded by the Storm Prediction Center (NOAA) and NCEI databases for the Orange County planning area, including all participating jurisdictions. The most significant event reported occurred in Orange County in Bridge City on October 31, 2013. The F1 tornado was 200 yards wide and stayed on the ground for close to 6 miles.

Figure 11-2. Spatial Historical Tornado Events, 1996-2016³



³ Source: NOAA Records

Section 11: Tornado

Table 11-4. Historical Tornado Events, 1996-2016⁴

JURISDICTION	DATE	TIME	MAGNITUDE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Vidor	10/18/1998	9:23 AM	F0	0	0	\$146,637	\$0
Orange County	10/18/1998	10:30 AM	F0	0	0	\$73,318	\$0
Bridge City	10/31/2013	8:39 AM	F1	0	0	\$103,016	\$0

Table 11-5. Summary of Historical Tornado Events, 1996-2016⁵

JURISDICTION	NUMBER OF EVENTS	MAGNITUDE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Orange County	1	F0	0	0	\$73,393	\$0
Bridge City	1	F1	0	0	\$102,706	\$0
City of Orange	0	N/A	0	0	\$0	\$0
Pine Forest	0	N/A	0	0	\$0	\$0
Pinehurst	0	N/A	0	0	\$0	\$0
Rose City	0	N/A	0	0	\$0	\$0
Vidor	1	F0	0	0	\$146,786	\$0
West Orange	0	N/A	0	0	\$0	\$0
TOTAL LOSSES	3	(Max Extent)	0	0	\$322,885	

Based on the list of historical tornado events for the Orange County planning area (listed above), including all participating jurisdictions, 1 of the events has occurred since the 2011 Plan.

Significant Past Events

October 31, 2013 – Bridge City

A tornado touched down south of West Round Bunch Road near Susan Circle and traveled generally west and crossed Highway 87/73 south of Cow Bayou. The tornado then turned northwest to parallel Highway 87/73 after crossing the bayou and moved across FM 1006 and lifted before reaching Western AVE. The tornado was strongest before crossing Highway 87/73 and produced EF1 damage to homes and trees. EF0 damage was done after crossing 87/73. Roofs, carports, sheds and trees were damaged along the path. The tornado path was just under six miles long and 200 yards wide.

Probability of Future Events

Tornadic storms can occur at any time of year and at any time of day, but they are typically more common in the spring months during the late afternoon and evening hours. A smaller, high frequency

⁴ Values are in 2016 dollars.

⁵ Values are in 2016 dollars.

Section 11: Tornado

period can emerge in the fall during the brief transition between the warm and cold seasons. According to historical records, Orange County experiences a tornado touchdown approximately every five years. This frequency supports an occasional probability of future events for the Orange County planning area, including all participating jurisdictions.

Vulnerability and Impact

Because tornadoes often cross jurisdictional boundaries, all existing and future buildings, facilities and populations in Orange County are considered to be exposed to this hazard and could potentially be impacted. The damage caused by a tornado is typically a result of high wind velocity, wind-blown debris, lightning, and large hail.

The average tornado moves from southwest to northeast, but tornadoes have been known to move in any direction. Consequently, vulnerability of humans and property is difficult to evaluate since tornadoes form at different strengths, in random locations, and create relatively narrow paths of destruction. Although tornadoes strike at random, making all buildings vulnerable, three types of structures are more likely to suffer damage:

- Manufactured Homes;
- Homes on crawlspaces (more susceptible to lift); and
- Buildings with large spans, such as shopping malls, gymnasiums, and factories.

Tornadoes can possibly cause a significant threat to people as they could be struck by flying debris, falling trees/branches, utility lines, and poles. First responders could also not be able to respond to calls due to blocked roads. Tornadoes commonly cause power outages which could cause health and safety risks to patients in hospitals or other vulnerable populations that rely on power for medical necessities.

The Orange County planning area features eleven mobile or manufactured home parks including two in Bridge City, three in Orange, one in Pinehurst, three in Vidor and two in West Orange. In addition, manufactured homes are located sporadically throughout rural portions of the county. Manufactured homes are typically more vulnerable to tornado damage than site built structures. The US Census data indicates a total of 6,074 manufactured homes located in the Orange County planning area including all participating jurisdictions (Table 11-6). In addition, 53.9% (approximately 19,269 structures) of the residential structures in the Orange County planning area were built before 1980.⁶ These structures would typically be built to lower or less stringent construction standards than newer construction and may be more susceptible to damages during significant tornado events.

Table 11-6. Structures at Greater Risk by Jurisdiction

JURISDICTION	MANUFACTURED HOMES	SFR STRUCTURES BUILT BEFORE 1980
Bridge City	339	1,561
City of Orange	283	6112
Pine Forest	49	146

⁶ Source: US Census Bureau data estimates for 2014.

Section 11: Tornado

JURISDICTION	MANUFACTURED HOMES	SFR STRUCTURES BUILT BEFORE 1980
Pinehurst	871	576
Rose City	54	125
Vidor	929	2,867
West Orange	304	1,409
Orange County⁷	6,074	19,269

The following critical facilities would be vulnerable to tornado events in each participating jurisdiction:

Table 11-7. Critical Facilities by Jurisdiction

JURISDICTION	CRITICAL FACILITIES
Orange County	Fire Station
Bridge City	Fire Station, Police Station, 5 Schools
City of Orange	Port District Facilities, River Authority Facilities, 5 Fire Stations, 3 Police Stations, 2 Water District Facilities, 14 Schools
Pine Forest	None
Pinehurst	None
Rose City	None
Vidor	Fire Station, Police Station, 2 Water District Facilities, 7 Schools
West Orange	None

The average loss estimate of property and crop is \$322,885 (in 2016 dollars), having an approximate annual loss estimate of \$15,376. Based on historic loss and damages, the impact of tornado on the Orange County planning area can be considered “Minor”, with more than 10 percent of property expected to be destroyed or with major damage, injuries and/or illness that do not result in permanent disability, and critical facilities shut down for more than one week.

Assessment of Impacts

Tornadoes have the potential to pose a significant risk to the population and can create dangerous situations. Often providing and preserving public health and safety is difficult. Impacts to the planning area can include:

- Individuals exposed to the storm can be struck by flying debris, falling limbs, or downed trees causing serious injury or death.
- Structures can be damaged or crushed by falling trees, which can result in physical harm to the occupants.

⁷ County totals includes all participating jurisdictions and unincorporated areas.

Section 11: Tornado

- Manufactured homes may suffer substantial damage as they would be more vulnerable than typical site built structures.
- Sub-standard construction may suffer substantial damage as they are not built to code and would be more vulnerable to tornado events than code compliant structures.
- Significant debris and downed trees can result in emergency response vehicles being unable to access areas of the community.
- Downed power lines may result in roadways being unsafe for use, which may prevent first responders from answering calls for assistance or rescue.
- Tornadoes often result in widespread power outages increasing the risk to more vulnerable portions of the population who rely on power for health and/or life safety.
- Extended power outage can result in an increase in structure fires and/or carbon monoxide poisoning, as individuals attempt to cook or heat their home with alternate, unsafe cooking or heating devices, such as grills.
- Tornadoes can destroy or make residential structures uninhabitable, requiring shelter or relocation of residents in the aftermath of the event.
- First responders must enter the damage area shortly after the tornado passes to begin rescue operations and to organize cleanup and assessments efforts, therefore they are exposed to downed power lines, unstable and unusual debris, hazardous materials, and generally unsafe conditions, elevating the risk of injury to first responders and potentially diminishing emergency response capabilities.
- Emergency operations and services may be significantly impacted due to damaged facilities, loss of communications, damaged emergency vehicles and equipment.
- County or City departments may be damaged or destroyed, delaying response and recovery efforts for the entire community.
- Private sector entities that the County or City and its residents rely on, such as utility providers, financial institutions, and medical care providers may not be fully operational and may require assistance from neighboring communities until full services can be restored.
- Economic disruption negatively impacts the programs and services provided by the community due to short and long term loss in revenue.
- Damage to infrastructure may slow economic recovery since repairs may be extensive and lengthy.
- Some businesses not directly damaged by the tornado may be negatively impacted while roads and utilities are being restored, further slowing economic recovery.
- When the community is affected by significant property damage it is anticipated that funding would be required for infrastructure repair and restoration, temporary services and facilities, overtime pay for responders, as well as normal day-to-day operating expenses.
- Displaced residents may not be able to immediately return to work, further slowing economic recovery.
- Residential structures destroyed by a tornado may not be rebuilt for years, reducing the tax base for the community.
- Large or intense tornadoes may result in a dramatic population fluctuation, as people are unable to return to their homes or jobs and must seek shelter and/or work outside of the affected area.
- Businesses that are uninsured or underinsured may have difficulty reopening, which results in a net loss of jobs for the community and a potential increase in the unemployment rate.
- Recreation activities may be unavailable and tourism can be unappealing for years following a large tornado, devastating directly related local businesses.

Section 11: Tornado

The economic and financial impacts of a tornado event on the community will depend on the scale of the event, what is damaged, costs of repair or replacement, lost business days in impacted areas, and how quickly repairs to critical components of the economy can be implemented. The level of preparedness and pre-event planning done by government, businesses and citizens will contribute to the overall economic and financial conditions in the aftermath of a tornado event.

Section 12: Drought

Hazard Description.....	1
Location.....	2
Extent.....	2
Historical Occurrences.....	4
Significant Past Events.....	4
Probability of Future Events.....	5
Vulnerability and Impact.....	5
Assessment of Impacts.....	6

Hazard Description

Drought is a period of time within substantial rainfall that persists from one year to the next. Drought is a normal part of virtually all climatic regions, including areas with high and low average rainfall. Drought is the consequence of anticipated natural precipitation reduction over an extended period of time, usually a season or more in length. Droughts can be classified as meteorological, hydrologic, agricultural, and socioeconomic. Table 12-1 presents definitions for these different types of drought.



Table 12-1. Drought Classification Definitions¹

METEOROLOGICAL DROUGHT	The degree of dryness or departure of actual precipitation from an expected average or normal amount based on monthly, seasonal, or annual time scales.
HYDROLOGIC DROUGHT	The effects of precipitation shortfalls on stream flows and reservoir, lake, and groundwater levels.
AGRICULTURAL DROUGHT	Soil moisture deficiencies relative to water demands of plant life, usually crops.
SOCIOECONOMIC DROUGHT	The effect of demands for water exceeding the supply as a result of a weather-related supply shortfall.

Droughts are one of the most complex of all natural hazards as it is difficult to determine their precise beginning or end. In addition, droughts can lead to other hazards such as extreme heat and wildfires. Their impact on wildlife and area farming is enormous, often killing crops, grazing land, edible plants, and even in severe cases, trees. A secondary hazard to drought is wildfire because dying vegetation

¹ Source: Multi-Hazard Identification and Risk Assessment: A Cornerstone of the National Mitigation Strategy, FEMA

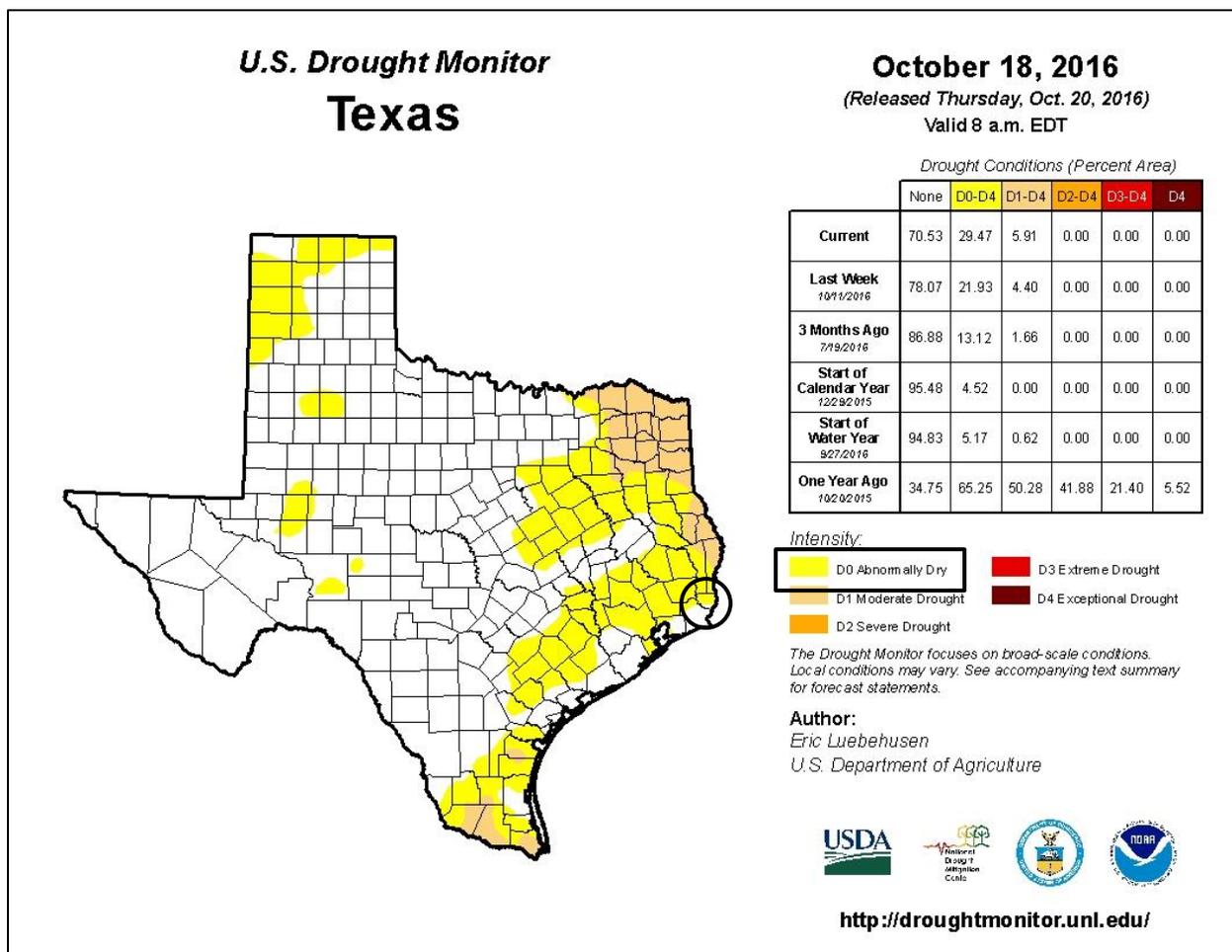
Section 12: Drought

serves as a prime ignition source. Therefore, a heat wave combined with a drought is a very dangerous situation.

Location

Droughts occur regularly throughout Texas and Orange County, and are a normal condition. However, they can vary greatly in their intensity and duration. The Drought Monitor (Figure 12-1) shows the majority of the study region is currently experiencing abnormally dry conditions, or Drought Category D0. The planning area has experienced abnormally dry to extreme drought conditions over the last five years. There is no distinct geographic boundary to drought; therefore, it can occur throughout the Orange County planning area, including all participating jurisdictions, equally.

Figure 12-1. U.S. Drought Monitor, October 2016



Extent

The Palmer Drought Index is used to measure the extent of drought by measuring the duration and intensity of long-term drought-inducing circulation patterns. Long-term drought is cumulative, with the intensity of drought during the current month dependent upon the current weather patterns plus the cumulative patterns of previous months. The hydrological impacts of drought (e.g., reservoir levels,

Section 12: Drought

groundwater levels, etc.) take longer to develop. Table 12-2 depicts magnitude of drought, while Table 12-3 describes the classification descriptions.

Table 12-2. Palmer Drought Index

DROUGHT INDEX	DROUGHT CONDITION CLASSIFICATIONS						
	Extreme	Severe	Moderate	Normal	Moderately Moist	Very Moist	Extremely Moist
Z Index	-2.75 and below	-2.00 to -2.74	-1.25 to -1.99	-1.24 to +.99	+1.00 to +2.49	+2.50 to +3.49	n/a
Meteorological	-4.00 and below	-3.00 to -3.99	-2.00 to -2.99	-1.99 to +1.99	+2.00 to +2.99	+3.00 to +3.99	+4.00 and above
Hydrological	-4.00 and below	-3.00 to -3.99	-2.00 to -2.99	-1.99 to +1.99	+2.00 to +2.99	+3.00 to +3.99	+4.00 and above

Table 12-3. Palmer Drought Category Descriptions²

CATEGORY	DESCRIPTION	POSSIBLE IMPACTS	PALMER DROUGHT INDEX
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures; fire risk above average. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered.	-1.0 to -1.9
D1	Moderate Drought	Some damage to crops, pastures; fire risk high; streams, reservoirs, or wells low, some water shortages developing or imminent, voluntary water use restrictions requested.	-2.0 to -2.9
D2	Severe Drought	Crop or pasture losses likely; fire risk very high; water shortages common; water restrictions imposed.	-3.0 to -3.9
D3	Extreme Drought	Major crop/pasture losses; extreme fire danger; widespread water shortages or restrictions.	-4.0 to -4.9
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; exceptional fire risk; shortages of water in reservoirs, streams, and wells, creating water emergencies.	-5.0 or less

² Source: National Drought Mitigation Center

Section 12: Drought

Drought is monitored nationwide by the National Drought Mitigation Center (NDMC). Indicators are used to describe broad scale drought conditions across the U.S. Indicators correspond to the intensity of drought.

Based on the historical occurrences for drought and the location of Orange County, the area can anticipate a range of drought from abnormally dry to exceptional or D0 to D4 based on the Palmer Drought Category.

Historical Occurrences

Orange County may typically experience a severe drought. Tables 12-4 and 12-5 lists historical events that have occurred in Orange County as reported in the National Centers for Environmental Information (NCEI). Historical drought information, as provided by the NCEI, shows drought activity across a multi-county forecast area for each event, the appropriate percentage of the total property and crop damage reported for the entire forecast area has been allocated to each county impacted by the event. Historical drought data for the participating jurisdictions in the Orange County planning area is provided on a County-wide basis per the NCEI database.

Table 12-4. Historical Drought Years, 1996-2016

DROUGHT YEAR
1996
1998
2000
3 unique events

Table 12-5. Historical Drought Events, 1996-2016³

JURISDICTION	DATE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Orange County	5/1/1996	0	0	\$0	\$1,446,525
Orange County	5/20/1998	0	0	\$0	\$0
Orange County	6/1/1998	0	0	\$0	\$0
Orange County	7/1/1998	0	0	\$0	\$0
Orange County	2/1/2000	0	0	\$0	\$0
TOTALS		0	0	\$1,446,525	

Based on the list of historical drought events for the Orange County planning area (listed above), including all participating jurisdictions, no events have occurred since the 2011 Plan.

³ Damages reported as 2016 dollar value.

Section 12: Drought

Significant Past Events

January - May, 1996 – Orange County

Rainfall totals from January through May averaged 10 to 15 inches below normal. The main areas affected include farming and fire protection. Crop damage across the entire region exceeded 1 million dollars. Drought conditions continue across southeast Texas through May.

May - July, 1998 – Orange County

Drought conditions began by mid-May, as southeast Texans had gone over six weeks without any significant rainfall. By the end of May, many locations had seen less than 0.10 inches of rain for the month. This was the start of a significant impact on agriculture and forestry resources. A mild to moderate drought continued across southeast Texas in the month of June. Only two days provided any relief from the dry weather, June 5th and June 26th. Many places recorded less than two inches of rain for the entire month of June. Crop losses continued to mount, primarily in the rice business, as well as forestry resources.

Probability of Future Events

Based on available records of historic events, there have been 3 extended time periods of drought within a 21 year reporting period, which provides a frequency of occurrence of 1 event probable in the next five years. This frequency supports an occasional probability of future events. All participating jurisdictions are included under the County.

Vulnerability and Impact

Loss estimates were based on 21 years of statistical data from the NCEI. A drought event frequency-impact was then developed to determine an impact profile on agriculture products and estimate potential losses due to drought in the area. Table 12-6 shows annualized exposure.

Table 12-6. Potential Annualized Losses for Orange County⁴

JURISDICTION	PROPERTY & CROP LOSS	ANNUAL LOSS ESTIMATE
Orange County	\$1,446,525	\$68,882

Drought impacts large areas and crosses jurisdictional boundaries. All existing and future buildings, facilities, and populations are exposed to this hazard and could potentially be impacted. However, drought impacts are mostly experienced in water shortages and crop/livestock losses on agricultural lands and typically have no impact on buildings.

In terms of vulnerability, population, agriculture, property, and environment are all vulnerable to drought. The average person will survive only a few days without water, and this timeframe can be drastically shortened for those people with more fragile health – typically children, the elderly, and the ill. Populations over 65 in the Orange County planning area exceeds 15% of the total population and children under the age of 5 exceed 6% or an estimated total of 18,706⁵ potentially vulnerable residents in the planning area based on age (Table 12-7).

⁴ Values are in 2016 dollars.

⁵ US Census Bureau 2014 data for Orange County

Section 12: Drought

Table 12-7. Populations at Greater Risk by Jurisdiction

JURISDICTION	POPULATION 65 AND OLDER	POPULATION UNDER 5
Bridge City	875	536
City of Orange	3,054	1,353
Pine Forest	70	48
Pinehurst	871	576
Rose City	60	25
Vidor	1,373	945
West Orange	625	97
Orange County⁶	11,995	5,440

The population is also vulnerable to food shortages when drought conditions exist and potable water is in short supply. Potable water is used for drinking, sanitation, patient care, sterilization, equipment, heating and cooling systems, and many other essential functions in medical facilities. While all residents in the Orange County planning area could be adversely affected by drought conditions, which could limit water supplies and present health threats, during summer drought, or hot and dry, conditions elderly persons, small children, infants and the chronically ill who do not have adequate cooling units in their homes may become more vulnerable to injury and/or death.

The economic impact of droughts can be significant as they produce a complex web of impacts that spans many sectors of the economy and reach well beyond the area experiencing physical drought. This complexity exists because water is integral to our ability to produce goods and provide services. If droughts extend over a number of years, the direct and indirect economic impact can be significant.

Habitat damage is a vulnerability of the environment during periods of drought, for both aquatic and terrestrial species. The environment also becomes vulnerable during periods of extreme or prolonged drought due to severe erosion and land degradation.

Impact of droughts experienced in the Orange County planning area has resulted in no injuries and fatalities supporting a limited severity of impact meaning injuries and/or illnesses are treatable with first aid, shutdown of facilities and services for 24 hours or less, and less than 10% of property is destroyed or with major damage. Annualized loss over the 21-year reporting period in Orange County is \$68,882 annually.

Assessment of Impacts

The Drought Impact Reporter was developed in 2005 by the University of Nebraska-Lincoln to provide a national database of drought impacts. Droughts can have an impact on: the agriculture; business and industry; energy; fire; plants and wildlife; relief, response, and restrictions; society and public

⁶ County totals includes all participating jurisdictions and unincorporated areas.

Section 12: Drought

health; tourism and recreation; and water supply and quality. Table 12-8 lists the drought impacts to Orange County from 2005 to 2016, based on reports received by the Drought Impact Reporter.

Table 12-8. Drought Impacts, 2005-2016

DROUGHT IMPACTS	
Agriculture	24
Business & Industry	3
Energy	2
Fire	6
Plants & Wildlife	17
Relief, Response & Restrictions	9
Society & Public Health	2
Tourism & Recreation	1
Water Supply & Quality	8

Drought has the potential to impact people in the Orange County planning area. While it is rare that drought, in and of itself, leads to a direct risk to the health and safety of people in the U.S., severe water shortages could result in inadequate supply for human needs. Drought also is frequently associated with a variety of impacts, including:

- Recreational activities at Sabine Lake that rely on water may be curtailed, such as hunting and fishing, resulting in fewer tourists and lower revenue.
- The Lower Neches Wildlife Management Area may be especially vulnerable as severe and prolonged drought can result in the reduction of a species, or cause the extinction of a species altogether.
- Plant life will suffer from long-term drought. Wind and erosion will also pose a threat to plant life as soil quality will decline.
- The number of health-related low-flow issues (e.g., diminished sewage flows, increased pollution concentrations, reduced firefighting capacity, and cross-connection contamination) will increase as the drought intensifies.
- Public safety from forest/range/wildfires will increase as water availability and/or pressure decreases.
- Respiratory ailments may increase as the air quality decreases.
- There may be an increase in disease due to wildlife concentrations (e.g., rabies, Rocky Mountain spotted fever, Lyme disease).
- Jurisdictions and residents may disagree over water use/water rights, creating conflict.
- Political conflicts may increase between municipalities, counties, states, and regions.
- Water management conflicts may arise between competing interests.
- Increased law enforcement activities may be required to enforce water restrictions.
- Severe water shortages could result in inadequate supply for human needs as well as lower quality of water for consumption.

Section 12: Drought

- Firefighters may have limited water resources to aid in firefighting and suppression activities, increasing risk to lives and property.
- During drought there is an increased risk for wildfires and dust storms.
- The community may need increased operational costs to enforce water restriction or rationing.
- Prolonged drought can lead to increases in illness and disease related to drought.
- Utility providers can see decreases in revenue as water supplies diminish.
- Utilities providers may cut back energy generation and service to their customers to prioritize critical service needs.
- Hydroelectric power generation facilities and infrastructure would have significantly diminished generation capability. Dams simply cannot produce as much electricity from low water levels as they can from high water levels.
- Fish and wildlife food and habitat will be reduced or degraded over time during a drought and disease will increase, especially for aquatic life.
- Wildlife will move to more sustainable locations creating higher concentrations of wildlife in smaller areas, increasing vulnerability and further depleting limited natural resources.
- Dry and dead vegetation will increase the risk of wildfire.
- Land subsidence threat increases as groundwater is depleted.
- Drought poses a significant risk to annual and perennial crop production and overall crop quality leading to higher food costs.
- Drought related declines in production may lead to an increase in unemployment.
- Drought may limit livestock grazing resulting in decreased livestock weight, potential increased livestock mortality, and increased cost for feed.
- Negatively impacted water suppliers may face increased costs resulting from the transport water or develop supplemental water resources.
- Long term drought may negatively impact future economic development.

The overall extent of damages caused by periods of drought is dependent on its extent and duration. The level of preparedness and pre-event planning done by government, businesses and citizens will contribute to the overall economic and financial conditions in the aftermath of a drought event.

Section 13: Wildfire

Hazard Description.....	1
Location.....	1
Extent.....	9
Historical Occurrences	19
Probability of Future Events	21
Vulnerability and Impact.....	21
Assessment of Impacts	31

Hazard Description

A wildfire event can rapidly spread out of control and occurs most often in the summer, when the brush is dry and flames can move unchecked through a highly vegetative area. Wildfires can start as a slow burning fire along the forest floor, killing and damaging trees. The fires often spread more rapidly as they reach the tops of trees, with wind carrying the flames from tree to tree. Usually, dense smoke is the first indication of a wildfire.

A wildfire event often begins unnoticed and spreads quickly, lighting brush, trees and homes on fire. For example, a wildfire may be started by a campfire that was not doused properly, tossed cigarette, burning debris, or arson.

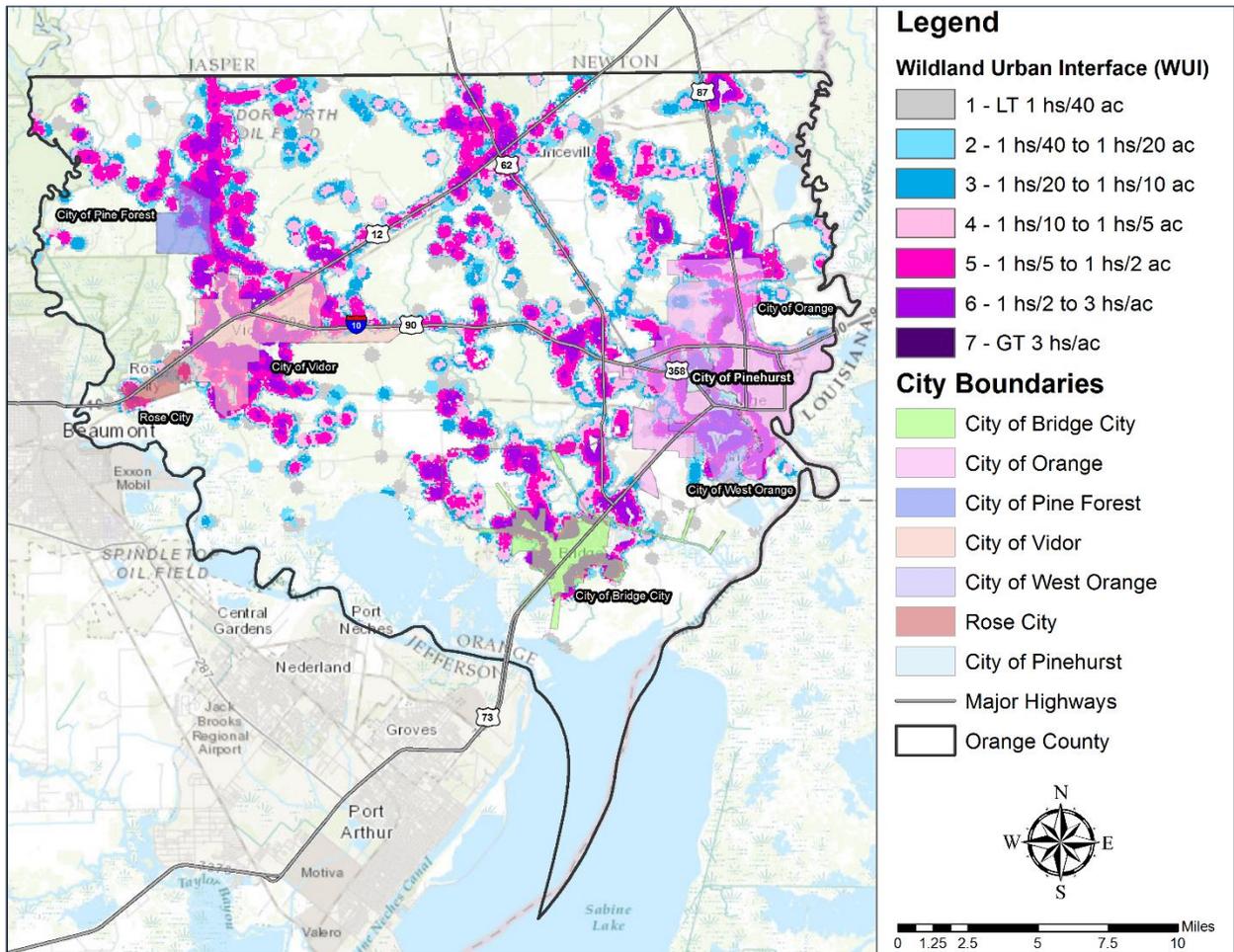
Texas has seen a significant increase in the number of wildfires in the past 30 years, which included wildland, interface or intermix fires. Wildland Urban Interface or Intermix (WUI) fires occur in areas where structures and other human improvements meet or intermingle with undeveloped wildland or vegetative fuels. Wildland fires are fueled almost exclusively by natural vegetation while interface or intermix fires are urban/wildland fires in which vegetation and the built-environment provide the fuel.

Location

A wildfire event can be a potentially damaging consequence of drought. Wildfires can vary greatly in terms of size, location, intensity and duration. While wildfires are not confined to any specific geographic location, they are most likely to occur in open grasslands. The threat to people and property from a wildfire event is greater in the fringe areas where developed areas meet open grass lands, such as the WUI. (Figures 13-1 through 13-8). It is estimated that 74 percent of the total population in Orange County live within the WUI. However, the entire Orange County planning area is at risk for wildfires.

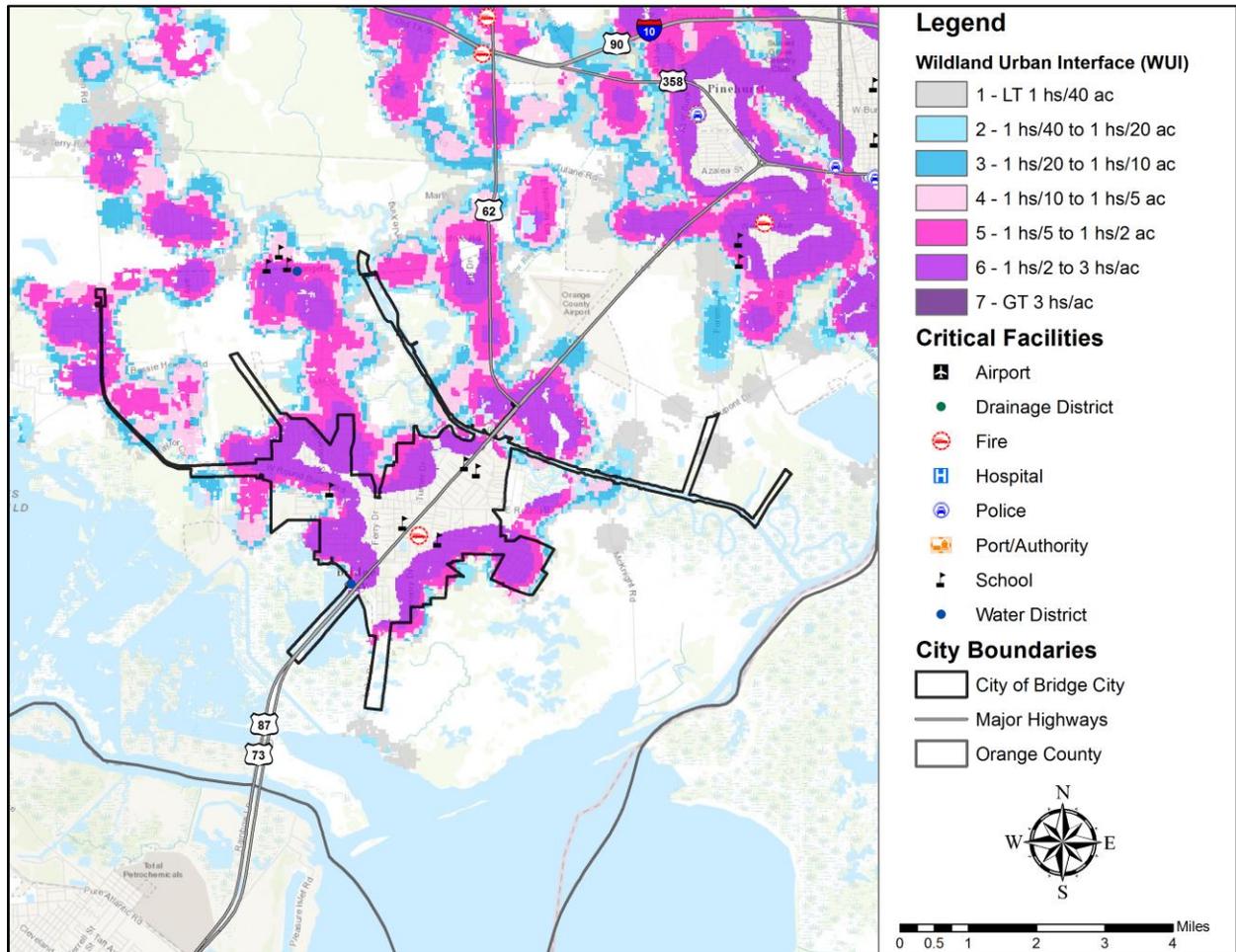
Section 13: Wildfire

Figure 13-1. Wildland Urban Interface Map – Orange County



Section 13: Wildfire

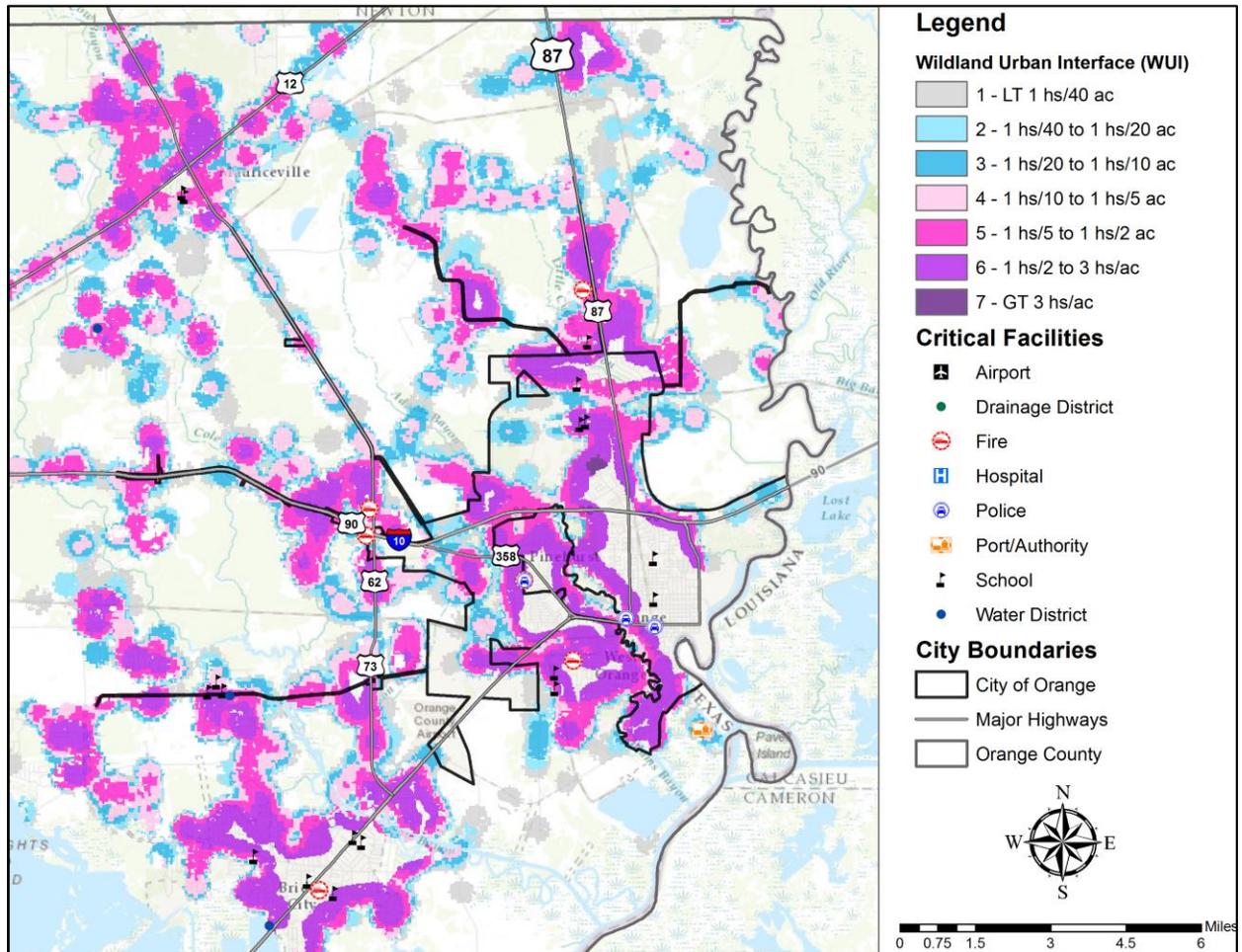
Figure 13-2. Wildland Urban Interface Map – Bridge City



It is estimated that 51 percent of the total population in Bridge City live within the WUI. However, the entire City of Bridge City is at risk for wildfires.

Section 13: Wildfire

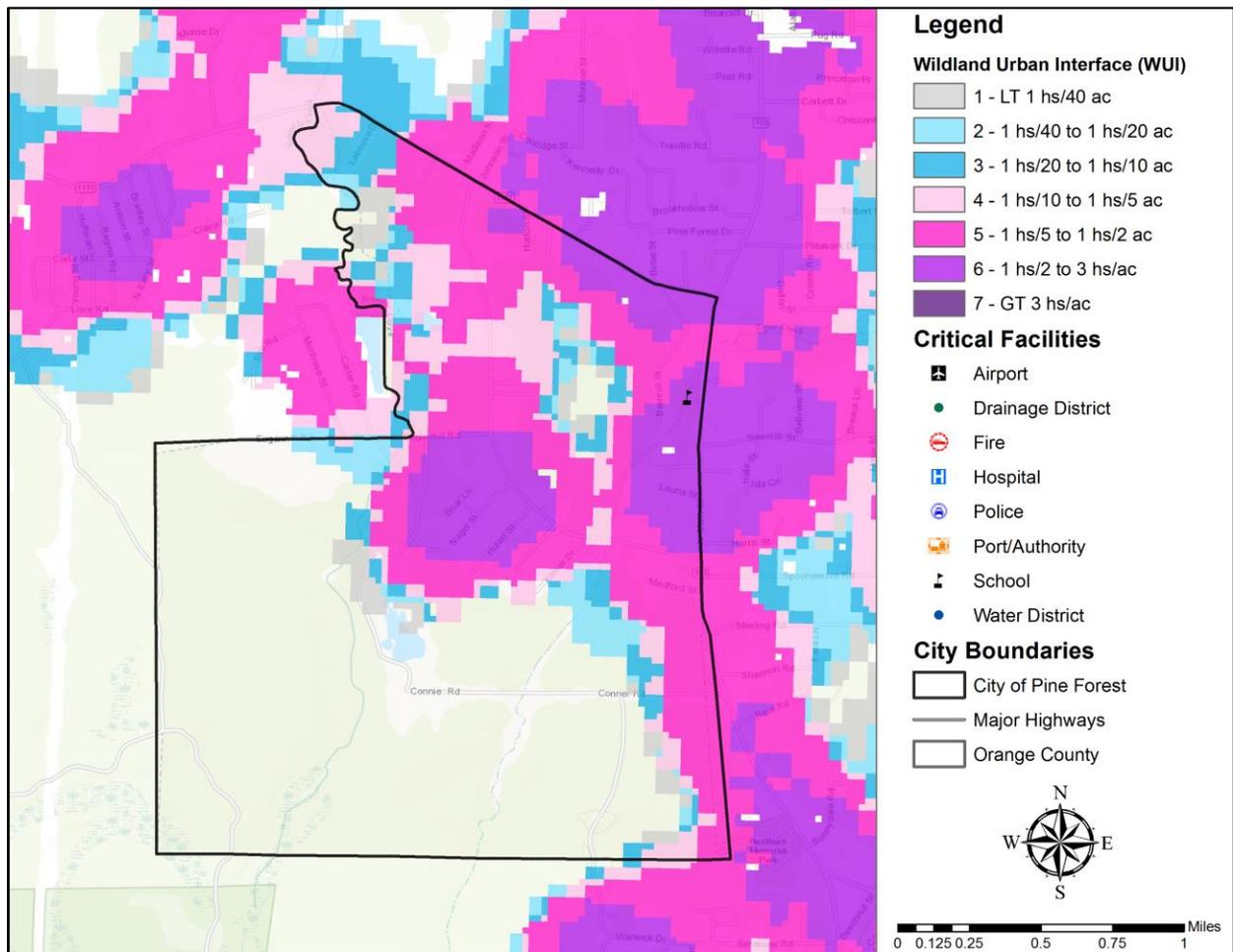
Figure 13-3. Wildland Urban Interface Map – City of Orange



It is estimated that 48 percent of the total population in Orange live within the WUI. However, the entire City of Orange is at risk for wildfires.

Section 13: Wildfire

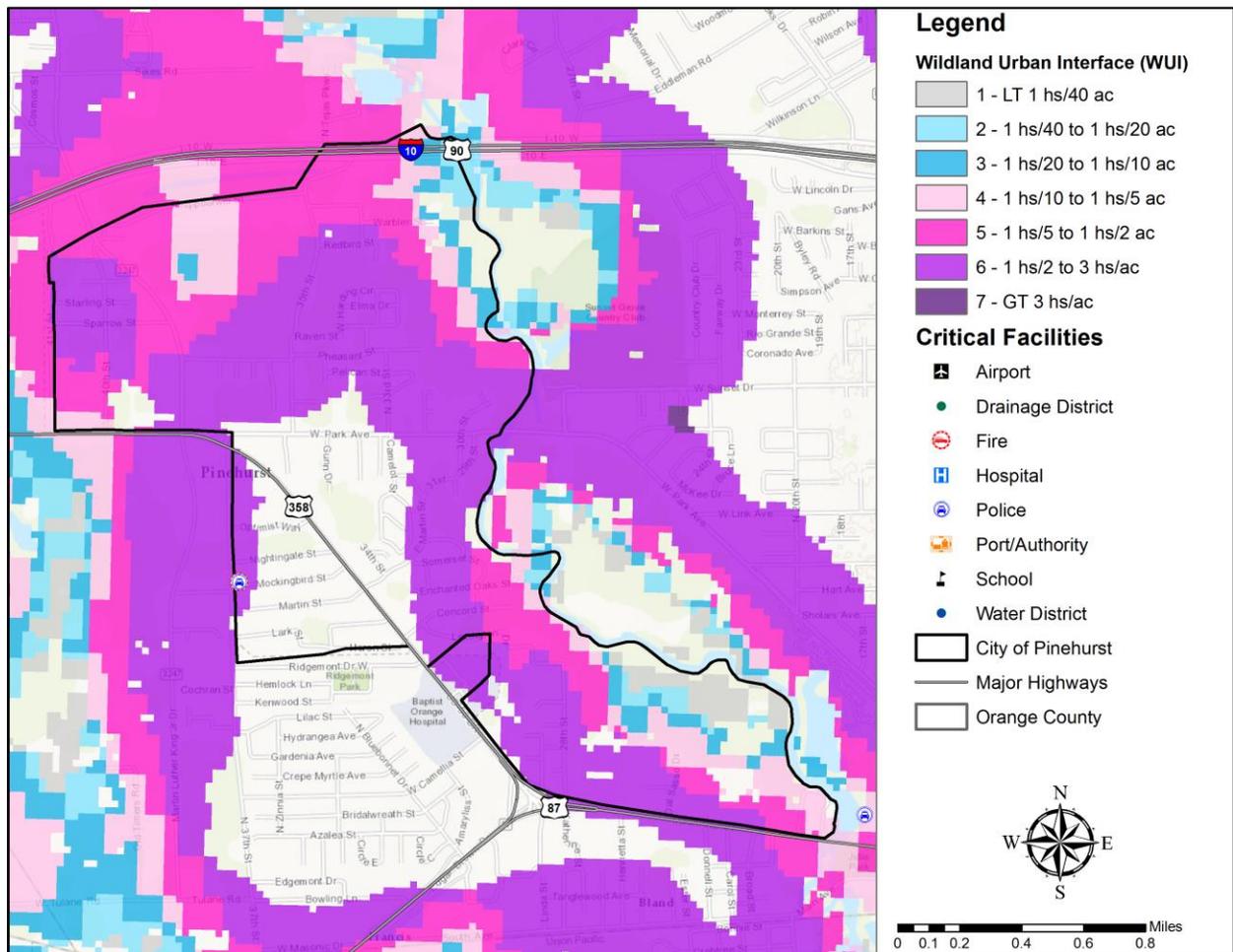
Figure 13-4. Wildland Urban Interface Map – Pine Forest



It is estimated that 100 percent of the total population in Pine Forest live within the WUI. However, the entire City of Pine Forest is at risk for wildfires.

Section 13: Wildfire

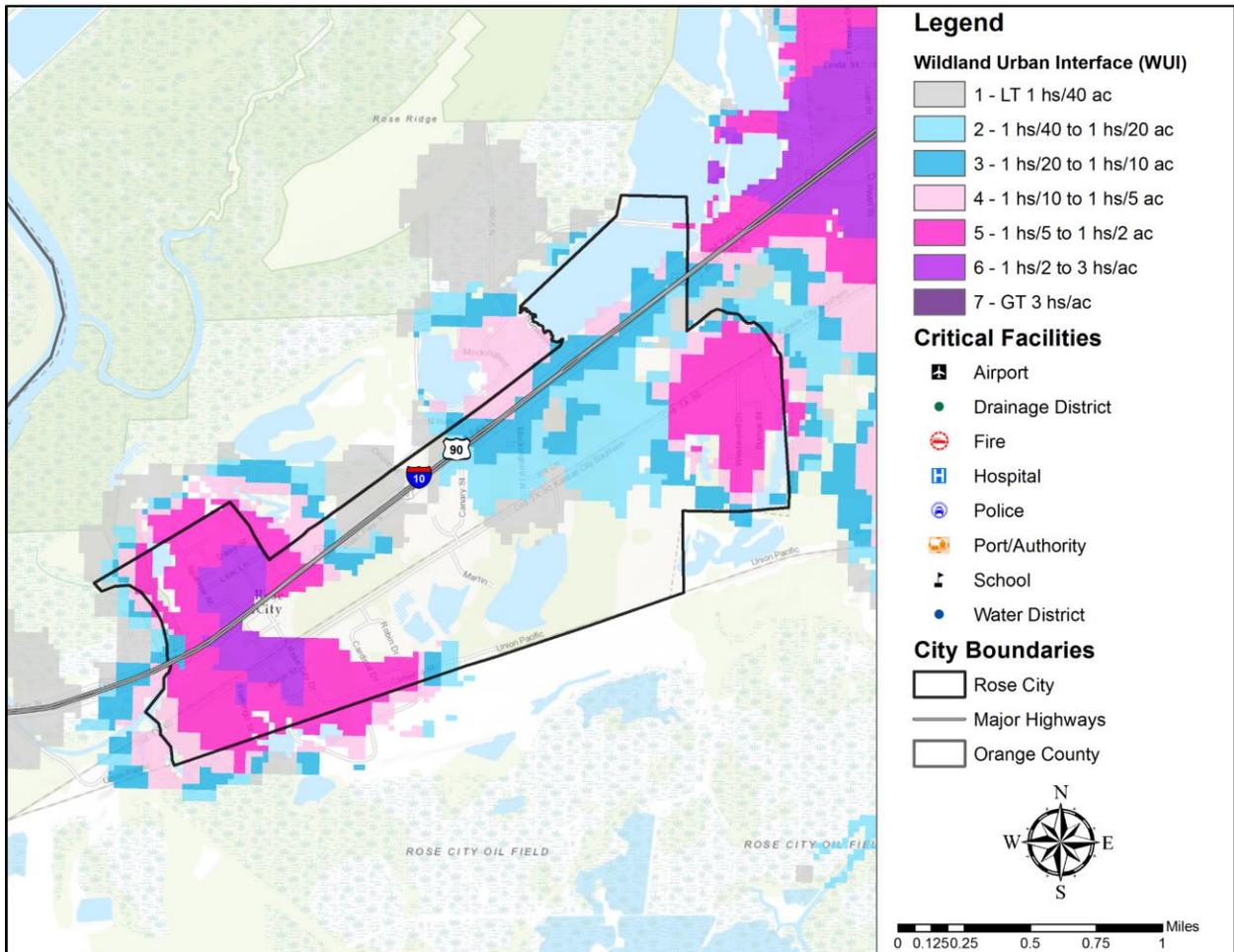
Figure 13-5. Wildland Urban Interface Map – Pinehurst



It is estimated that 66 percent of the total population in Pinehurst live within the WUI. However, the entire City of Pinehurst is at risk for wildfires.

Section 13: Wildfire

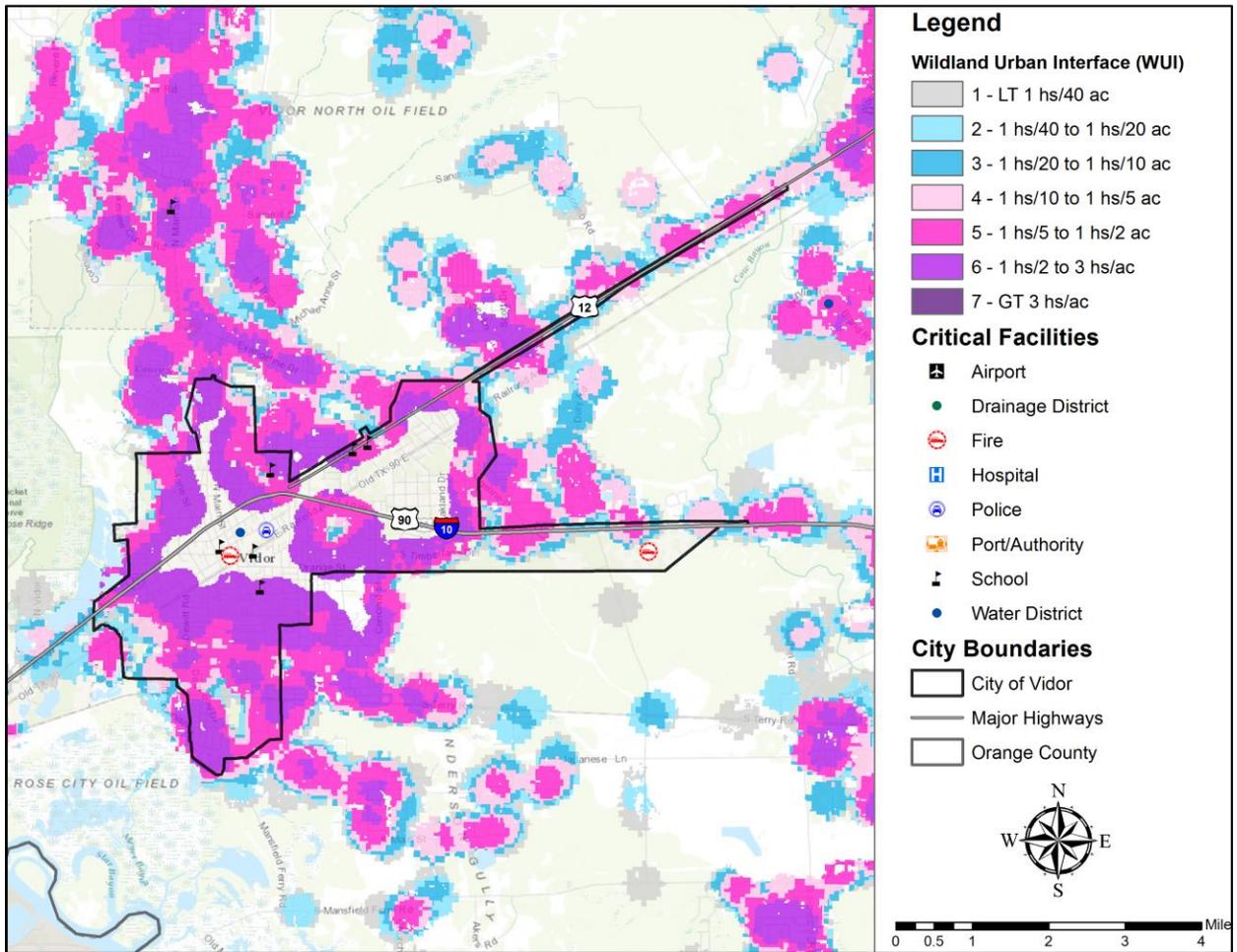
Figure 13-6. Wildland Urban Interface Map – Rose City



It is estimated that 82 percent of the total population in Rose City live within the WUI. However, the entire City of Rose City is at risk for wildfires.

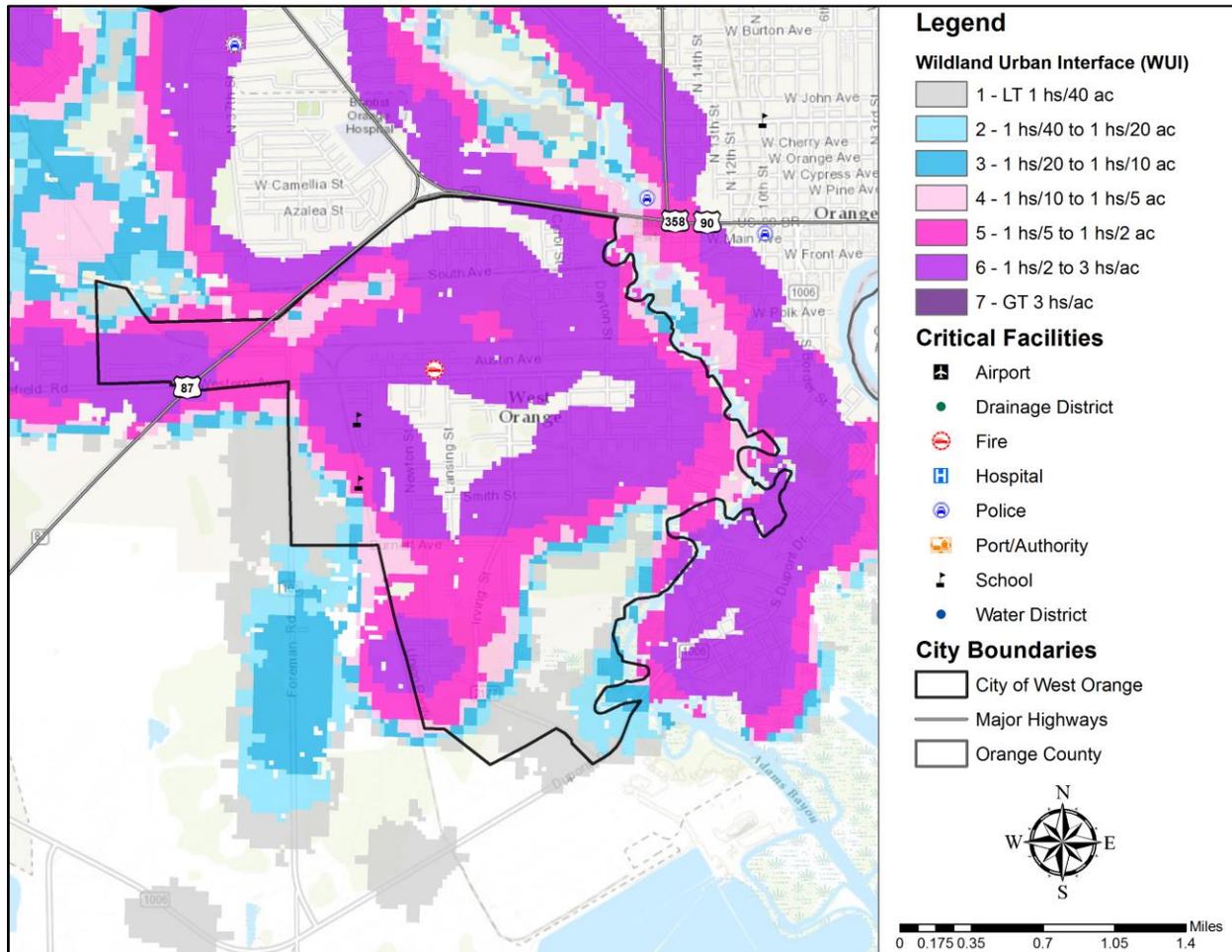
Section 13: Wildfire

Figure 13-7. Wildland Urban Interface Map – Vidor



It is estimated that 67 percent of the total population in Vidor live within the WUI. However, the entire City of Vidor is at risk for wildfires.

Figure 13-8. Wildland Urban Interface Map – West Orange



It is estimated that 79 percent of the total population in West Orange live within the WUI. However, the entire City of West Orange is at risk for wildfires.

Extent

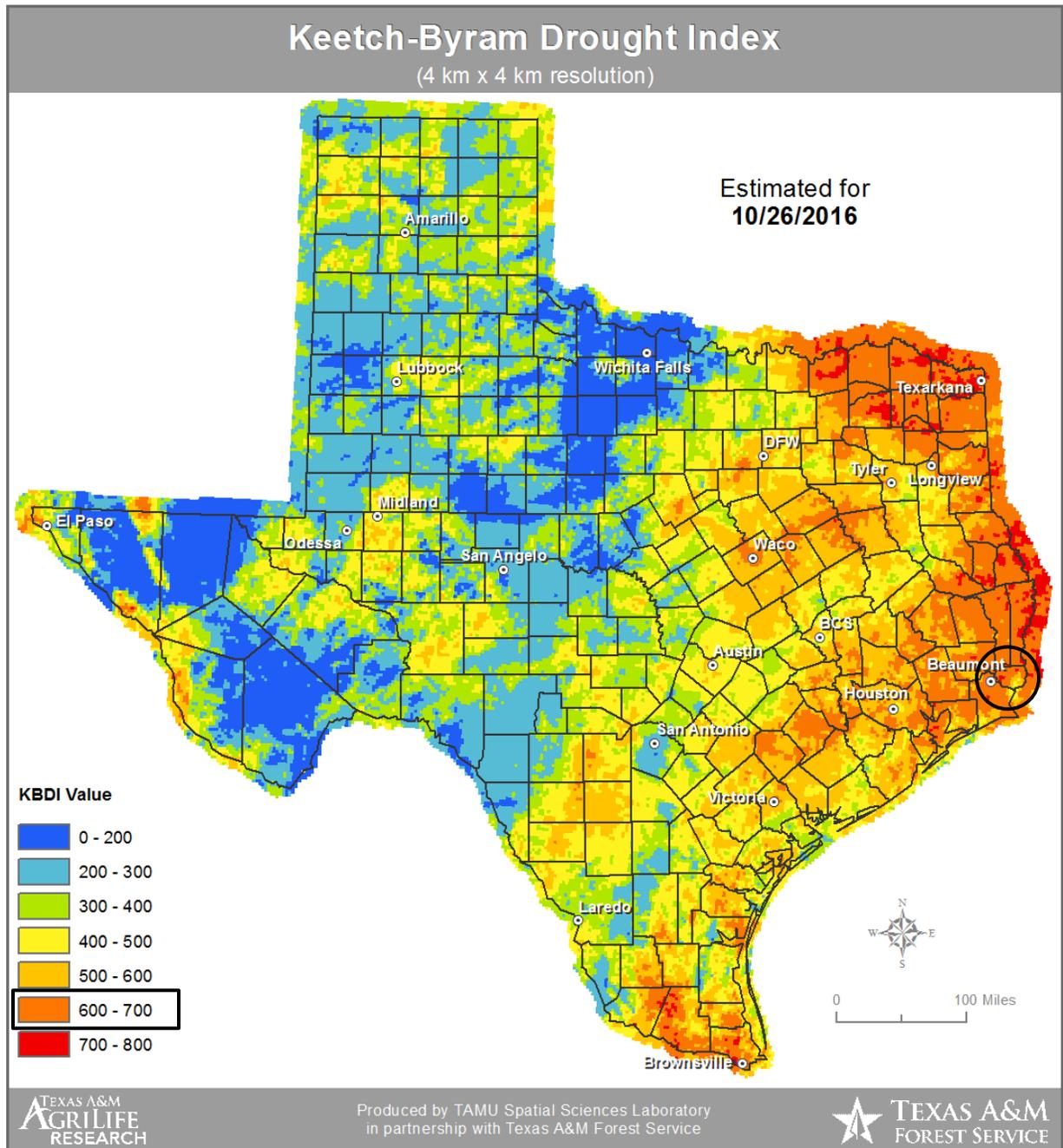


Risk for a wildfire event is measured in terms of magnitude and intensity using the Keetch Byram Drought Index (KBDI), a mathematical system for relating current and recent weather conditions to potential or expected fire behavior. The KBDI determines forest fire potential based on a daily water balance, derived by balancing a drought factor with precipitation and soil moisture (assumed to have a maximum storage capacity of eight inches), and is expressed in hundredths of an inch of soil moisture depletion.

Each color in Figure 13-9 represents the drought index at that location. The drought index ranges from 0 to 800. A drought index of 0 represents no moisture depletion, and a drought index of 800 represents absolutely dry conditions.

Section 13: Wildfire

Figure 13-9. Keetch-Byram Drought Index (KBDI) for the State of Texas, 2016¹



Fire behavior can be categorized at four distinct levels on the KBDI:

- **0 -200:** Soil and fuel moisture are high. Most fuels will not readily ignite or burn. However, with sufficient sunlight and wind, cured grasses and some light surface fuels will burn in spots and patches.

¹ Orange County is located within the black circle.

Section 13: Wildfire

- **200 -400:** Fires more readily burn and will carry across an area with no gaps. Heavier fuels will not readily ignite and burn. Expect smoldering and the resulting smoke to carry into and possibly through the night.
- **400 -600:** Fires intensity begins to significantly increase. Fires will readily burn in all directions exposing mineral soils in some locations. Larger fuels may burn or smolder for several days creating possible smoke and control problems.
- **600 -800:** Fires will burn to mineral soil. Stumps will burn to the end of underground roots and spotting will be a major problem. Fires will burn through the night and heavier fuels will actively burn and contribute to fire intensity.

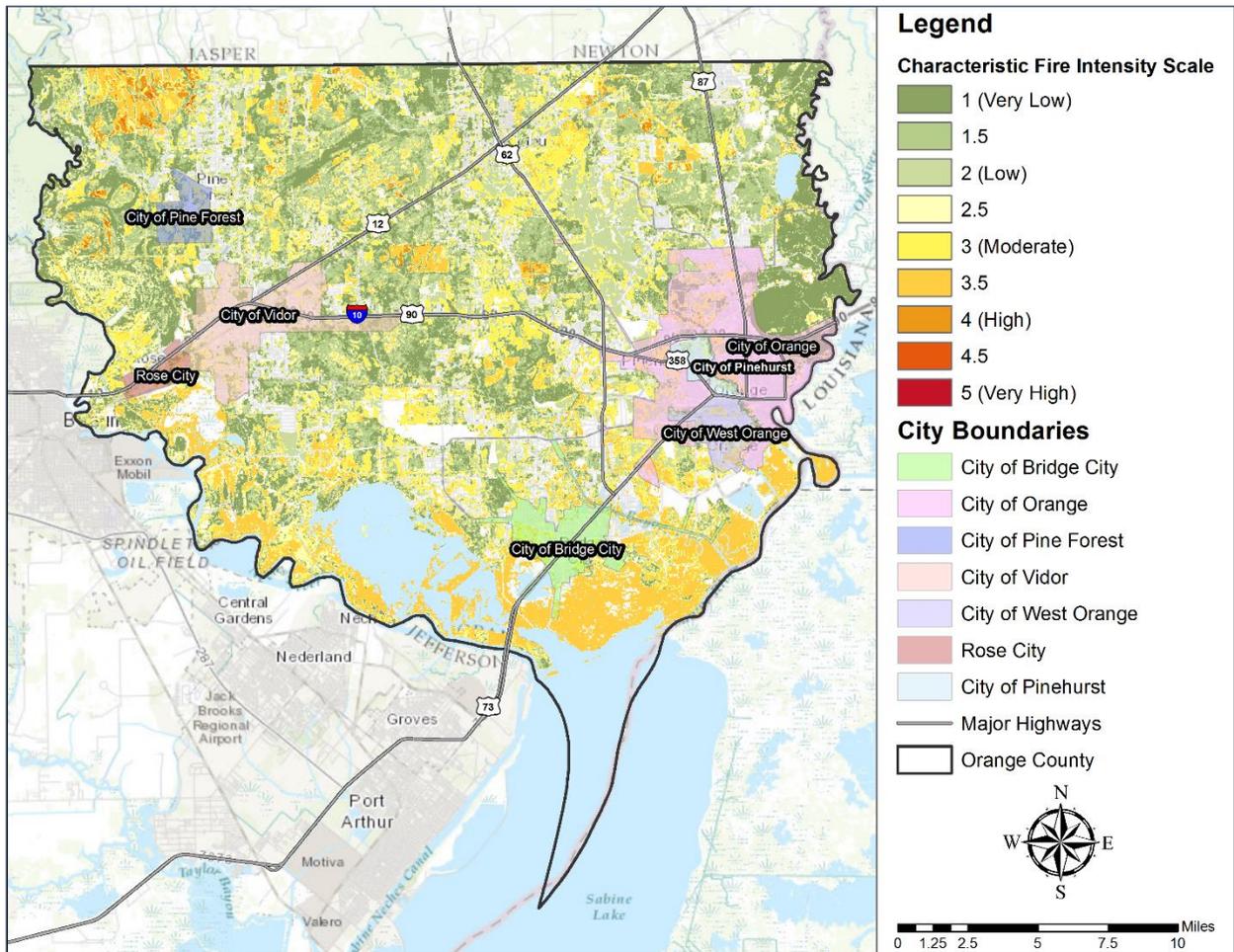
The KBDI is a good measure of the readiness of fuels for a wildfire event. The KBDI should be referenced as the area experiences changes in precipitation and soil moisture, and caution exercised in dryer, hotter conditions.

The range of intensity for Orange County in a wildfire event is within 600 to 700. The average extent to be mitigated for the Orange County planning area is a KBDI of 628. At this level fires intensity begins to significantly increase and fires readily burn in all directions, exposing mineral soils in some locations.

The Texas Forest Service's Fire Intensity Scale identifies areas where significant fuel hazards and associated dangerous fire behavior potential exist based on weighted average of four percentile weather categories. Orange County is between a potential low to moderate wildfire intensities. Figures 13-10 through 13-17 identifies the wildfire intensity for the Orange County planning area.

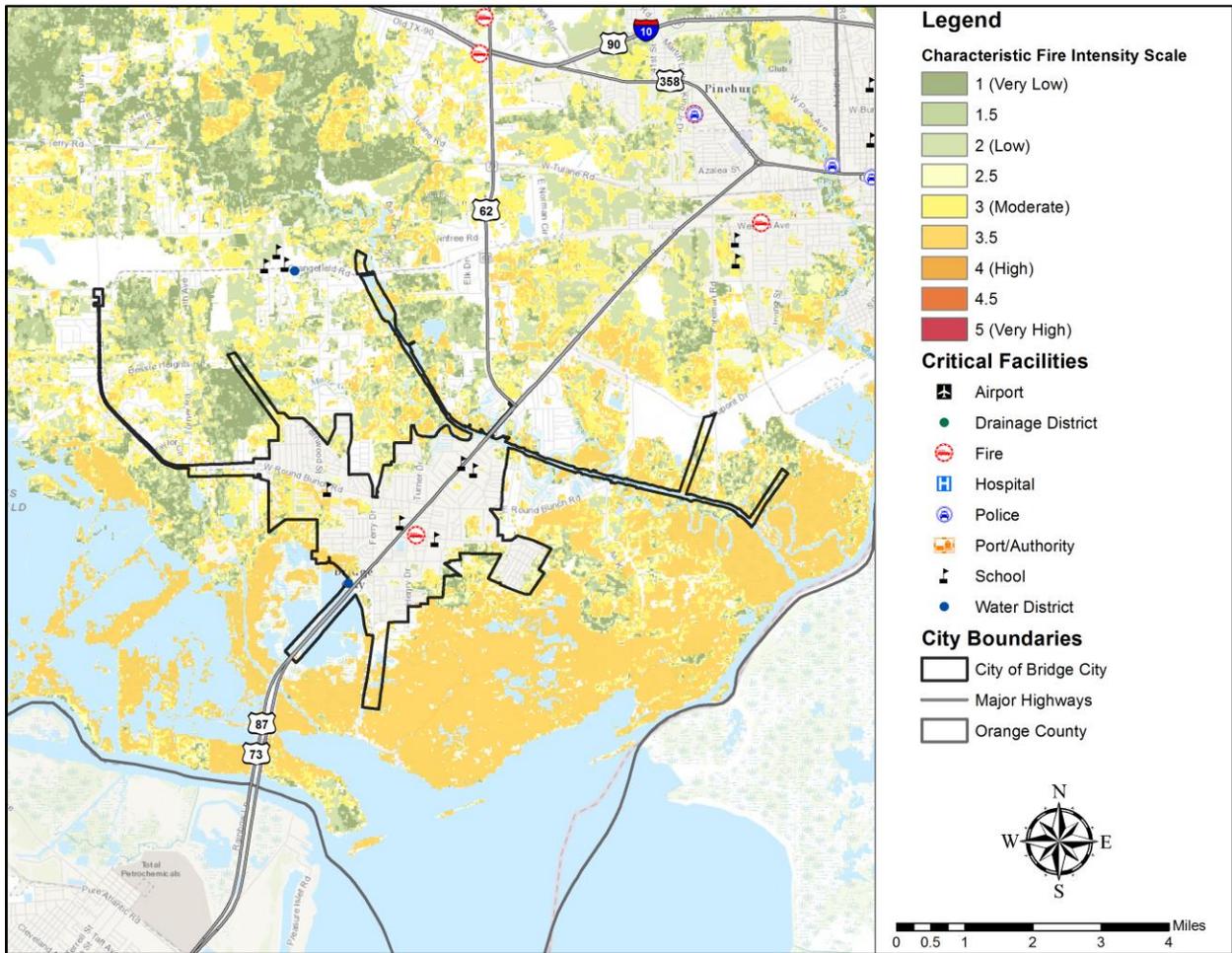
Section 13: Wildfire

Figure 13-10. Fire Intensity Scale Map – Orange County



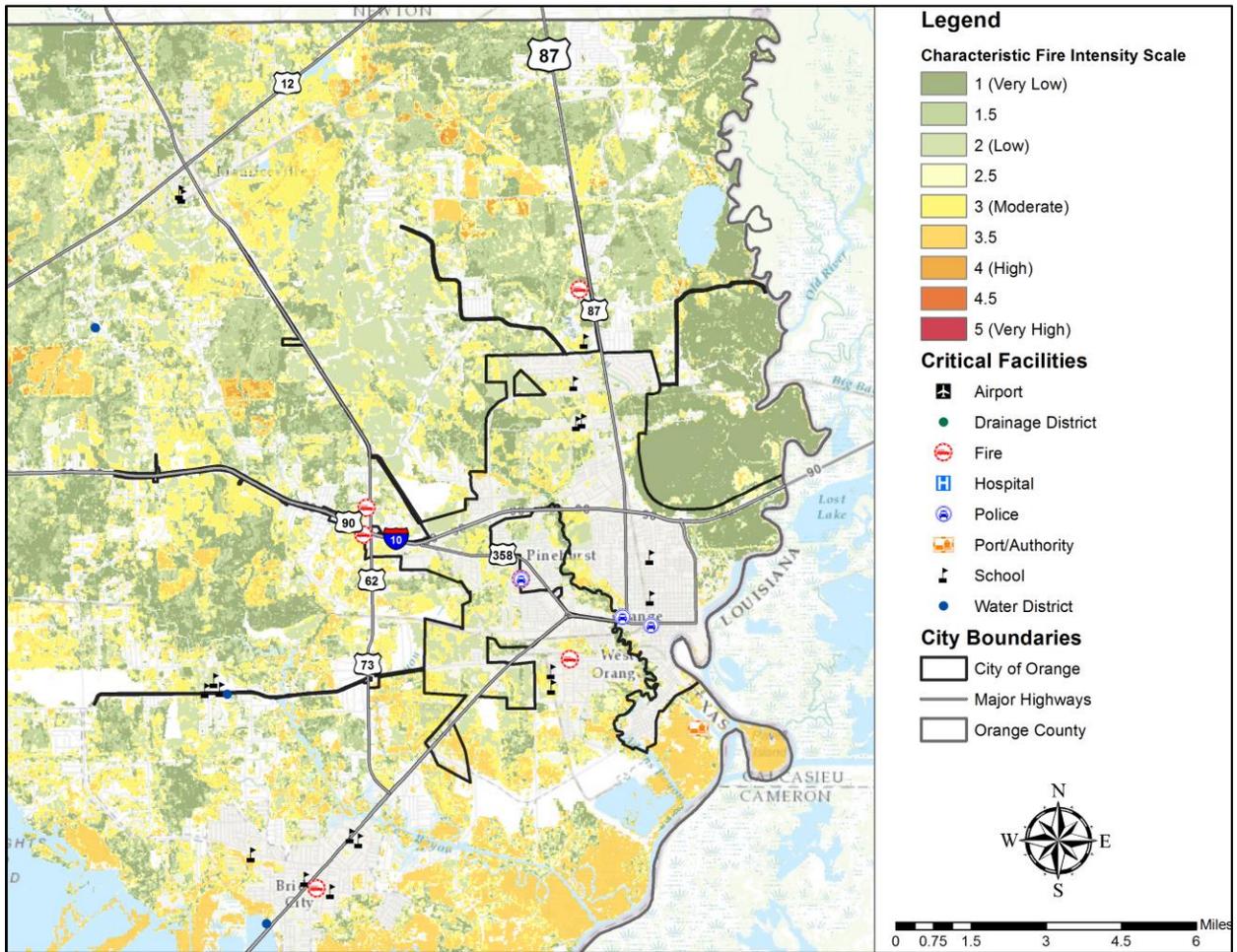
Section 13: Wildfire

Figure 13-11. Fire Intensity Scale Map – Bridge City



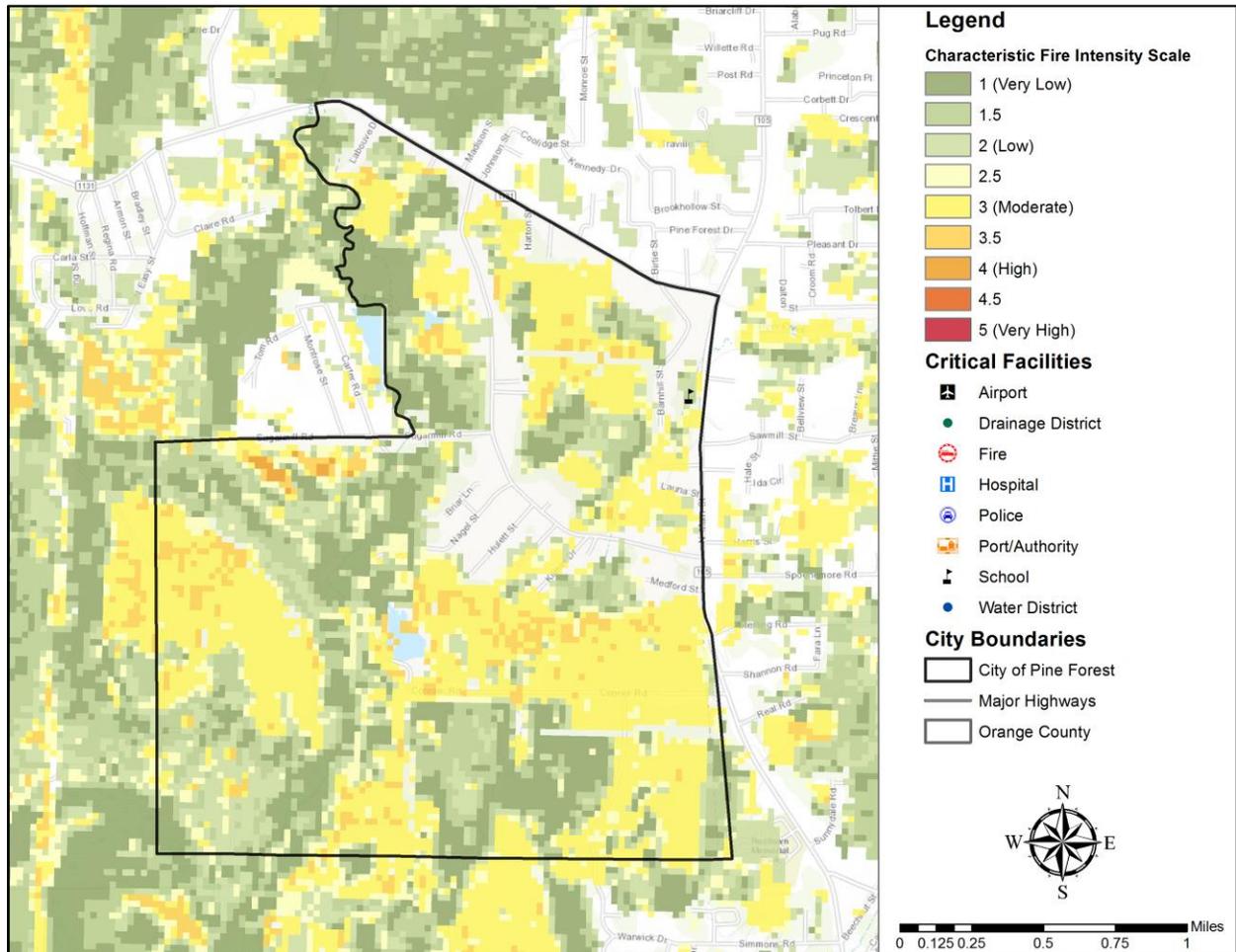
Section 13: Wildfire

Figure 13-12. Fire Intensity Scale Map – City of Orange



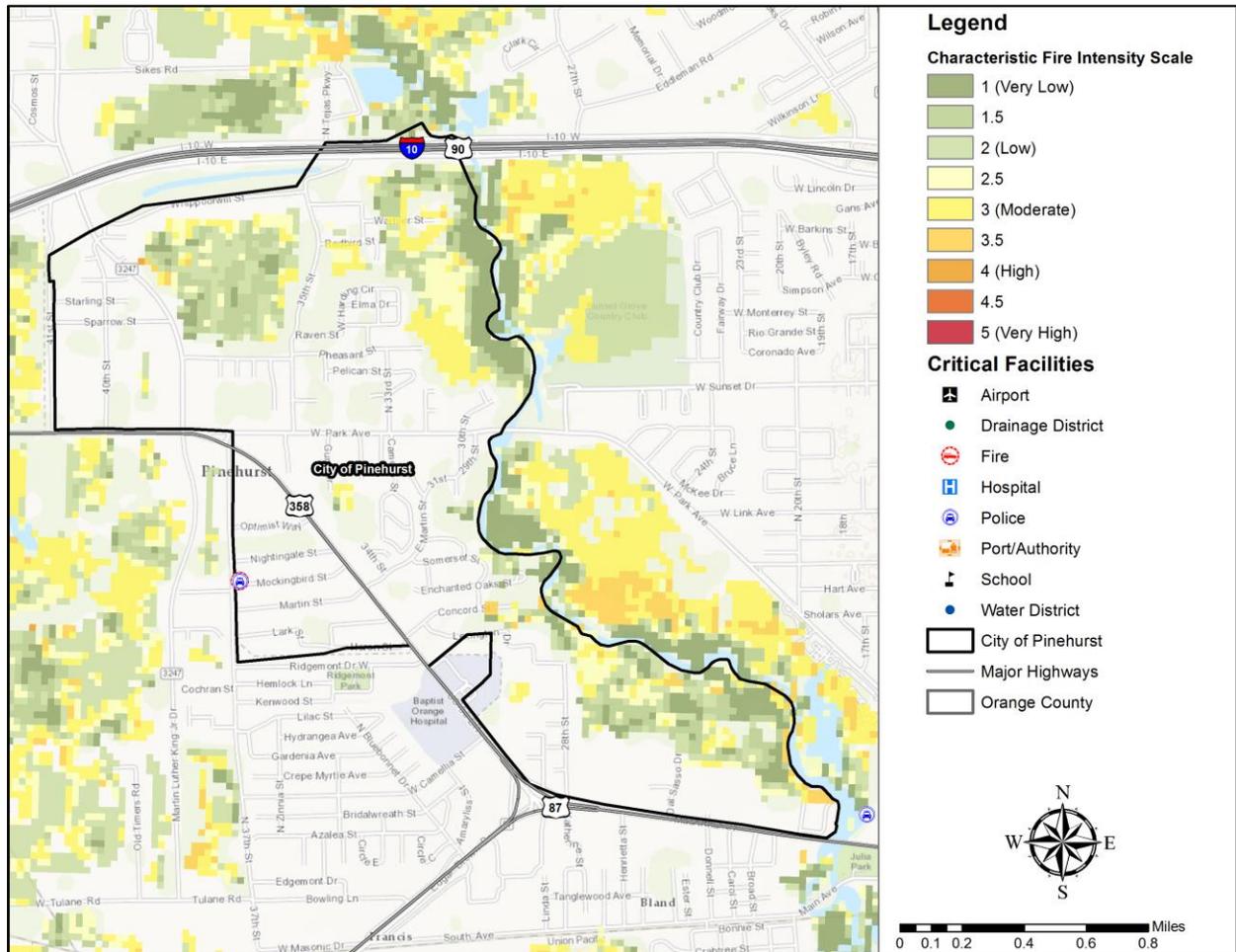
Section 13: Wildfire

Figure 13-13. Fire Intensity Scale Map – Pine Forest



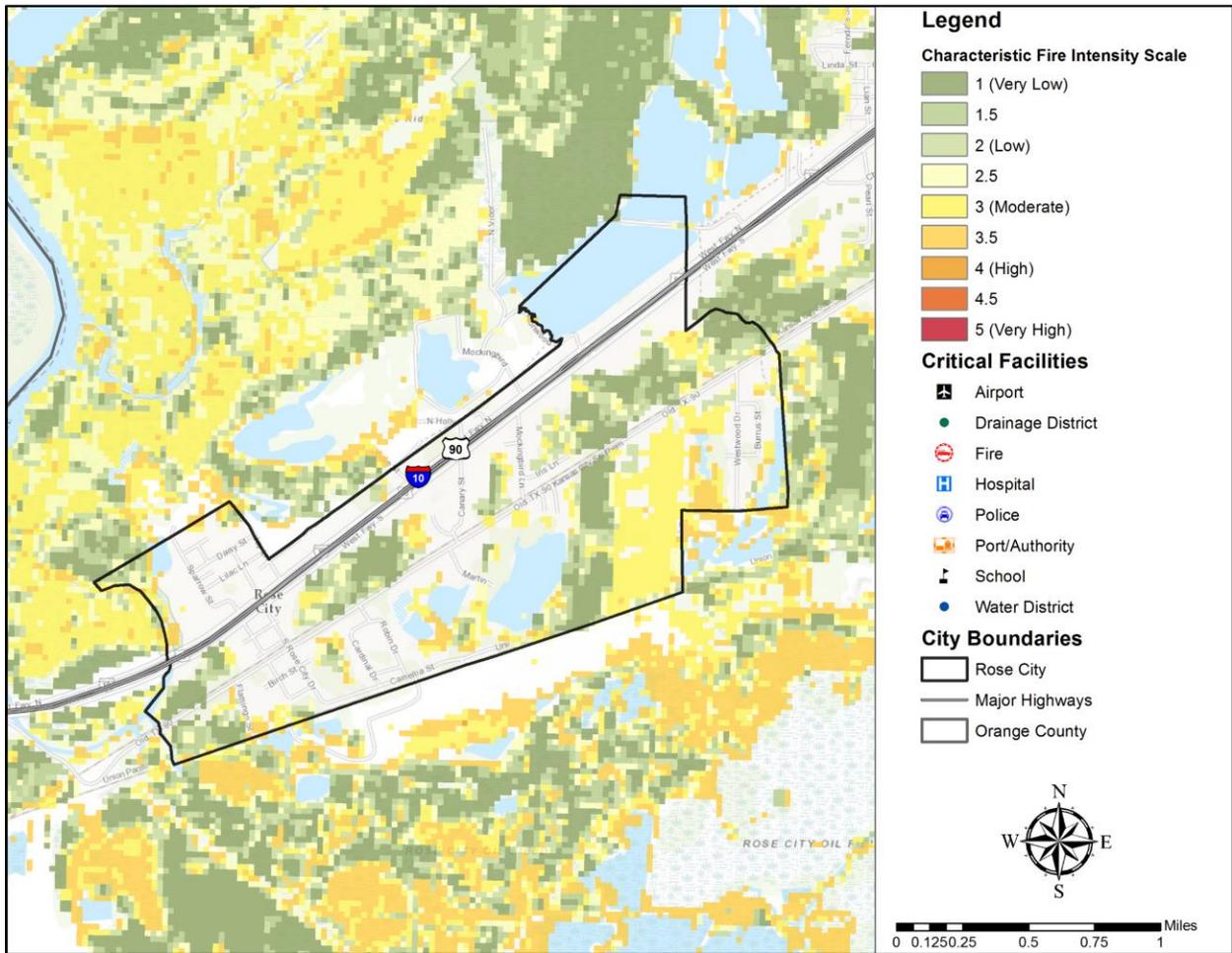
Section 13: Wildfire

Figure 13-14. Fire Intensity Scale Map – Pinehurst



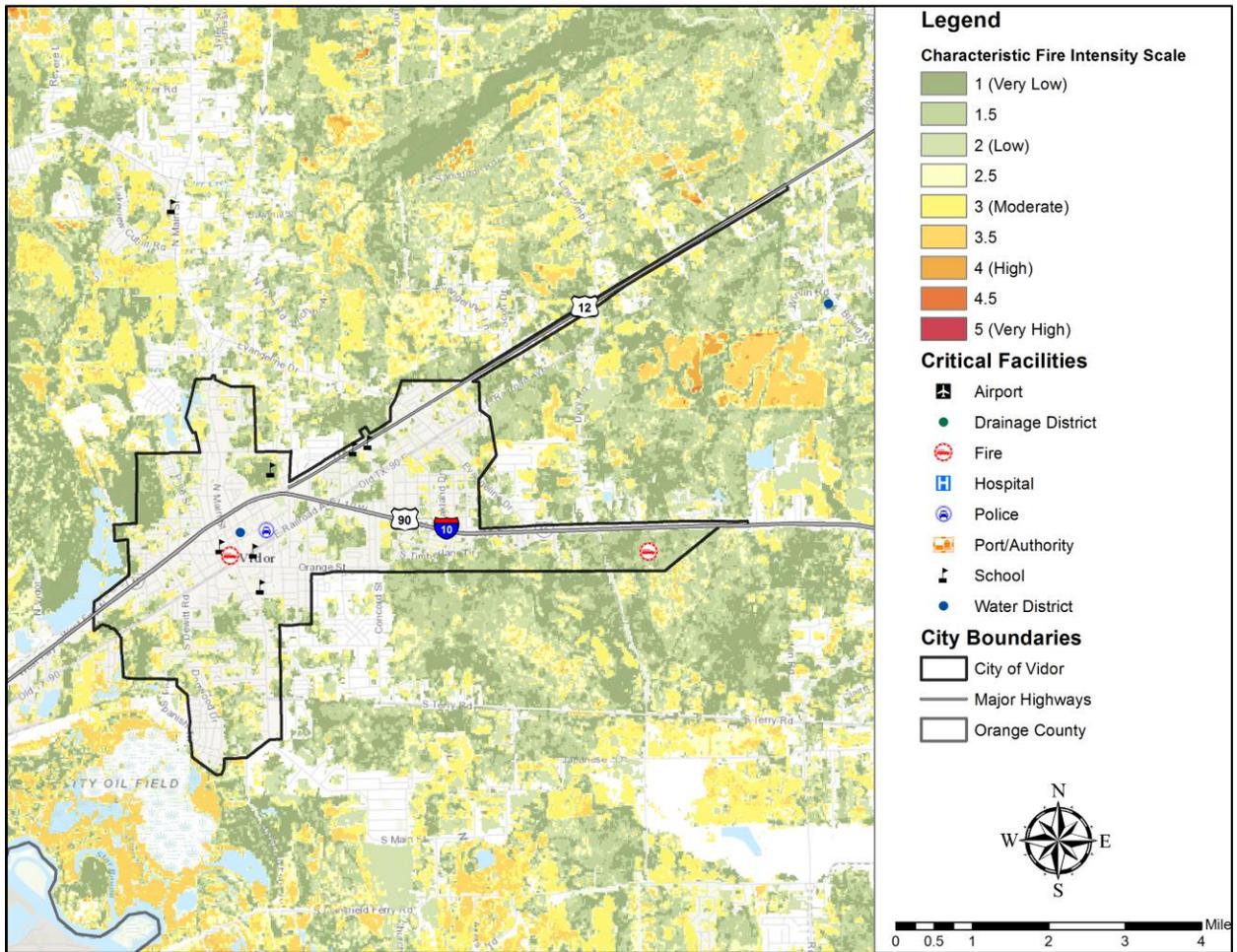
Section 13: Wildfire

Figure 13-15. Fire Intensity Scale Map – Rose City



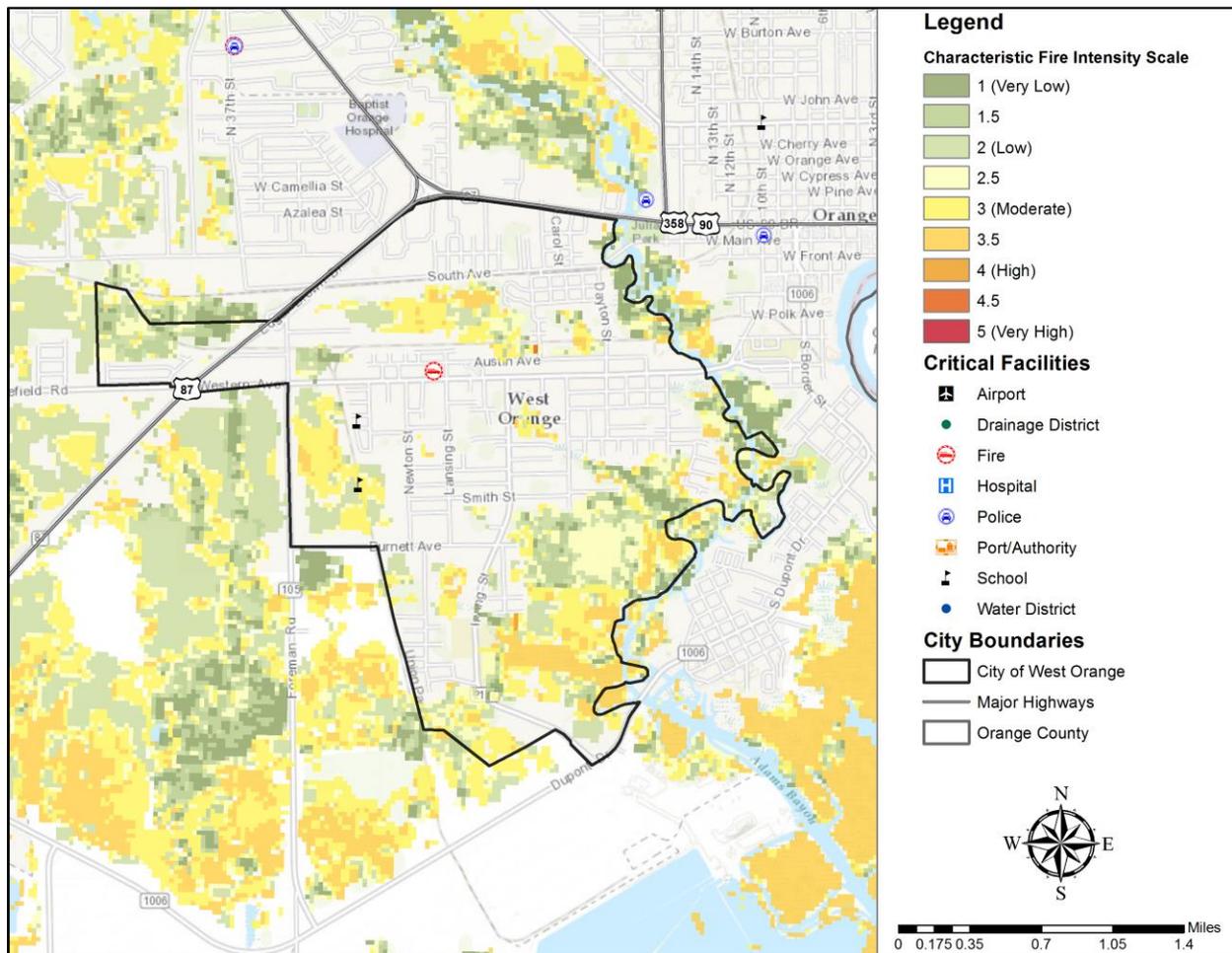
Section 13: Wildfire

Figure 13-16. Fire Intensity Scale Map – Vidor



Section 13: Wildfire

Figure 13-17. Fire Intensity Scale Map – West Orange



Historical Occurrences

The Texas Forest Service reported 85 wildfire events between 2005 and 2009. The National Centers for Environmental Information (NCEI) did not have any reported events from 1996 through June 2016. The Texas Forest Service (TFS) started collecting wildfire data in 1985 and volunteer fire departments started reporting events until 2005. Due to a lack of recorded data for wildfire events prior to 2005, frequency calculations are based on an eleven-year period, using only data from recorded years. The map below shows approximate locations of wildfires, which can be grass or brushfires of any size (Figure 13-18). Table 13-1 identifies the number of wildfires by jurisdiction, and total acreage burned.

Section 13: Wildfire

Figure 13-18. Location and Historic Wildfire Events for Orange County

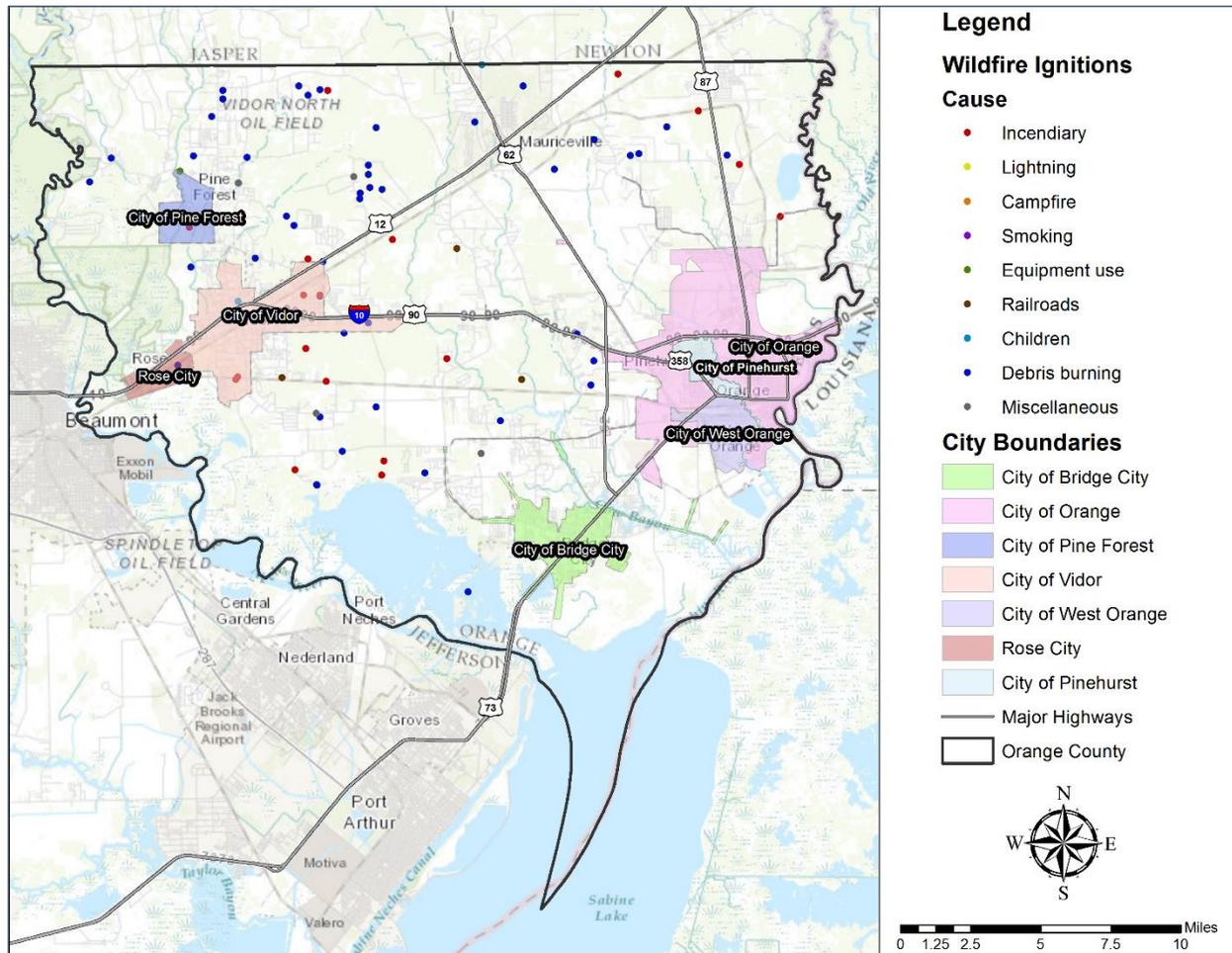


Table 13-1. Historical Wildfire Events Summary

JURISDICTION	NUMBER OF EVENTS	ACRES BURNED
Orange County	77	760
Bridge City	0	0
City of Orange	0	0
Pine Forest	1	40
Pinehurst	0	0
Rose City	1	15
Vidor	6	14
West Orange	0	0

Section 13: Wildfire

Table 13-2. Acreage of Suppressed Wildfire by Year

JURISDICTION	2005	2006	2007	2008	2009
Orange County	322	127	47	67	197
Bridge City	0	0	0	0	0
City of Orange	0	0	0	0	0
Pine Forest	0	0	0	40	0
Pinehurst	0	0	0	0	0
Rose City	0	15	0	0	0
Vidor	7	2	0	5	0
West Orange	0	0	0	0	0

Probability of Future Events

Wildfires can occur at any time of the year. As the jurisdictions within the county move into wildland, the potential area of occurrence of wildfire increases. With 85 events in an 11 year period, an event within Orange County, including all participating jurisdictions, is highly likely, meaning an event is probable within the next year.

Vulnerability and Impact

Periods of drought, dry conditions, high temperatures, and low humidity are factors that contribute to the occurrence of a wildfire event. Areas along railroads and people whose homes are in woodland settings have an increased risk of being affected by wildfire.

The heavily populated, urban areas of Orange County are not likely to experience large, sweeping fires. Areas outside of city limits and in the unincorporated areas of Orange County are vulnerable. Unoccupied buildings and open spaces that have not been maintained have the greatest vulnerability to wildfire. The overall level of concern for wildfires is located mostly along the perimeter of the study area where wildland and urban areas interface. Figures 13-1 through 13-8 illustrate the areas that are the most vulnerable to wildfire throughout the County.

The sparsely populated unincorporated areas of Forest Heights and Orangefield are capable of experiencing large sweeping fires, especially where areas of vegetation are not maintained. Areas along major highways in Vidor and Pinehurst, as well as Orange County have an increased vulnerability where empty lots and unoccupied areas are located.

The following critical facilities are located in the WUI and are more susceptible to wildfire in each participating jurisdiction:

Section 13: Wildfire

Table 13-3. Critical Facilities Located in WUI by Jurisdiction

JURISDICTION	CRITICAL FACILITIES
Orange County	None
Bridge City	3 Schools
City of Orange	Port Authority Facilities, 3 Fire Stations, 1 Police Stations, 2 Water District Facilities, 11 Schools
Pine Forest	None
Pinehurst	None
Rose City	None
Vidor	5 Schools
West Orange	None

Within Orange County, a total of 85 fire events were reported from 2005 to 2016. All of these events were suspected wildfires. Historic loss and annualized estimates due to wildfires are presented in Table 13-4 below. The frequency is approximately 8 events every year.

Table 13-4. Historic Loss Estimates Due to Wildfire²

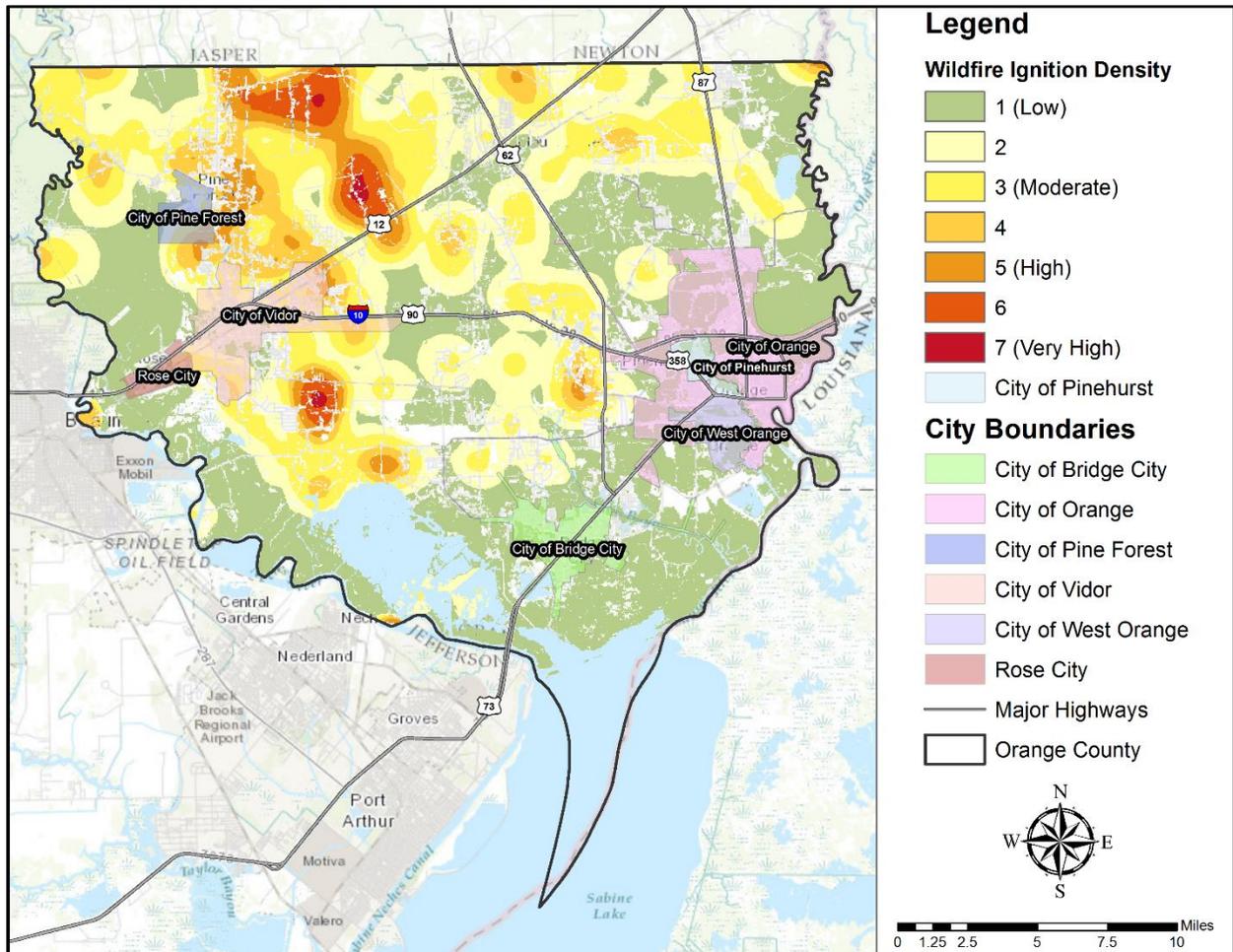
JURISDICTION	NUMBER OF EVENTS	ACRES BURNED	ANNUAL ACRE LOSSES
Orange County	77	760	69.1
Bridge City	0	0	0
City of Orange	0	0	0
Pine Forest	1	40	3.6
Pinehurst	0	0	0
Rose City	1	15	1.4
Vidor	6	14	1.3
West Orange	0	0	0

Figures 13-19 through 13-26 show Orange County and the threat of wildfire to the County and participating jurisdictions.

² Events divided by 11 years of data.

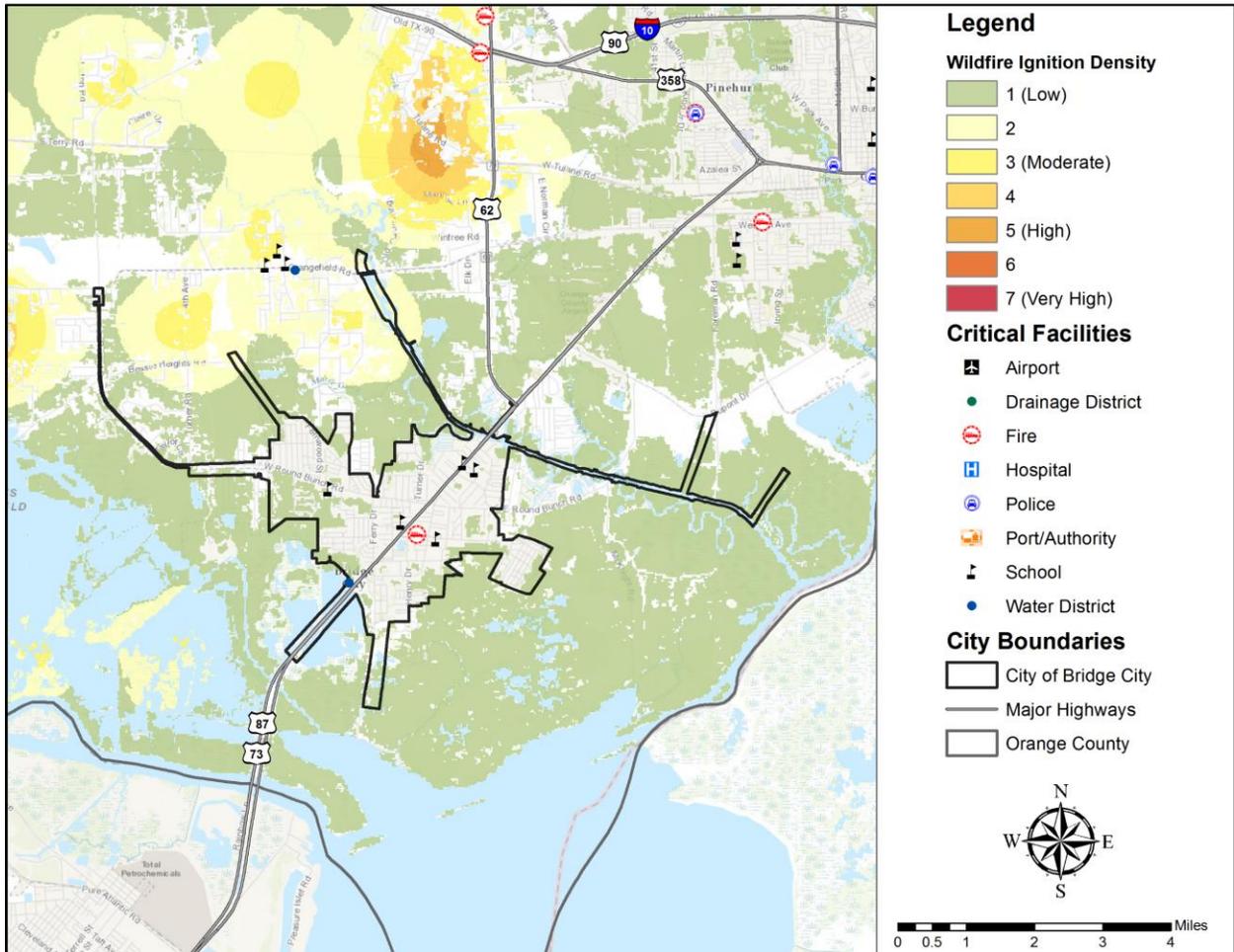
Section 13: Wildfire

Figure 13-19. Wildfire Ignition Density – Orange County



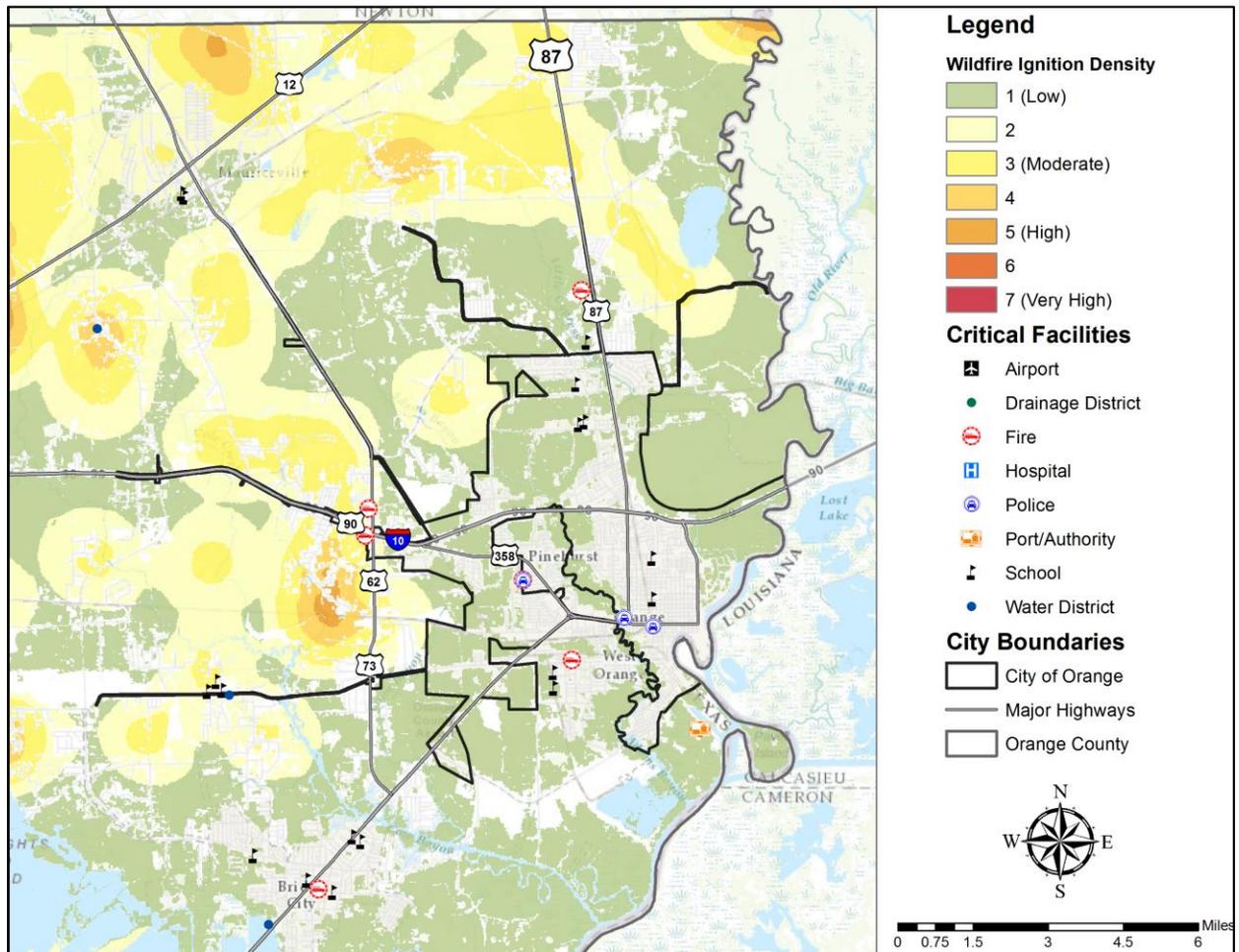
Section 13: Wildfire

Figure 13-20. Wildfire Ignition Density – Bridge City



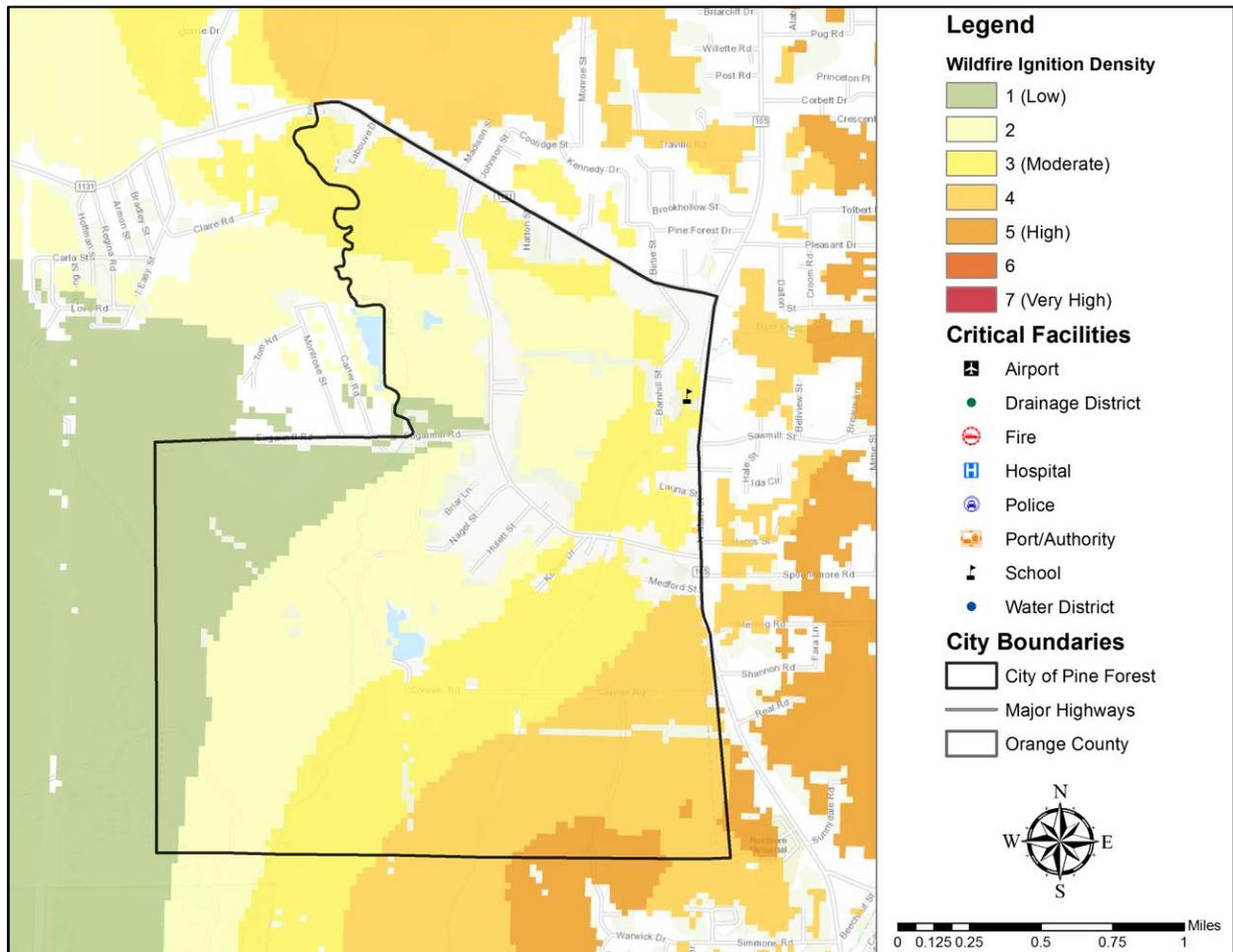
Section 13: Wildfire

Figure 13-21. Wildfire Ignition Density – City of Orange



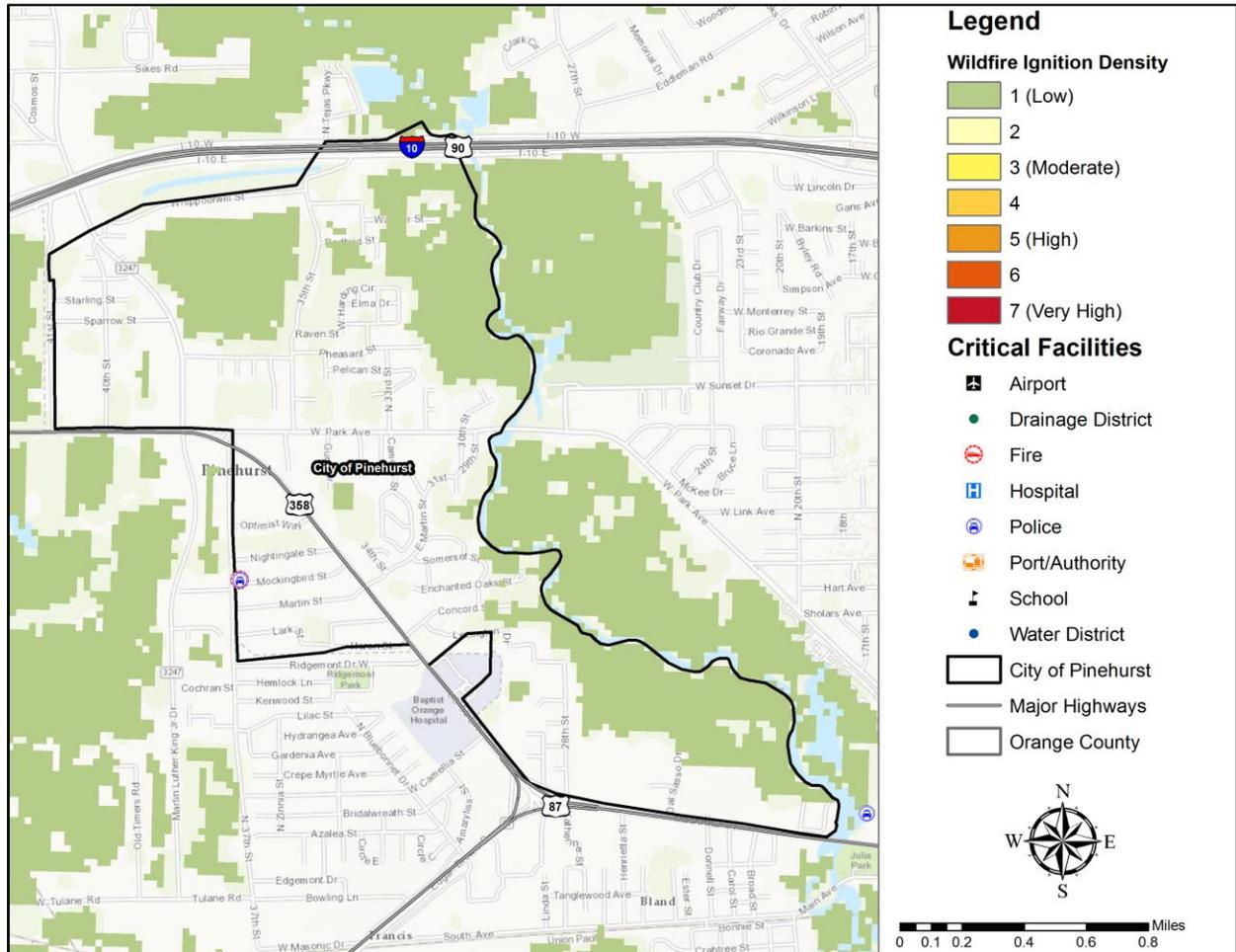
Section 13: Wildfire

Figure 13-22. Wildfire Ignition Density – Pine Forest



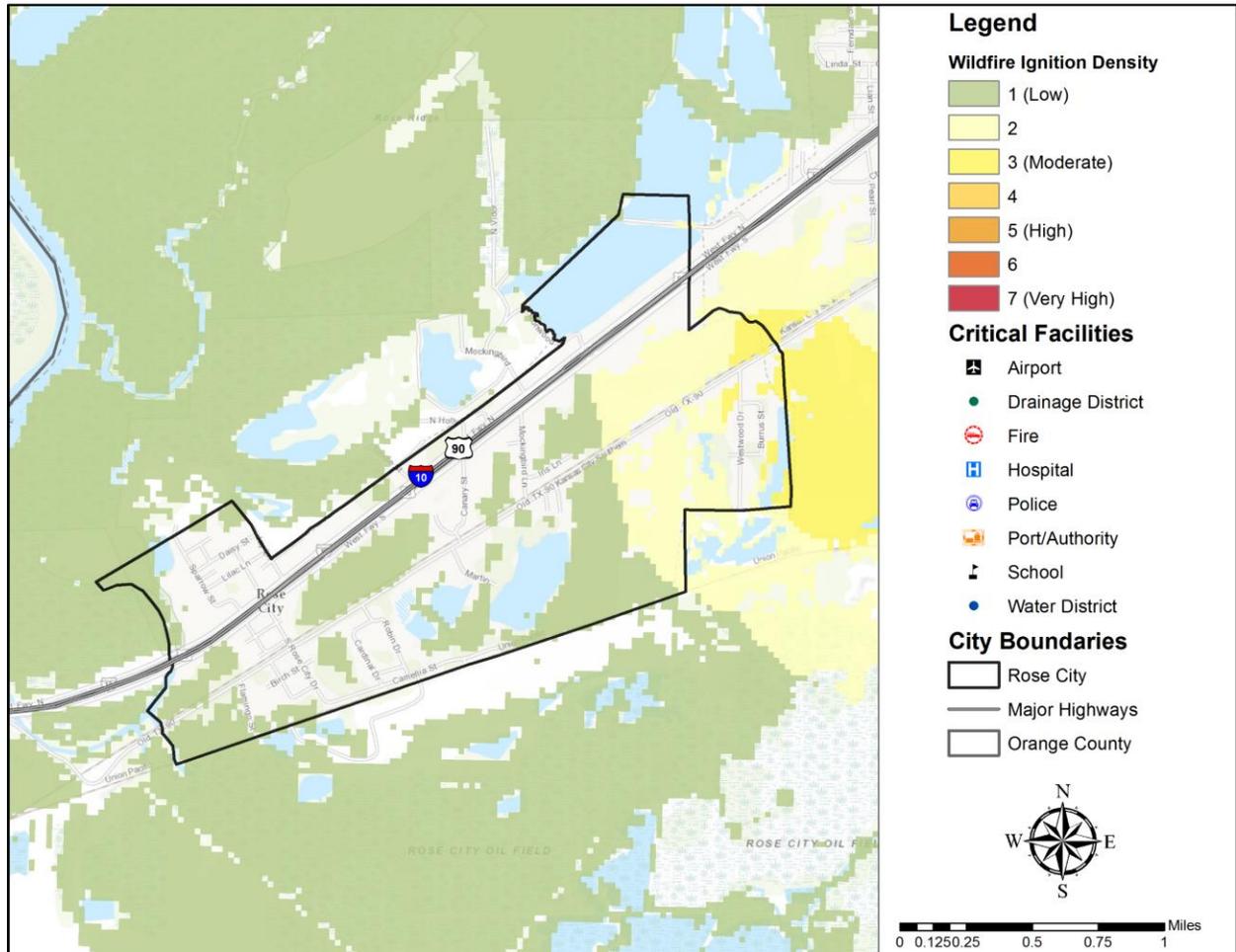
Section 13: Wildfire

Figure 13-23. Wildfire Ignition Density – Pinehurst



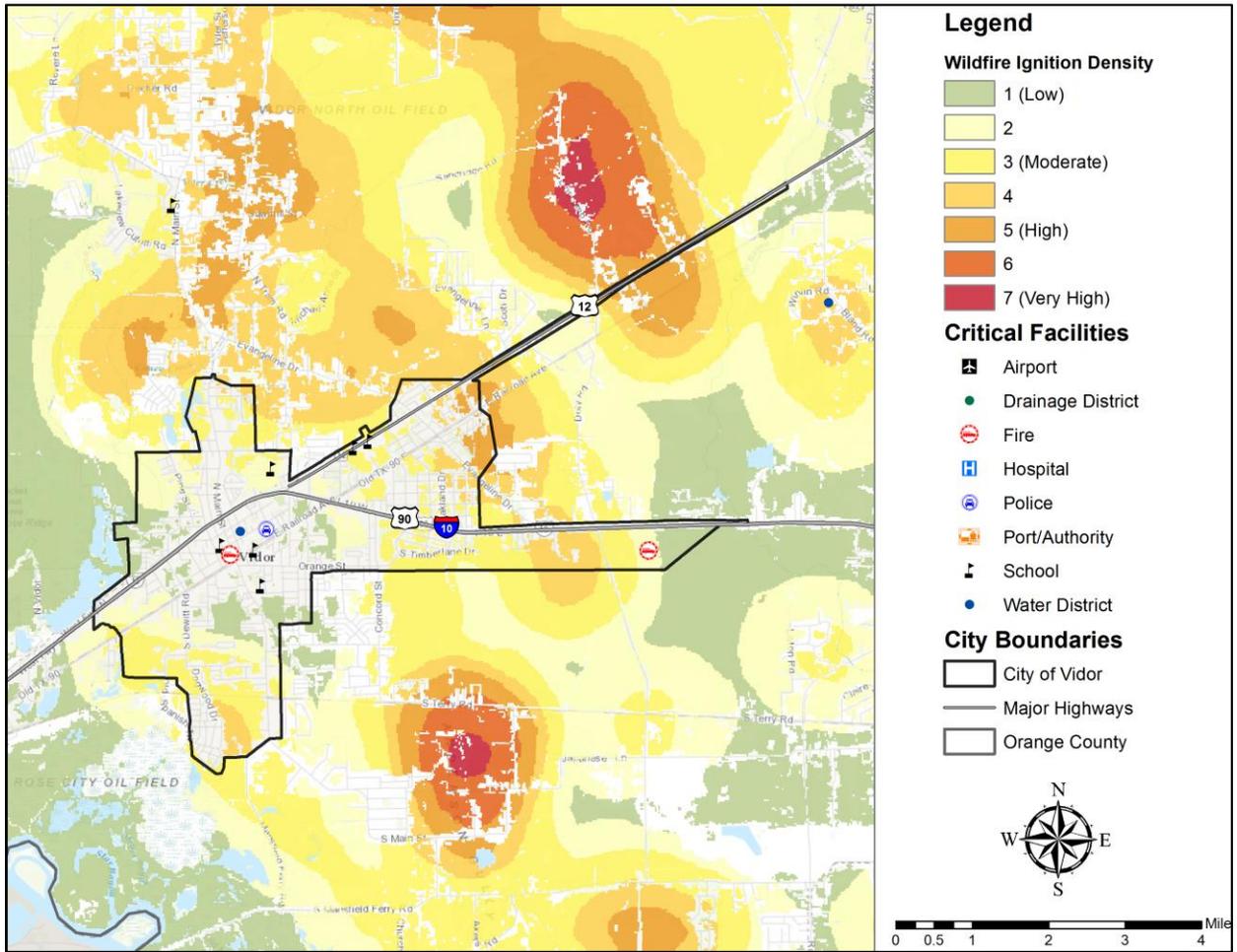
Section 13: Wildfire

Figure 13-24. Wildfire Ignition Density – Rose City



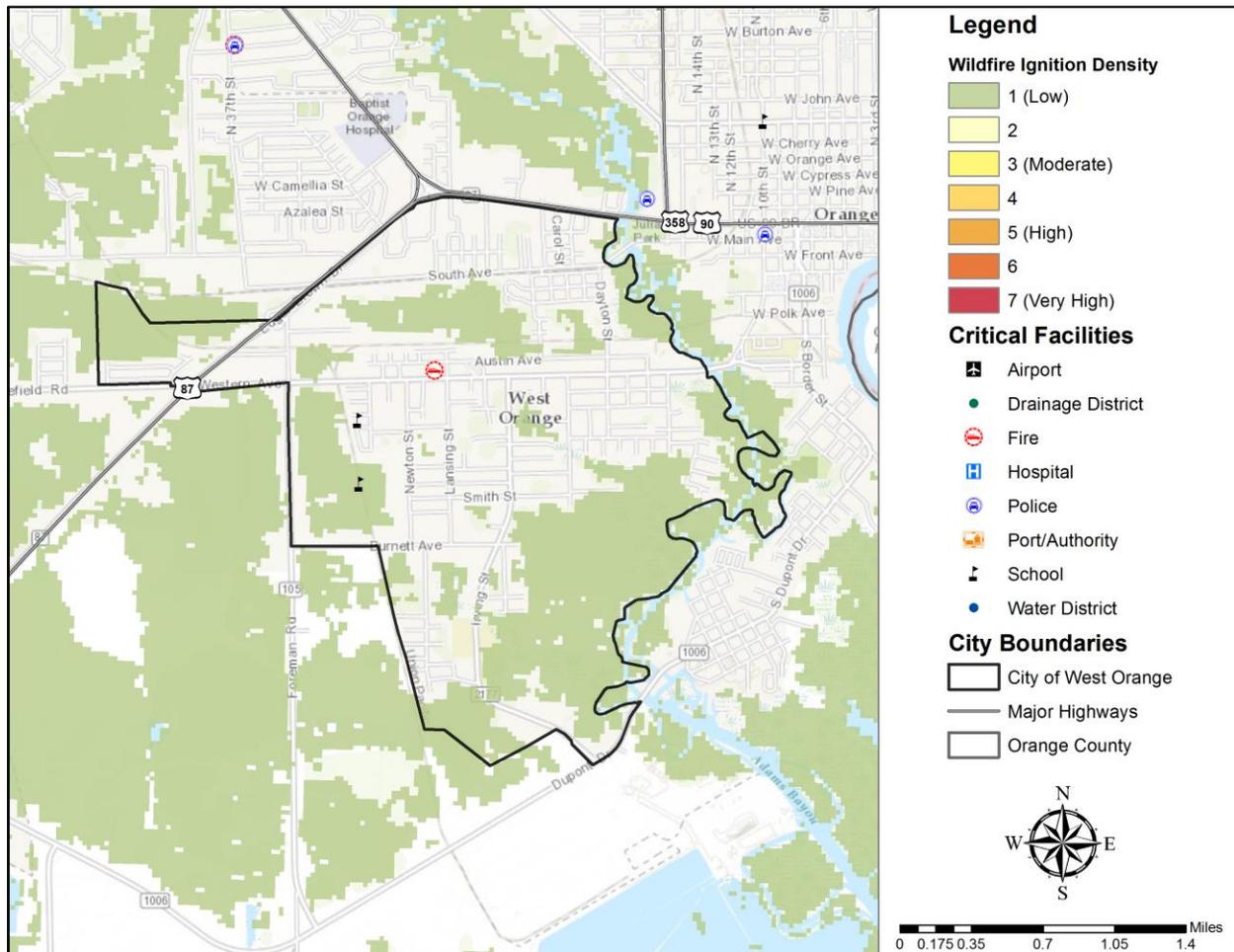
Section 13: Wildfire

Figure 13-25. Wildfire Ignition Density – Vidor



Section 13: Wildfire

Figure 13-26. Wildfire Ignition Density – West Orange



Diminished air quality is an environmental impact that can result from a wildfire event and pose a potential health risk. The smoke plumes from wildfires can contain potentially inhalable carcinogenic matter. Fine particles of invisible soot and ash that are too microscopic for the respiratory system to filter can cause immediate and possibly long term health effects. The elderly or those individuals with compromised respiratory systems may be more vulnerable to the effects of diminished air quality after a wildfire event.

Climatic conditions such as severe freezes and drought can significantly increase the intensity of wildfires since these conditions kill vegetation, creating a prime fuel source for wildfires. The intensity and rate at which wildfires spread are directly related to wind speed, temperature, and relative humidity.

The severity of impact from major wildfire events can be substantial. Such events can cause multiple deaths, shut down facilities for 30 days or more, and cause more than 50 percent of affected properties to be destroyed or suffer major damage. Severity of impact is gauged by acreage burned, homes and structures lost, and the number of resulting injuries and fatalities. For the Orange County planning area, the impact from a wildfire event can be considered "Minor," meaning injuries and/or illnesses are treatable with first aid, shutdown of facilities and services for 24 hours or less, and less than 10% of property is destroyed or with major damage.

Section 13: Wildfire

Assessment of Impacts

A Wildfire event poses a potentially significant risk to public health and safety, particularly if the wildfire is initially unnoticed and spreads quickly. The impacts associated with a wildfire are not limited to the direct damages. Potential impacts for the planning area include:

- Persons in the area at the time of the fire are at risk for injury or death from burns and/or smoke inhalation.
- First responders are at greater risk of physical injury since they are in close proximity to the hazard while extinguishing flames, protecting property or evacuating residents in the area.
- First responders can experience heart disease, respiratory problems, and other long term related illnesses from prolonged exposure to smoke, chemicals, and heat.
- Emergency services may be disrupted during a wildfire if facilities are impacted, roadways are inaccessible or personnel are unable to report for duty.
- Critical city and/or county departments may not be able to function and provide necessary services depending on the location of the fire, and the structures or personnel impacted.
- Non-critical businesses may be directly damaged, suffer loss of utility services, or be otherwise inaccessible, delaying normal operations and slowing the recovery process.
- Displaced residents may not be able to immediately return to work, further slowing economic recovery.
- Roadways in or near the WUI could be damaged or closed due to smoke and limited visibility.
- Older homes are generally exempt from modern building code requirements, which may require fire suppression equipment in the structure.
- Some high density neighborhoods feature small lots with structures close together, increasing the potential for fire to spread rapidly.
- Air pollution from smoke may exacerbate respiratory problems of vulnerable residents.
- Charred ground after a wildfire cannot easily absorb rainwater, increasing the risk of flooding and potential mudflows.
- Wildfires can cause erosion, degrading stream water quality.
- Wildlife may be displaced or destroyed.
- Historical or cultural resources may be damaged or destroyed.
- Tourism can be significantly disrupted, further delaying economic recovery for the area.
- Vegetated dunes can be stripped, significantly damaging the function of the dunes to protect inland areas from the destructive forces of wind and waves.
- Economic disruption negatively impacts the programs and services provided by the community due to short and long term loss in revenue.
- Fire suppression costs can be substantial, exhausting the financial resources of the community.
- Residential structures lost in a wildfire may not be rebuilt for years, reducing the tax base for the community.
- Sabine Lake recreation and tourism can be unappealing for years following a large wildfire, devastating directly related businesses.
- Direct impacts to municipal water supply may occur through contamination of ash and debris during the fire, destruction of aboveground delivery lines, and soil erosion or debris deposits into waterways after the fire.

The economic and financial impacts of a wildfire event on local government will depend on the scale of the event, what is damaged, costs of repair or replacement, lost business days in impacted areas, and how quickly repairs to critical components of the economy can be implemented. The level of

Section 13: Wildfire

preparedness and pre-event planning done by government, businesses and citizens will contribute to the overall economic and financial conditions in the aftermath of a wildfire event.

Section 14: Winter Storm

Hazard Description.....	1
Location.....	3
Extent.....	3
Historical Occurrences	4
Significant Past Events.....	5
Probability of Future Events	6
Vulnerability and Impact.....	6
Assessment of Impacts	7

Hazard Description



A severe winter storm event is identified as a storm with snow, ice, or freezing rain. This type of storm can cause significant problems for area residents. Winter storms are associated with freezing or frozen precipitation such as freezing rain, sleet, snow and the combined effects of winter precipitation and strong winds. Wind chill is a function of temperature and wind. Low wind chill is a product of high winds and freezing temperatures.

Winter storms that threaten Orange County usually begin as powerful cold fronts that push south from central Canada. The County is at risk to ice hazards and extremely cold temperatures, as well as snow, the effects and frequencies of winter storm events are generally mild and short-lived. As indicated in Figure 14-1, on average, the area experiences 1-10 cold days a year, meaning 1-10 days per year are at or around freezing temperatures. During these times of ice and snow accumulation response times will increase until public works road crews are able to assist in making the major roads passable. Table 14-1 describes the types of winter storms possible to occur in Orange County.

Section 14: Winter Storm

Figure 14-1. Extreme Cold Days 1960-2003¹

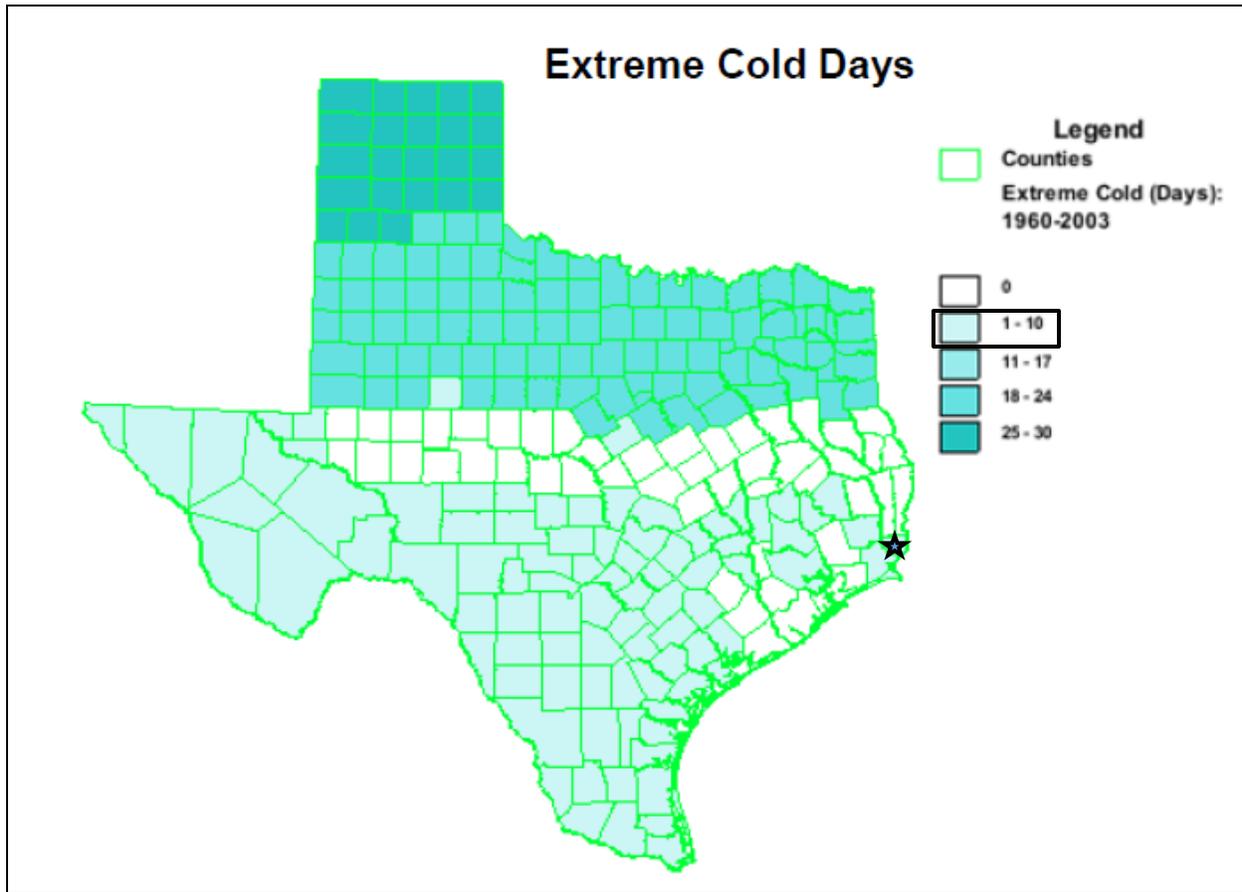


Table 14-1. Types of Winter Storms

TYPE OF WINTER STORM	DESCRIPTION
Winter Weather Advisory	This alert may be issued for a variety of severe conditions. Weather advisories may be announced for snow, blowing or drifting snow, freezing drizzle, freezing rain, or a combination of weather events.
Winter Storm Watch	Severe winter weather conditions may affect your area (freezing rain, sleet or heavy snow may occur separately or in combination).
Winter Storm Warning	Severe winter weather conditions are imminent.
Freezing Rain or Freezing Drizzle	Rain or drizzle is likely to freeze upon impact, resulting in a coating of ice glaze on roads and all other exposed objects.
Sleet	Small particles of ice usually mixed with rain. If enough sleet accumulates on the ground, it makes travel hazardous.

¹ Source: National Weather Service. Orange County indicated by star.

Section 14: Winter Storm

TYPE OF WINTER STORM	DESCRIPTION
Blizzard Warning	Sustained wind speeds of at least 35 mph are accompanied by considerable falling or blowing snow. This alert is the most perilous winter storm with visibility dangerously restricted.
Frost/Freeze Warning	Below freezing temperatures are expected and may cause significant damage to plants, crops and fruit trees.
Wind Chill	A strong wind combined with a temperature slightly below freezing can have the same chilling effect as a temperature nearly 50 degrees lower in a calm atmosphere. The combined cooling power of the wind and temperature on exposed flesh is called the wind-chill factor.

Location

Winter storm events are not confined to specific geographic boundaries. Therefore, all existing and future buildings, facilities, and populations in the Orange County planning area, including all participating jurisdictions, are considered to be exposed to a winter storm hazard and could potentially be impacted.

Extent

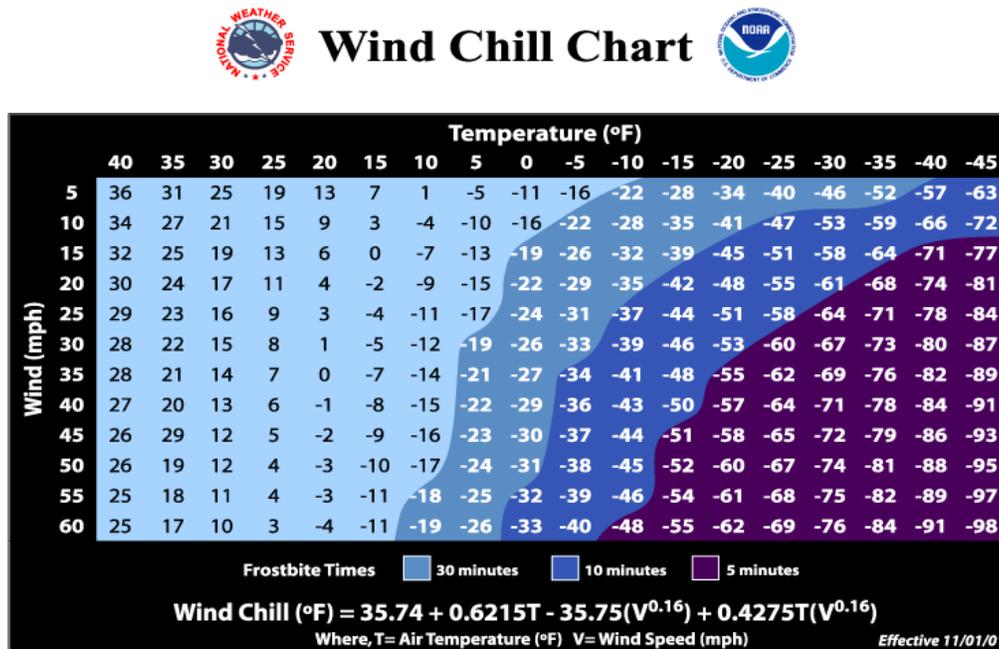
The extent or magnitude of a severe winter storm is measured in intensity based on the temperature and level of accumulations as shown in Table 14-2. Table 14-2 should be read in conjunction with the wind-chill factor described in Figure 14-2 to determine the intensity of a winter storm. The chart is not applicable when temperatures are over 50°F or winds are calm. This is an index developed by the National Weather Service.

Table 14-2. Magnitude of Severe Winter Storms

INTENSITY	TEMPERATURE RANGE (Fahrenheit)	EXTENT DESCRIPTION
Mild	40° – 50°	Winds less than 10 mph and freezing rain or light snow falling for short durations with little or no accumulations
Moderate	30° – 40°	Winds 10 – 15 mph and sleet and/or snow up to 4 inches
Significant	25° – 30°	Intense snow showers accompanied with strong gusty winds, between 15 and 20 mph with significant accumulation
Extreme	20° – 25°	Wind driven snow that reduces visibility, heavy winds (between 20 to 30 mph), and sleet or ice up to 5 millimeters in diameter
Severe	Below 20°	Winds of 35 mph or more and snow and sleet greater than 4 inches

Section 14: Winter Storm

Figure 14-2. Wind Chill Chart



Wind chill temperature is a measure of how cold the wind makes real air temperature feel to the human body. Since wind can dramatically accelerate heat loss from the body, a blustery 30°F day would feel just as cold as a calm day with 0°F temperatures. Orange County has never experienced a blizzard, but based on 9 previous occurrences recorded from 1996 to June 2016, it has been subject to winter storm watches, warnings, freezing rain, sleet, snow and wind chill.

The average number of cold days is similar for the entire county planning area. Therefore the intensity or extent of a winter storm event to be mitigated for the area ranges from mild to significant according to the definitions at Table 14-2. Orange County planning area can expect anywhere between 0.1 to 3.0 inches of ice and snow during a winter storm event and temperatures between 25 and 50 degrees with winds ranging from 0 to 20 mph.

Historical Occurrences

Table 14-3 shows historical occurrences for Orange County from 1996 to June 2016 provided by the NCEI database. There have been 9 recorded winter storm events in Orange County. Historical winter storm information, as provided by the NCEI, identifies winter storm activity across a multi-county forecast area for each event. The appropriate percentage of the total property and crop damage reported for the entire forecast area has been allocated to each county impacted by the event. Historical winter storm data for all participating jurisdictions are provided on a County-wide basis per the NCEI database. Table 14-3 shows historical incident information for the planning area which resulted in property or crop damage.

Section 14: Winter Storm

Table 14-3. Historical Winter Storm Events, 1996-2016²

JURISDICTION	DATE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Orange County	1/12/1997	1	10	\$10,512,561	\$0
Orange County	12/11/2008	0	0	\$0	\$0
Orange County	12/4/2009	0	0	\$0	\$0
Orange County	1/8/2010	0	0	\$276,349	\$0
Orange County	2/23/2010	0	0	\$0	\$0
Orange County	2/3/2011	0	0	\$2,143	\$0
Orange County	1/23/2014	0	0	\$0	\$0
Orange County	1/28/2014	0	0	\$0	\$0
Orange County	3/4/2014	0	0	\$0	\$0
TOTALS		1	10	\$10,791,053	

Based on the list of historical winter storm events for the Orange County planning area (listed above), including all participating jurisdictions, 4 of the events have occurred since the 2011 Plan.

Significant Past Events

January 12 - 14, 1997 – Orange County

A record ice storm paralyzed southeast Texas and southwest Louisiana. Around 90,000 electric customers across southeast Texas were without power for up to six days. Emergency shelters were opened for several nights due to the cold weather following the ice storm. Hundreds of homes received minor damage due to trees or tree limbs falling on roofs. Several house fires were directly or indirectly related to the ice storm. Numerous traffic accidents attributed to icy roads led to several minor injuries. One death was indirectly attributed to the ice storm. Two men were electrocuted on Tuesday, January 21st, while doing cleanup work for a local electric company. One 48 year old man died, and a 19 year old man was seriously injured in the accident.

January 8 – 11, 2010 – Orange County

A deep upper level trough moving eastward across the United States forced a bitterly cold Arctic air mass southward from Canada into the Gulf Coast states on January 7, 2010. This air mass remained in place for several days across southeast Texas, leading to the coldest temperatures seen across this region since February 1996. A few record low temperatures and record low maximum temperatures were set. Many locations in the Lakes Region of southeast Texas remained below freezing for over 36 hours from around midnight early on January 8th through the afternoon on Saturday January 9th.

The cold temperatures led to several school closures, numerous weather-related fires, and widespread plumbing ruptures throughout southeast Texas. One indirect fatality occurred near Jamestown in Newton County due to a house fire. The Insurance Council of Texas estimated losses

² Values are in 2016 dollars.

Section 14: Winter Storm

across southeast Texas from the cold weather at around \$1 million. Beaumont Enterprise reported 1,800 customers in Vidor lost power during the morning hours on Friday January 8th due to the cold temperatures.

Probability of Future Events

According to historical records, Orange County experiences approximately one winter storm event per year. Hence, the probability of a future winter storm event affecting the Orange County planning area is highly likely, with a winter storm likely to occur within the next year. All participating jurisdiction events are included under the County.

Vulnerability and Impact

During periods of extreme cold and freezing temperatures, water pipes can freeze and crack; and ice can build up on power lines, causing them to break under the weight or causing tree limbs to fall on the lines. These events can disrupt electric service for long periods.

An economic impact may occur due to increased consumption of heating fuel, which can lead to energy shortages and higher prices. House fires and resulting deaths tend to occur more frequently from increased and improper use of alternate heating sources. Fires during winter storms also present a greater danger because water supplies may freeze and impede firefighting efforts.

All populations, buildings, critical facilities, and infrastructure in the entire Orange County planning area, including all participating jurisdictions, are vulnerable to severe winter events.

The following critical facilities would be vulnerable to Winter Storm events in each participating jurisdiction:

Table 14-4. Critical Facilities by Jurisdiction

JURISDICTION	CRITICAL FACILITIES
Orange County	Fire Station
Bridge City	Fire Station, Police Station, 5 Schools
City of Orange	Port District Facilities, River Authority Facilities, 5 Fire Stations, 3 Police Stations, 2 Water District Facilities, 14 Schools
Pine Forest	None
Pinehurst	None
Rose City	None
Vidor	Fire Station, Police Station, 2 Water District Facilities, 7 Schools
West Orange	None

People and animals are subject to health risks from extended exposure to cold air. Elderly people are at greater risk of death from hypothermia during these events, especially in the rural areas of the county where populations are sparse, icy roads may impede travel, and there are fewer neighbors to

Section 14: Winter Storm

check in on the elderly. According to the U.S. Center for Disease Control, every year hypothermia kills about 600 Americans, half of whom are 65 years of age or older.

Populations over 65 in the Orange County planning area is approximately 15.3% of the total population or an estimated total of 12,892³ potentially vulnerable residents in the planning area based on age (Table 14-5).

Table 14-5. Populations at Greater Risk by Jurisdiction

JURISDICTION	POPULATION 65 AND OLDER
Bridge City	875
City of Orange	3,054
Pine Forest	70
Pinehurst	871
Rose City	60
Vidor	1,373
West Orange	625
Orange County⁴	11,995

Historic loss, in 2016 dollars, is estimated at \$10,791,053 in damages over the 21-year recording period giving an approximate loss of \$513,860 in damages annually (Table 14-6). The potential severity of impact is limited meaning injuries are treatable with first aid, shutdown of facilities and services for 24 hours or less, and less than 10% of property destroyed or with major damage.

Table 14-6. Potential Annualized Losses for Orange County

JURISDICTION	PROPERTY & CROP LOSS	ANNUAL LOSS ESTIMATE
Orange County	\$10,791,053	\$513,860

Assessment of Impacts

The greatest risk from a winter storm hazard is to public health and safety. Potential impacts for the planning area may include:

- Vulnerable populations, particularly the elderly and infants, can face serious or life-threatening health problems from exposure to extreme cold including hypothermia and frostbite.
- Loss of electric power or other heat source can result in increased potential for fire injuries or hazardous gas inhalation because residents burn candles for light or use fires or generators to stay warm.
- Response personnel, including utility workers, public works personnel, debris removal staff, tow truck operators, and other first responders are subject to injury or illness resulting from exposure to extreme cold temperatures.

³ US Census Bureau 2014 data for Orange County

⁴ County totals includes all participating jurisdictions and unincorporated areas.

Section 14: Winter Storm

- Response personnel would be required to travel in potentially hazardous conditions, elevating the life safety risk due to accidents, and potential contact with downed power lines.
- Operations or service delivery may experience impacts from electricity blackouts due to winter storms.
- Power outages are possible throughout the planning area due to downed trees and power lines and/or rolling blackouts.
- Critical facilities without emergency backup power may not be operational during power outages.
- Emergency response and service operations may be impacted by limitations on access and mobility if roadways are closed, unsafe, or obstructed.
- Hazardous road conditions will likely lead to increases in automobile accidents, further straining emergency response capabilities.
- Depending on the severity and scale of damage caused by ice and snow events, damage to power transmission and distribution infrastructure can require days or weeks to repair.
- A winter storm event could lead to tree, shrub, and plant damage or death.
- Severe cold and ice could significantly damage agricultural crops.
- Schools may be forced to shut early due to treacherous driving conditions.
- Exposed water pipes may be damaged by severe or late season winter storms at both residential and commercial structures, causing significant damages.

The economic and financial impacts of winter weather on the community will depend on the scale of the event, what is damaged, and how quickly repairs to critical components of the economy can be implemented. The level of preparedness and pre-event planning done by businesses and citizens will also contribute to the overall economic and financial conditions in the aftermath of a winter storm event.

Section 15: Dam Failure

Portions of the Orange County Hazard Mitigation Plan Update are considered confidential and not for release to the public. The information in this section is covered under Privacy Act of 1974 (5 U.S.C. Section 552a).

Section 16: Mitigation Strategy

Mitigation Goals	1
Goal 1	1
Goal 2	1
Goal 3	2
Goal 4	2
Goal 5	2
Goal 6	3

Mitigation Goals

Based on the results of the risk and capability assessments, the Planning Team developed and prioritized the mitigation strategy. This involved utilizing the results of both assessments and reviewing the goals and objectives that were included in the previous 2011 Plan.

At the Mitigation Workshop in August 2016, Planning Team members reviewed the mitigation strategy from the previous 2011 Plan. The consensus among all members present was that the strategy developed for the 2011 Plan did not require changes, as it identified overall improvements to be sought in the Plan Update. However, the order and priority of the goals and objectives were reorganized.

Goal 1

Protect public health and safety.

Objective 1.1

Advise the public about health and safety precautions to guard against injury and loss of life from hazards.

Objective 1.2

Maximize utilization of the latest technology to provide adequate warning, communication, and mitigation of hazard events.

Objective 1.3

Reduce the danger to, and enhance protection of, high risk areas during hazard events.

Objective 1.4

Protect critical facilities and services.

Goal 2

Build and support local capacity and commitment to continuously become less vulnerable to hazards.

Objective 2.1

Build and support local partnerships to continuously become less vulnerable to hazards.

Section 16: Mitigation Strategy

Objective 2.2

Build a cadre of committed volunteers to safeguard the community before, during, and after a disaster.

Objective 2.3

Build hazard mitigation concerns into county planning and budgeting processes.

Goal 3

Increase public understanding, support, and demand for hazard mitigation.

Objective 3.1

Heighten public awareness regarding the full range of natural and man-made hazards the public may face.

Objective 3.2

Educate the public on actions they can take to prevent or reduce the loss of life or property from all hazards and increase individual efforts to respond to potential hazards.

Objective 3.3

Publicize and encourage the adoption of appropriate hazard mitigation measures.

Goal 4

Protect new and existing properties.

Objective 4.1

Reduce repetitive losses to the National Flood Insurance Program (NFIP).

Objective 4.2

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

Objective 4.3

Enact and enforce regulatory measures to ensure that future development will not put people in harm's way or increase threats to existing properties.



Goal 5

Maximize the resources for investment in hazard mitigation.

Objective 5.1

Maximize the use of outside sources of funding.

Objective 5.2

Maximize participation of property owners in protecting their properties.

Objective 5.3

Maximize insurance coverage to provide financial protection against hazard events.

Section 16: Mitigation Strategy

Objective 5.4

Prioritize mitigation projects, based on cost-effectiveness and sites facing the greatest threat to life, health and property.

Goal 6

Promote growth in a sustainable manner.

Objective 6.1

Incorporate hazard mitigation activities into long-range planning and development activities.

Objective 6.2

Promote beneficial uses of hazardous areas while expanding open space and recreational opportunities.

Objective 6.3

Utilize regulatory approaches to prevent creation of future hazards to life and property.

Section 17: Previous Actions

Summary.....	1
Orange County - Countywide	2
Bridge City.....	27
City of Orange	30
Pine Forest.....	40
Pinehurst.....	43
Rose City.....	55
Vidor.....	58
West Orange	75

Summary

Planning Team members were given copies of the previous mitigation actions submitted in the 2011 Plan at the mitigation workshop. Orange County reviewed the previous actions and provided an analysis as to whether the action had been completed, should be deferred as an ongoing activity, or be deleted from the Plan. The actions from the 2011 Plan are included in this section as they were written in 2011, with the exception of the “2016 Analysis” section.

Section 17: Previous Actions

Orange County – Countywide

Orange County (Past Action) – 1	
Proposed Action:	Seek funding and construct centralized shelter(s) of last resort within the county that is elevated out of the flood prone area and designed for appropriate wind load, in coordination with the Texas Safe Shelter Initiative.
BACKGROUND INFORMATION	
Reason for Action:	Prevention and Life Safety.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Hurricane/Tropical Storm, Thunderstorm, Flood, Hazardous Material, Tornado
STAPLE-E Summary:	Social, Technical, Administrative, Political, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$20,000,000
Implementation Schedule:	3-5 years
Coordinating Agency:	Orange County OEM, Orange County Maintenance, Approved Contractor
Potential Funding Sources:	Operating budgets, local funding, PDF, HMGP grants. Also Private Non-Profit Organizations
Objective:	1.3, 2.1, 5.1

2016 Analysis:
Completed.

Section 17: Previous Actions

Orange County (Past Action) – 2	
Proposed Action:	Develop medium and large scale storm-water conveyance structures to improve drainage for the County and the Cities.
BACKGROUND INFORMATION	
Reason for Action:	Improved floodwater outflow capacity from city centers and industrial complexes is needed to reduce/prevent impacts of flooding, storm surge, and flash flood.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane, Thunderstorm
STAPLE-E Summary:	Social, Technical, Administrative, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$100,000,000-\$150,000,000
Implementation Schedule:	3-5 years
Coordinating Agency:	Orange County, Drainage District, Road and Bridge
Potential Funding Sources:	Operating Budgets, local funding, HMGP, PDM
Objective:	1.3, 2.1, 5.1

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update.

Section 17: Previous Actions

Orange County (Past Action) – 3	
Proposed Action:	Seek funding and construct additional dry hydrants throughout the county, additional floating pumps and hose; improve surfaces to existing dry hydrants and other existing water sources.
BACKGROUND INFORMATION	
Reason for Action:	To upgrade fire suppression and control equipment for areas within the county that are currently underserved to better enhance response time and minimize damage to structures and timber resources.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Wildfire
STAPLE-E Summary:	Social, Technical, Administrative
Priority (High, Moderate, Low):	High
Estimated Cost:	\$500,000
Implementation Schedule:	12 months
Coordinating Agency:	Orange County, Fire Districts, Drainage District, Road and Bridge
Potential Funding Sources:	Operating Budgets, local funding, HMGP, PDM
Objective:	1.3, 2.2, 4.1, 5.1

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. Change Estimated Cost to \$800,000.

Section 17: Previous Actions

Orange County (Past Action) – 4	
Proposed Action:	Develop a Community Wildfire Protection Plan (CWPP) with the assistance of a contractor.
BACKGROUND INFORMATION	
Reason for Action:	Enhance outreach and education programs aimed at mitigating wildfire and reducing or preventing the exposure of citizens, public agencies, private property owners, and businesses to wildfire or natural hazards.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Wildfire
STAPLE-E Summary:	Social, Technical, Administrative, Political, Legal
Priority (High, Moderate, Low):	High
Estimated Cost:	\$40,000
Implementation Schedule:	12 months
Coordinating Agency:	Orange County OEM, local fire departments
Potential Funding Sources:	Operating Budgets, local funding, PDM, HMGP, USFS grants
Objective:	1.3, 2.1, 3.2, 4.1, 5.1, 5.4

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update.

Section 17: Previous Actions

Orange County (Past Action) – 5	
Proposed Action:	Require fire department notification for new business applications for fire plans. Encourage single-family residences to have fire escape plans. Encourage public to evaluate access routes for fire departments on their property.
BACKGROUND INFORMATION	
Reason for Action:	To increase communication, coordination, and collaboration between property owners, local and county officials, fire prevention crews or officials to address risk, existing mitigation measures, and federal assistance.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Wildfire
STAPLE-E Summary:	Technical, Administrative
Priority (High, Moderate, Low):	High
Estimated Cost:	\$10,000-200,000
Implementation Schedule:	12 months
Coordinating Agency:	Orange County OEM, local fire departments
Potential Funding Sources:	Operating Budgets, local funding, PDM, HMGP
Objective:	1.1, 2.1, 3.2

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. Change to All Hazards Addressed; change Estimated Cost to \$100,000.

Section 17: Previous Actions

Orange County (Past Action) – 6	
Proposed Action:	Install back-up power generators for all four county precinct barns. Orange County Road and Bridge provide sandbags to the citizens of Orange County during severe weather events that cause flooding.
BACKGROUND INFORMATION	
Reason for Action:	By providing for uninterrupted operation during severe weather event to assist the citizens of Orange County.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane, Thunderstorm, Tornado, Winter Storm
STAPLE-E Summary:	Social, Technical, Political, Administrative, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$800,000
Implementation Schedule:	12 months
Coordinating Agency:	Orange County OEM, Orange County Road and Bridge
Potential Funding Sources:	Operating Budgets, local funding, PDM, HMGP, USFS grants
Objective:	1.3, 5.1

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. Change Estimated Cost to \$1,000,000.

Section 17: Previous Actions

Orange County (Past Action) – 7	
Proposed Action:	Provide back-up power generator for the Orange County Sheriff’s Department.
BACKGROUND INFORMATION	
Reason for Action:	Assure uninterrupted operation during severe weather event to assist the personnel of Orange County Sheriff’s Department.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane/Tropical Storm, Severe Winter Weather, Thunderstorm/Lightning/Hail/High Wind, Tornado
STAPLE-E Summary:	Social, Technical, Political, Administrative, Legal
Priority (High, Moderate, Low):	High
Estimated Cost:	\$500,000
Implementation Schedule:	12 months
Coordinating Agency:	Orange County OEM, Orange County Road and Bridge
Potential Funding Sources:	Orange County OEM, Orange County Road and Bridge
Objective:	1.3, 5.1

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. Change Estimated Cost to \$800,000.

Section 17: Previous Actions

Orange County (Past Action) – 8	
Proposed Action:	Develop and construct flood and storm surge protection systems for all of Orange County.
BACKGROUND INFORMATION	
Reason for Action:	Flood Protection. Mitigate storm surge inundation during coastal storms.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane/Tropical Storm, Thunderstorm
STAPLE-E Summary:	Social, Technical, Administrative, Political, Environmental
Priority (High, Moderate, Low):	High
Estimated Cost:	\$100,500,000
Implementation Schedule:	5-10 years
Coordinating Agency:	Orange County OEM, Orange County Road and Bridge, Orange County Drainage District
Potential Funding Sources:	USACE, Operating Budgets, local funding, PDM, HMGP grants
Objective:	1.1, 1.3, 3.1, 5.1

2016 Analysis:	
Defer Action – Will include in the 2016 Plan Update. Include Levy System within the Mitigation Action.	

Section 17: Previous Actions

Orange County (Past Action) – 9	
Proposed Action:	Improve and/or install signage at major intersections around the county, and secondary signage to deploy in neighborhoods to notify the public of when the county is under a burn ban.
BACKGROUND INFORMATION	
Reason for Action:	Try to inform citizens of Orange County and transient traffic as they pass through Orange County of the current Burn Ban.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Drought, Wildfire
STAPLE-E Summary:	Social, Political, Administrative, Legal
Priority (High, Moderate, Low):	High
Estimated Cost:	\$750,000
Implementation Schedule:	12 months
Coordinating Agency:	Orange County OEM, Orange County Road and Bridge, Local Fire Departments
Potential Funding Sources:	Operating Budgets, local funding, PDM, HMGP grants
Objective:	1.3, 2.1, 3.1, 5.1

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. Combine Orange County Past Action 9 and Orange County Past Action 10 into one action in the 2016 Plan Update. Include Flood, Burnban and Hurricanes in the Hazards Addressed; Increase Estimated Cost to \$2,500,000 and the Implementation schedule to 24 months.

Section 17: Previous Actions

Orange County (Past Action) – 10	
Proposed Action:	Install electronic signage at major intersections around the county, and secondary signage to deploy in neighborhoods when the county has flooded areas.
BACKGROUND INFORMATION	
Reason for Action:	Try to inform citizens of Orange County and transient traffic as they pass through Orange County of the current flooding issues.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane/Tropical Storm, Thunderstorm
STAPLE-E Summary:	Social, Political, Administrative, Legal
Priority (High, Moderate, Low):	High
Estimated Cost:	\$2,000,000
Implementation Schedule:	12-24 months
Coordinating Agency:	Orange County OEM, Orange County Road and Bridge, Local Fire Departments
Potential Funding Sources:	Operating Budgets, local funding, PDM, HMGP grants
Objective:	1.3, 2.1, 2.2, 3.1, 5.1

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. Combine Orange County Past Action 9 and Orange County Past Action 10 into one action in the 2016 Plan Update. See additional analysis under Orange County Past Action 9.

Section 17: Previous Actions

Orange County (Past Action) – 11	
Proposed Action:	Retrofit County Courthouse, Sheriff’s Department, District Attorney’s Office, and Administration Building with storm shutters, or laminate film to prevent damage from flying debris. Also retrofit and strengthen roofs and provide surge protection and data back-up systems on all critical facilities.
BACKGROUND INFORMATION	
Reason for Action:	Continuity of county government after a storm event.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Hurricane/Tropical Storm, Thunderstorm/Lightning/Hail/High Wind, Tornado
STAPLE-E Summary:	Social, Technical, Administrative, Political, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$1,000,000-\$2,800,000
Implementation Schedule:	12-24 months
Coordinating Agency:	Orange County OEM, Orange County Maintenance, Approved Contractor
Potential Funding Sources:	Operating Budgets, local funding, PDM, HMGP grants
Objective:	1.3, 5.1

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. Change Estimated Cost to \$200,000.

Section 17: Previous Actions

Orange County (Past Action) – 12	
Proposed Action:	Acquisition of Flood prone Properties. Property acquired through acquisition will remain as open space for perpetuity and will be used for the benefit of the community.
BACKGROUND INFORMATION	
Reason for Action:	To reduce the flood losses in Orange County and improve public safety.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane, Thunderstorm
STAPLE-E Summary:	Social, Technical, Administrative, Economic, Environmental
Priority (High, Moderate, Low):	High
Estimated Cost:	\$4,000,000
Implementation Schedule:	12-24 months
Coordinating Agency:	Orange County OEM, Orange County Maintenance, Approved Contractor
Potential Funding Sources:	Operating Budgets, local funding, PDM, HMGP grants
Objective:	1.1, 1.3, 1.4, 3.3

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update.

Section 17: Previous Actions

Orange County (Past Action) – 13	
Proposed Action:	Construct floodwater retention areas in the Cow Bayou Watershed to mitigate the impact of severe rain events in traditionally flood-prone areas of the county. One of these retention areas is nearing completion and three more are planned.
BACKGROUND INFORMATION	
Reason for Action:	To prevent flooding to homes located at the Cow Bayou Watershed.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane/Tropical Storm, Thunderstorm
STAPLE-E Summary:	Social, Technical, Administrative, Economic, Environmental
Priority (High, Moderate, Low):	High
Estimated Cost:	\$5,000,000
Implementation Schedule:	2-5 years
Coordinating Agency:	Orange County OEM, Orange County Maintenance, Approved Contractor
Potential Funding Sources:	Operating Budgets, local funding, PDM, HMGP grants
Objective:	1.1, 1.3, 1.4

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. This is an ongoing project. Add Orange County Drainage District to the Coordinating Agency.

Section 17: Previous Actions

Orange County (Past Action) – 14	
Proposed Action:	Hire a consultant engineering company to provide a detailed study of the various watersheds in Orange County. Compile the data from all watershed studies into a Master Drainage Plan.
BACKGROUND INFORMATION	
Reason for Action:	To obtain the best possible data regarding watersheds and the flooding they could produce.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane, Thunderstorm
STAPLE-E Summary:	Technical, Administrative, Political, Social, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$300,000 - \$500,000
Implementation Schedule:	2-3 years
Coordinating Agency:	Orange County OEM, Orange County Maintenance, Approved Contractor
Potential Funding Sources:	Operating Budgets, local funding, PDM, HMGP grants
Objective:	4.1

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. Change Estimated Cost's upper range to \$750,000; Add Orange County Drainage District to the Coordinating Agency.

Section 17: Previous Actions

Orange County (Past Action) – 15	
Proposed Action:	Excavate a connecting channel between Tiger Creek and Ten Mile Creek North of Rose City. Once this phase is completed, a new channel running West toward the Neches River will be excavated. This will alleviate the impact of severe rain events in the North and West portions of the county.
BACKGROUND INFORMATION	
Reason for Action:	To reduce/eliminate flooding in the North and West portions of Orange County.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane, Thunderstorm
STAPLE-E Summary:	Social, Political, Administrative, Environmental, Technical
Priority (High, Moderate, Low):	High
Estimated Cost:	\$500,000 - \$1,600,000
Implementation Schedule:	2-3 years
Coordinating Agency:	Orange County OEM, Orange County Maintenance, Approved Contractor
Potential Funding Sources:	Operating Budgets, local funding, PDM, HMGP grants
Objective:	1.1, 1.3, 1.4

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. Change Estimate Cost's upper range to \$1,500,000.

Section 17: Previous Actions

Orange County (Past Action) – 16	
Proposed Action:	Make presentations to various organization such as schools, neighborhood watch groups, various civic groups, and special risk groups. Make articles available to local newspapers. Make pamphlets available on the various hazards at the Sheriff’s Office, Courthouse, Vidor Sub-Courthouse, and the Administration building.
BACKGROUND INFORMATION	
Reason for Action:	Prevention and Education.

MITIGATION ACTION DETAILS	
Hazard Addressed:	All
STAPLE-E Summary:	Social, Political, Administrative
Priority (High, Moderate, Low):	High
Estimated Cost:	\$100,000
Implementation Schedule:	12 months
Coordinating Agency:	Orange County OEM, Orange County Maintenance, Approved Contractor
Potential Funding Sources:	Operating Budgets, local funding, PDM, HMGP grants
Objective:	1.3, 5.1

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. Include within the Action description: Install Electronic signs/Billboards throughout the County. Add Drought, Fire Risk, and Burn Bans to the Hazards Addressed; Change the Estimated Cost to \$250,000 - \$2,000,000.

Section 17: Previous Actions

Orange County (Past Action) – 17	
Proposed Action:	Seek funding for on-site sewerage facility upgrades or tie-in feeds to hook up to existing water and sewerage facilities to help improve the water quality in the Adams and Cow Bayou Watersheds.
BACKGROUND INFORMATION	
Reason for Action:	Water Quality Improvement.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Water Contamination
STAPLE-E Summary:	Social, Political, Administrative
Priority (High, Moderate, Low):	High
Estimated Cost:	\$2,000,000
Implementation Schedule:	2-5 years
Coordinating Agency:	Orange County OEM, Orange County Environmental Health, Approved Contractor
Potential Funding Sources:	Operating budgets, local funding, PDM, CIAP, HMGP grants
Objective:	1.3, 2.3, 4.1

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. This is an ongoing project. Change the Estimate Cost to \$4,000,000. Remove CIAP from the Potential Funding Sources, as that has completed the 1 st round of improvements; add CDBG to the Potential Funding Sources.

Section 17: Previous Actions

Orange County (Past Action) – 18	
Proposed Action:	Seek funding and construct Regional Wastewater Treatment Plants.
BACKGROUND INFORMATION	
Reason for Action:	Water Quality Improvement.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Water Contamination
STAPLE-E Summary:	Social, Political, Administrative
Priority (High, Moderate, Low):	High
Estimated Cost:	\$2,000,000
Implementation Schedule:	3-5 years
Coordinating Agency:	Orange County OEM, Orange County Environmental Health, local water districts, Approved Contractor
Potential Funding Sources:	Operating budgets, local funding, PDM, HMGP grants
Objective:	1.3, 2.3, 5.1, 5.2

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. This Action is within the Planning Stage. Change Estimate Cost to \$80,000,000.

Section 17: Previous Actions

Orange County (Past Action) – 19	
Proposed Action:	Seek funding to educate the public on issues related to the inappropriate discharge of wastewater in the environment and the impacts it has on the waterways.
BACKGROUND INFORMATION	
Reason for Action:	Prevention and Education.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Water Contamination
STAPLE-E Summary:	Social, Political, Administrative
Priority (High, Moderate, Low):	High
Estimated Cost:	\$100,000
Implementation Schedule:	12-18 months
Coordinating Agency:	Orange County OEM, Orange County Environmental Health
Potential Funding Sources:	Operating budgets, local funding, PDM, CIAP, HMGP grants
Objective:	2.3, 3.2, 4.1, 5.4

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. This action is ongoing. Remove CIAP from the Potential Funding Sources.

Section 17: Previous Actions

Orange County (Past Action) – 20	
Proposed Action:	Storm harden and upgrade alternate E.O.C. currently located in the Administration Building of the Orange County Airport. This would include the purchase and installation of retractable storm shutters, installing emergency power supply generator, surge protection and data back-up systems. This project would ensure continuous emergency operations during severe weather events and minor hurricanes (Category 2 or below).
BACKGROUND INFORMATION	
Reason for Action:	To maintain continuity of government during and after a disaster.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane/Tropical Storm, Thunderstorm/Lightning/Hail/High Wind, Tornado
STAPLE-E Summary:	Technical, Administrative
Priority (High, Moderate, Low):	Medium
Estimated Cost:	\$120,000
Implementation Schedule:	12-24 months
Coordinating Agency:	Orange County OEM, Orange County Maintenance, Approved Contractor
Potential Funding Sources:	Operating Budgets, local funding, PDM, HMGP grants
Objective:	1.1, 1.3, 1.4

2016 Analysis:
Delete Action. A new EOC was built, therefore this action is no longer needed.

Section 17: Previous Actions

Orange County (Past Action) – 21	
Proposed Action:	Retrofit existing or future structures to act as cooling stations during period of extreme heat.
BACKGROUND INFORMATION	
Reason for Action:	To ensure that citizens in Orange County have a cool place to go in times of Extreme Heat.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Extreme Heat
STAPLE-E Summary:	Social, Political, Administrative, Legal, Technical
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$500,000 - \$1,000,000
Implementation Schedule:	2-3 years
Coordinating Agency:	Orange County OEM, Orange County Maintenance, Approved Contractor
Potential Funding Sources:	Operating Budgets, local funding, PDM, HMGP grants
Objective:	1.3, 1.4

2016 Analysis:
Completed. The Orange County Convention Center will act as a cooling station.

Section 17: Previous Actions

Orange County (Past Action) – 22	
Proposed Action:	Develop and implement water conservation ordinances to be used during periods of drought.
BACKGROUND INFORMATION	
Reason for Action:	To ensure that water sources are not completely depleted in times of drought and that the county has adequate water supplies.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Drought
STAPLE-E Summary:	Social, Economic, Environmental, Administrative
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$1,000
Implementation Schedule:	1-5 years
Coordinating Agency:	Orange County OEM, Orange County
Potential Funding Sources:	Operating Budgets, local funding, PDM, HMGP grants
Objective:	

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update.

Section 17: Previous Actions

Orange County (Past Action) – 23	
Proposed Action:	Implement an “all hazards” education program that includes, but is not limited to brochures and public presentations.
BACKGROUND INFORMATION	
Reason for Action:	To educate the public on the hazards that they face in this region.

MITIGATION ACTION DETAILS	
Hazard Addressed:	All
STAPLE-E Summary:	Social, Political, Administrative
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$1,000
Implementation Schedule:	1-5 years
Coordinating Agency:	Orange County OEM, Orange County
Potential Funding Sources:	Operating Budgets, local funding, PDM, HMGP grants
Objective:	2.1, 5.4

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update.

Section 17: Previous Actions

Orange County (Past Action) – 24	
Proposed Action:	Continue and maintain participation in the National Flood Insurance Program (NFIP).
BACKGROUND INFORMATION	
Reason for Action:	Maintain eligibility for NFIP, insurance against future losses.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Dam Failure, Hurricane/Tropical Storm
STAPLE-E Summary:	Social, Technical, Administrative, Political, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$0
Implementation Schedule:	Ongoing, continuous
Coordinating Agency:	Orange County
Potential Funding Sources:	N/A
Objective:	1.2, 2.1, 3.2, 4.3

2016 Analysis:
Delete Action.

Section 17: Previous Actions

Orange County (Past Action) – 25	
Proposed Action:	Elevate flood prone roadways and install upgraded culverts and drainage for roads including but not limited to: West Bluff Road, Pine Bluff Road, 4-Oaks Ranch Road, Connolly Road, South Lakeview Road, Sharon Street, and Bailey Road. These 7 roads total 15.6 miles in length and would need to be raised an average of 3 feet. Distance, elevation, and structural methods for other flood prone roadways not listed will vary.
BACKGROUND INFORMATION	
Reason for Action:	To avoid public safety risk, loss of function, assist evacuation, and improve emergency response capabilities.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Dam Failure, Flood, Hurricane
STAPLE-E Summary:	Technical, Administrative, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$200,000 - \$1,500,000
Implementation Schedule:	1-5 years
Coordinating Agency:	Orange County
Potential Funding Sources:	Operating budget, PDM, HMGP
Objective:	1.1, 1.3, 1.4

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. Change Estimated Cost to \$400,000.

Section 17: Previous Actions

Bridge City

Bridge City (Past Action) – 1	
Proposed Action:	Acquisition of Flood prone Properties. Property acquired will remain as open space for perpetuity for the benefit of the community.
BACKGROUND INFORMATION	
Reason for Action:	To reduce the flood losses that occur in Bridge City.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane, Thunderstorm
STAPLE-E Summary:	Administrative, Environmental, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$150,000
Implementation Schedule:	1-5 years
Coordinating Agency:	City of Bridge City
Potential Funding Sources:	HMGP, PDM, FMA, RFC, SRL
Objective:	1.1, 3.3

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update.

Section 17: Previous Actions

Bridge City (Past Action) – 2	
Proposed Action:	Retrofit and storm-harden roofs, install permanent storm shutters and/or protective window film, install emergency power supply (generators), and install surge protection and data back-up systems for city facilities.
BACKGROUND INFORMATION	
Reason for Action:	To prevent damage to city buildings and fire department from flying debris and power loss.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Hurricane/Tropical Storm, Thunderstorm/Lightning/Hail/ High Wind, Tornado
STAPLE-E Summary:	Social, Technical, Administrative, Political, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$100,000 - \$350,000
Implementation Schedule:	1-5 years
Coordinating Agency:	City of Bridge City
Potential Funding Sources:	Operating budget, local funding, PDM, HMGP
Objective:	1.1, 1.3, 1.4

2016 Analysis:
Completed.

Section 17: Previous Actions

Bridge City (Past Action) – 3	
Proposed Action:	Continue and maintain participation in the National Flood Insurance Program (NFIP).
BACKGROUND INFORMATION	
Reason for Action:	Maintain eligibility for NFIP, insurance against future losses.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Dam Failure, Hurricane/Tropical Storm
STAPLE-E Summary:	Social, Technical, Administrative, Political, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$0
Implementation Schedule:	Ongoing, continuous
Coordinating Agency:	City of Bridge City
Potential Funding Sources:	N/A
Objective:	1.2, 2.1, 3.2, 4.3

2016 Analysis:
Delete Action.

Section 17: Previous Actions

City of Orange

City of Orange (Past Action) – 1	
Proposed Action:	Improve and enlarge the drainage ditch and culverts along Coopers Gully.
BACKGROUND INFORMATION	
Reason for Action:	To allow better water conveyance through the drainage ditches.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane
STAPLE-E Summary:	Social, Technical, Administrative, Political, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$1 million
Implementation Schedule:	1-5 years
Coordinating Agency:	City Public Works
Potential Funding Sources:	HMGP, PDM, and FMA
Objective:	1.1, 1.3, 1.4

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. This action is ongoing. Change Estimated Cost to \$3.5 Million.

Section 17: Previous Actions

City of Orange (Past Action) – 2	
Proposed Action:	Harden city buildings to withstand effects of hazard events. Hardening features may include but is not limited to wind rated roofing systems, wind rated window systems, wind or flood rated door systems, or flood proofing systems. Specific buildings include the city hall building, fire station #2, Link Street water plant office building, Jackson Street waste water treatment plan office building, alternate EOC at 4103 Meeks Drive.
BACKGROUND INFORMATION	
Reason for Action:	Maintain continuity of government and essential services throughout potential hazard events.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane, Thunderstorm, Tornado
STAPLE-E Summary:	Social, Technical, Administrative, Political, Legal, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$3.5 Million
Implementation Schedule:	1-5 years
Coordinating Agency:	City of Orange Public Works Department
Potential Funding Sources:	HMGP, PDM, FMA
Objective:	1.1, 1.3, 1.4

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. This action is ongoing.

Section 17: Previous Actions

City of Orange (Past Action) – 3	
Proposed Action:	Install emergency electrical generators and emergency mechanical bypass pumps at major waste water lift stations. Specific locations are the Roselawn lift station, Sikes Road lift station, MLK& HWY87 lift station, and Barkins Street lift station. The mechanical bypass pumps should have 6” suction and a 4” discharge and have the capability of pumping with high head pressure and include all associated hose and fittings. The emergency electrical generators should be either diesel or natural gas powered dependent upon the availability of adequate natural gas service near the lift station.
BACKGROUND INFORMATION	
Reason for Action:	Maintain waste water function throughout hazard events.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane, Thunderstorm, Tornado
STAPLE-E Summary:	Social, Technical, Administrative, Political, Legal
Priority (High, Moderate, Low):	High
Estimated Cost:	\$500,000
Implementation Schedule:	1-5 years
Coordinating Agency:	City of Orange Public Works Department
Potential Funding Sources:	Operating budget, local funding, PDM, HMGP
Objective:	1.1, 1.3, 1.4

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. Change the Estimated Cost to \$750,000.

Section 17: Previous Actions

City of Orange (Past Action) – 4	
Proposed Action:	Enlarge existing underground storm lines and install sluice gates at two outfall lines to Sabine River in the Old Town area.
BACKGROUND INFORMATION	
Reason for Action:	Storm lines and systems too small – outdated, restricts watershed.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane, Thunderstorm
STAPLE-E Summary:	Social, Technical, Administrative
Priority (High, Moderate, Low):	High
Estimated Cost:	\$1 Million
Implementation Schedule:	1-5 years
Coordinating Agency:	City of Orange Public Works Department
Potential Funding Sources:	Operating budget, local funding, PDM, HMGP
Objective:	1.1, 1.3, 1.4

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. This action is ongoing. Change Estimated Cost to \$1.5 Million

Section 17: Previous Actions

City of Orange (Past Action) – 5	
Proposed Action:	Acquisition of Flood prone Properties. Property acquired will remain as open space for perpetuity for the benefit of the community.
BACKGROUND INFORMATION	
Reason for Action:	To reduce flood losses in the City of Orange.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Dam Failure, Hurricane
STAPLE-E Summary:	Administrative, Environmental, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$100,000 - \$150,000
Implementation Schedule:	1-5 years
Coordinating Agency:	City of Orange
Potential Funding Sources:	Operating budget, local funding, PDM, HMGP, FMA, RFC, SRL
Objective:	1.1, 3.3

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. Include Acquisition, Elevation or Mitigation Reconstruction within the Action description. Change Estimated Cost to \$1 Million.

Section 17: Previous Actions

City of Orange (Past Action) – 6	
Proposed Action:	Continue and maintain participation in the NFIP.
BACKGROUND INFORMATION	
Reason for Action:	Maintain eligibility for NFIP, insurance against future losses.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Dam Failure, Hurricane/Tropical Storm
STAPLE-E Summary:	Social, Technical, Administrative, Political, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$0
Implementation Schedule:	Ongoing, continuous
Coordinating Agency:	City of Orange
Potential Funding Sources:	N/A
Objective:	1.2, 2.1, 3.2, 4.3

2016 Analysis:
Completed.

Section 17: Previous Actions

City of Orange (Past Action) – 7	
Proposed Action:	Upgrade pumps, motors, forebay, and debris removal at the Coopers Gully Pump Station.
BACKGROUND INFORMATION	
Reason for Action:	Improve capability to discharge water out of Coopers Gully.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane, Thunderstorm
STAPLE-E Summary:	Social, Technical, Administrative, Political, Economic
Priority (High, Moderate, Low):	Medium
Estimated Cost:	\$4.2 Million
Implementation Schedule:	12-24 months
Coordinating Agency:	Public Works Department
Potential Funding Sources:	Public Works
Objective:	1.1, 1.3, 1.4

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update.

Section 17: Previous Actions

City of Orange (Past Action) – 8	
Proposed Action:	Fund an engineering study to improve drainage in the general area between the railroad tracks and 8 th Street (E/W) and IH-10 and Link Street (N/S).
BACKGROUND INFORMATION	
Reason for Action:	This area contains five repetitive flood loss properties and a plan to reduce future damage is needed.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane/Tropical Storm, Thunderstorm/Lightning/Hail/High Wind
STAPLE-E Summary:	Social, Technical, Administrative, Political, Legal, Economic
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$500,000
Implementation Schedule:	1-5 years
Coordinating Agency:	City of Orange Public Works
Potential Funding Sources:	Operating budget, local funding, PDM, HMGP
Objective:	4.1

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update.

Section 17: Previous Actions

City of Orange (Past Action) – 9	
Proposed Action:	Fund an engineering study to improve drainage in the general area between the railroad tracks and Simmons Dr. (E/W) and Front and Link St. (N/S).
BACKGROUND INFORMATION	
Reason for Action:	This area contains six repetitive flood loss properties and a plan to reduce future damage is needed.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane/Tropical Storm, Thunderstorm/Lightning/Hail/High Wind
STAPLE-E Summary:	Social, Technical, Administrative, Political, Legal, Economic
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$500,000
Implementation Schedule:	1-5 years
Coordinating Agency:	City of Orange Public Works Department
Potential Funding Sources:	Operating budget, local funding, PDM, HMGP
Objective:	1.1, 1.3, 1.4

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update.

Section 17: Previous Actions

City of Orange (Past Action) – 10	
Proposed Action:	Orange will proactively educate citizens of all age groups on safety precautions to take against all types of natural hazards. These presentations will be made to school age children, civic groups, neighborhood associations, etc.
BACKGROUND INFORMATION	
Reason for Action:	Citizens of Orange need to have a personal or family plan for all potential hazard risks.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Drought, Extreme Heat, Flood, Hazardous Material, Hurricane/Tropical Storm, Thunderstorm/Lightning/Hail/High Wind, Tornado, Water Contamination, Wildfire
STAPLE-E Summary:	Social, Technical, Administrative, Political, Legal, Economic
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$100 - \$5,000
Implementation Schedule:	1-5 years
Coordinating Agency:	Emergency Management Office, Local American Red Cross Chapter, Salvation Army, Orange County Emergency Management
Potential Funding Sources:	Operating budget, local funding, HMGP
Objective:	2.1

2016 Analysis:
Completed.

Section 17: Previous Actions

Pine Forest

Pine Forest (Past Action) – 1	
Proposed Action:	Retrofit roof and install permanent storm shutters on the Pine Forest Municipal Building and install emergency power supply.
BACKGROUND INFORMATION	
Reason for Action:	TO prevent damage to the Pine Forest Municipal Building from flying debris and power loss.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Hurricane/Tropical Storm, Thunderstorm/Lightning/Hail/ High Wind, Tornado
STAPLE-E Summary:	Social, Technical, Administrative, Political, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$10,000 - \$50,000
Implementation Schedule:	1-5 years
Coordinating Agency:	City of Pine Forest
Potential Funding Sources:	Operating Budget, local funding, PDM, HMGP
Objective:	1.1, 1.3, 1.4

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. Change Estimated Cost to \$80,000; Add Orange County OEM to the Coordinating Agency.

Section 17: Previous Actions

Pine Forest (Past Action) – 2	
Proposed Action:	Install outdoor warning siren system for Pine Forest.
BACKGROUND INFORMATION	
Reason for Action:	Provide early warning of disaster events to citizens.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hazardous Material, Hurricane/Tropical Storm, Thunderstorm/Lightning/Hail/High Wind, Tornado, Wildfire
STAPLE-E Summary:	Social, Technical, Administrative, Political
Priority (High, Moderate, Low):	Medium
Estimated Cost:	\$100,000 - \$200,000
Implementation Schedule:	1-5 years
Coordinating Agency:	City of Orange
Potential Funding Sources:	Operating budget, local funding, EMPG, PDM, HMGP
Objective:	

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. Change the Coordinating Agency to City of Pine Forest and add Orange County OEM.

Section 17: Previous Actions

Pine Forest (Past Action) – 3	
Proposed Action:	Continue and maintain participation in the National Flood Insurance Program (NFIP).
BACKGROUND INFORMATION	
Reason for Action:	Maintain eligibility for NFIP, insurance against future losses.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Dam Failure, Hurricane/Tropical Storm
STAPLE-E Summary:	Social, Technical, Administrative, Political, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$0
Implementation Schedule:	Ongoing, continuous
Coordinating Agency:	City of Pine Forest
Potential Funding Sources:	N/A
Objective:	1.2, 2.1, 3.2, 4.3

2016 Analysis:
Delete Action.

Section 17: Previous Actions

Pinehurst

Pinehurst (Past Action) – 1	
Proposed Action:	Implement a plan to increase the size of the existing drainage ditches and culverts from 40 th Street through Swallow Street, under a designated state highway (Hwy. 3247) into existing drainage onto Whippoorwill Street.
BACKGROUND INFORMATION	
Reason for Action:	To allow better water conveyance through the drainage ditches.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane/Tropical Storm, Thunderstorm/Lightning/Hail/High Wind
STAPLE-E Summary:	Social, Technical, Administrative, Political, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$500,000
Implementation Schedule:	1-5 years
Coordinating Agency:	City of Pinehurst
Potential Funding Sources:	HMGP, PDM, and FMA
Objective:	1.1, 1.3, 1.4

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. Change Estimated Cost to \$650,000.

Section 17: Previous Actions

Pinehurst (Past Action) – 2	
Proposed Action:	Engineer and implement a plan to increase and redirect storm water drainage from 35 th Street through Pheasant Street to 33 rd Street.
BACKGROUND INFORMATION	
Reason for Action:	To allow better water conveyance through the drainage ditches.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane/Tropical Storm, Thunderstorm/Lightning/Hail/High Winds
STAPLE-E Summary:	Social, Technical, Administrative, Political, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$500,000
Implementation Schedule:	1-5 years
Coordinating Agency:	City of Pinehurst
Potential Funding Sources:	HMGP, PDM, and FMA
Objective:	1.1, 1.3, 1.4

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. Change Estimated Cost to \$650,000.

Section 17: Previous Actions

Pinehurst (Past Action) – 3	
Proposed Action:	Engineer and implement a plan to connect to existing drainage on 35 th Street and reroute it under Raven Street at the intersection of Harding and Raven and continuing to 33 rd Street.
BACKGROUND INFORMATION	
Reason for Action:	To allow better water conveyance through the drainage ditches.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane/Tropical Storm, Thunderstorm/Lightning/Hail/High Wind
STAPLE-E Summary:	Social, Technical, Administrative, Political, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$500,000
Implementation Schedule:	1-5 years
Coordinating Agency:	City Pinehurst
Potential Funding Sources:	HMGP, PDM, and FMA
Objective:	1.1, 1.3, 1.4

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. Change Estimated Cost to \$650,000.

Section 17: Previous Actions

Pinehurst (Past Action) – 4	
Proposed Action:	Implement a plan to increase the size of the existing drainage ditches and culverts on Enchanted Oaks Street from its intersection at Shadow Wood to the intersection of Somerset Street.
BACKGROUND INFORMATION	
Reason for Action:	To allow better water conveyance through the drainage ditches.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane/Tropical Storm, Thunderstorm/Lightning/Hail/High Wind
STAPLE-E Summary:	Social, Technical, Administrative, Political, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$500,000
Implementation Schedule:	1-5 years
Coordinating Agency:	City Public Works
Potential Funding Sources:	HMGP, PDM, and FMA
Objective:	1.1, 1.3, 1.4

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. Change Estimated Cost to \$650,000.

Section 17: Previous Actions

Pinehurst (Past Action) – 5	
Proposed Action:	Acquisition of Flood prone Properties. Property acquired will remain as open space for perpetuity and will be used for the benefit of the community.
BACKGROUND INFORMATION	
Reason for Action:	To reduce flood losses in the City of Pinehurst.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane/Tropical Storm, Thunderstorm/Lightning/Hail/High Wind
STAPLE-E Summary:	Social, Technical, Administrative, Political, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$500,000
Implementation Schedule:	1-5 years
Coordinating Agency:	City Public Works
Potential Funding Sources:	HMGP, PDM, and FMA
Objective:	1.1, 3.3

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. Include Acquisition/Elevation or Mitigation Reconstruction to the Action description; Change Estimated Cost to \$700,000.

Section 17: Previous Actions

Pinehurst (Past Action) – 6	
Proposed Action:	Implement a plan to redirect storm water runoff from the 3500 block of West Park Avenue to Adams Bayou.
BACKGROUND INFORMATION	
Reason for Action:	To reduce flood losses.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane/Tropical Storm, Thunderstorm/Lightning/Hail/High Wind
STAPLE-E Summary:	Social, Technical, Administrative, Political, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$500,000
Implementation Schedule:	1-5 years
Coordinating Agency:	City Public Works
Potential Funding Sources:	HMGP, PDM, and FMA
Objective:	1.1, 1.3, 1.4

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. Change Estimated Cost to \$650,000.

Section 17: Previous Actions

Pinehurst (Past Action) – 7	
Proposed Action:	Elevate Del Sasso lift station wet well and electrical control height to above recent flood elevation and install elevated generator.
BACKGROUND INFORMATION	
Reason for Action:	This lift station has experienced flood water depth of several feet above current wet well elevation causing flooding of the sewer system, damage to the electrical controls and restricting access by personnel and portable generators.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane/Tropical Storm, Thunderstorm/Lightning/Hail/High Wind, Tornado
STAPLE-E Summary:	Social, Technical, Administrative, Political, Legal
Priority (High, Moderate, Low):	High
Estimated Cost:	\$185,600
Implementation Schedule:	1-3 years
Coordinating Agency:	City of Pinehurst
Potential Funding Sources:	Operating budget, PDM, HMGP, FMA
Objective:	1.1, 1.3, 1.4

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. Change Estimated Cost to \$225,000.

Section 17: Previous Actions

Pinehurst (Past Action) – 8	
Proposed Action:	Public structure strengthening of City government offices and Police/Public Safety facility at 2497 MLK Jr. Dr. with mechanical storm shutters.
BACKGROUND INFORMATION	
Reason for Action:	This facility has a large glass façade and doors and a number of windows needing protection from flying debris carried by high winds.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane/Tropical Storm, Thunderstorm/Lightning/Hail/High Wind, Tornado
STAPLE-E Summary:	Social, Technical, Administrative, Political, Legal
Priority (High, Moderate, Low):	High
Estimated Cost:	\$75,000
Implementation Schedule:	1-3 years
Coordinating Agency:	City of Pinehurst
Potential Funding Sources:	Operating budget, PDM, HMGP, FMA
Objective:	1.1, 1.3, 1.4

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. Change Estimated Cost to \$100,000.

Section 17: Previous Actions

Pinehurst (Past Action) – 9	
Proposed Action:	Elevate lift station wet well height to above recent flood elevation and install elevated generator.
BACKGROUND INFORMATION	
Reason for Action:	City lift stations have experienced flood water depth of several feet above current wet well elevation causing flooding of the sewer system, damage to the electrical controls and restricting access by personnel and portable generators.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane/Tropical Storm, Thunderstorm/Lightning/Hail/High Wind
STAPLE-E Summary:	Social, Technical, Administrative, Political, Legal
Priority (High, Moderate, Low):	High
Estimated Cost:	\$140,000
Implementation Schedule:	Operating budget, PDM, HMGP, FMA
Coordinating Agency:	City of Pinehurst
Potential Funding Sources:	Operating budget, PDM, HMGP, FMA
Objective:	1.1, 1.3, 1.4

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. Change Estimated Cost to \$155,000.

Section 17: Previous Actions

Pinehurst (Past Action) – 10	
Proposed Action:	Elevate 34 th Street lift station generator and electrical controls to above recent flood elevation.
BACKGROUND INFORMATION	
Reason for Action:	This lift station has experienced flood water depth of several feet above current wet well elevation causing flooding of the sewer system, damage to the electrical controls and restricting access by personnel and portable generators.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane/Tropical Storm, Thunderstorm/Lightning/Hail/High Wind
STAPLE-E Summary:	Social, Technical, Administrative, Political, Legal
Priority (High, Moderate, Low):	High
Estimated Cost:	\$70,000
Implementation Schedule:	1-3 years
Coordinating Agency:	City of Pinehurst
Potential Funding Sources:	Operating budget, HMGP, PDM, FMA
Objective:	1.1, 1.3, 1.4

2016 Analysis:
Completed.

Section 17: Previous Actions

Pinehurst (Past Action) – 11	
Proposed Action:	Elevate 33rd St. lift station wet well height to above recent flood elevation and install elevated generator.
BACKGROUND INFORMATION	
Reason for Action:	This lift station has experienced flood water depth of several feet above current wet well elevation causing flooding of the sewer system, damage to the electrical controls and restricting access by personnel and portable generators.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane/Tropical Storm, Thunderstorm/Lightning/Hail/High Wind
STAPLE-E Summary:	Social, Technical, Administrative, Political, Legal
Priority (High, Moderate, Low):	High
Estimated Cost:	\$155,600
Implementation Schedule:	1-3 years
Coordinating Agency:	City of Pinehurst
Potential Funding Sources:	Operating budget, PDM, HMGP, FMA
Objective:	1.1, 1.3, 1.4

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. Change Estimated Cost to \$180,000.

Section 17: Previous Actions

Pinehurst (Past Action) – 12	
Proposed Action:	Continue and maintain participation in the National Flood Insurance Program (NFIP).
BACKGROUND INFORMATION	
Reason for Action:	Maintain eligibility for NFIP, insurance against future losses.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Dam Failure, Hurricane/Tropical Storm
STAPLE-E Summary:	Social, Technical, Administrative, Political, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$0
Implementation Schedule:	Ongoing, continuous
Coordinating Agency:	City of Pinehurst
Potential Funding Sources:	N/A
Objective:	1.2, 2.1, 3.2, 4.3

2016 Analysis:
Delete Action.

Section 17: Previous Actions

Rose City

Rose City (Past Action) – 1	
Proposed Action:	Perform public structure strengthening by retrofitting the roof and installing permanent storm shutters on the Rose City Municipal Building and other critical facilities such as water supply facilities.
BACKGROUND INFORMATION	
Reason for Action:	To protect the Rose City Municipal Building from flying debris during hazard events.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane/Tropical Storm, Thunderstorm/Lightning/Hail/High Wind, Tornado
STAPLE-E Summary:	Social, Technical, Administrative, Political, Legal
Priority (High, Moderate, Low):	High
Estimated Cost:	\$75,000
Implementation Schedule:	1-3 years
Coordinating Agency:	City of Rose City
Potential Funding Sources:	Operating budget, PDM, HMGP, FMA
Objective:	1.1, 1.3, 3.1

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. Change Estimated Cost to \$150,000; Add Orange County OEM to Coordinating Agency.

Section 17: Previous Actions

Rose City (Past Action) – 2	
Proposed Action:	Install auxiliary power supply on two Rose City Water System locations located at 370 Rose City Dr. and on Flamingo St. This will ensure continuous operations during a disaster.
BACKGROUND INFORMATION	
Reason for Action:	TO better prepare the Vidor ISD and first responders in times of severe weather or disasters.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane/Tropical Storm, Thunderstorm/Lightning/Hail/High Wind, Tornado
STAPLE-E Summary:	Social, Technical, Administrative, Political, Legal
Priority (High, Moderate, Low):	High
Estimated Cost:	\$100,000
Implementation Schedule:	1-5 years
Coordinating Agency:	City of Rose City
Potential Funding Sources:	PDM, HMGP
Objective:	1.3

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. Change Estimated Cost to \$200,000; Add Orange County OEM to Coordinating Agency; Update Reason for Action to: To better serve the community in times of disaster or loss of power.

Section 17: Previous Actions

Rose City (Past Action) – 3	
Proposed Action:	Continue and maintain participation in the National Flood Insurance Program (NFIP).
BACKGROUND INFORMATION	
Reason for Action:	Maintain eligibility for NFIP, insurance against future losses.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Dam Failure, Hurricane/Tropical Storm
STAPLE-E Summary:	Social, Technical, Administrative, Political, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$0
Implementation Schedule:	Ongoing, continuous
Coordinating Agency:	City of Rose City
Potential Funding Sources:	N/A
Objective:	1.2, 2.1, 3.2, 4.3

2016 Analysis:
Delete Action.

Section 17: Previous Actions

Vidor

Vidor (Past Action) – 1	
Proposed Action:	Seek funding for new generator to power public works / maintenance building where radios and repeater is located for the police department, street department/sanitation department and backup repeater/radio for fire department.
BACKGROUND INFORMATION	
Reason for Action:	Replaces current generator in place, which has failed on numerous occasions. Continuous repair in costly to the City.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane/Tropical Storm, Thunderstorm/Lightning/Hail/High Wind, Tornado
STAPLE-E Summary:	Social, Technical, Administrative, Political, Legal
Priority (High, Moderate, Low):	High
Estimated Cost:	\$200,000
Implementation Schedule:	1-3 years
Coordinating Agency:	City of Vidor Emergency Management Coordinator, City Manager
Potential Funding Sources:	Operating budget, local funding, PDM, HMGP
Objective:	1.1, 1.3, 1.4

2016 Analysis:
Completed. This action was funded in the Local Budget in 2016.

Section 17: Previous Actions

Vidor (Past Action) – 2	
Proposed Action:	Seek funding for a sewer jet to enable to drainage department to clear clogged culverts in a more efficient manner with fewer man hours and quicker response.
BACKGROUND INFORMATION	
Reason for Action:	At present, the drainage department has to use 3-4 persons to clean a culvert. This tool can be operated by just one or two persons and the job is done in a more efficient and safe manner.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane/Tropical Storm, Thunderstorm/Lightning/Hail/High Wind
STAPLE-E Summary:	Social, Technical, Administrative, Political, Legal
Priority (High, Moderate, Low):	High
Estimated Cost:	\$75,000
Implementation Schedule:	1-3 years
Coordinating Agency:	City of Vidor Emergency Management Coordinator, City Manager, Drainage Supervisor
Potential Funding Sources:	Operating budgets, local funding, PDM, HMGP
Objective:	1.1, 1.3, 1.4

2016 Analysis:
Completed. This action was funded in the Local Budget.

Section 17: Previous Actions

Vidor (Past Action) – 3	
Proposed Action:	Seek funding for enhanced security entrances and perimeter entrances for Police Department building and gate/fenced area of parking lot and air conditioning/generator area.
BACKGROUND INFORMATION	
Reason for Action:	Enhances security for employees and visitors of Police Department.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Hazardous Materials, Terrorism
STAPLE-E Summary:	Social, Administrative, Political
Priority (High, Moderate, Low):	High
Estimated Cost:	\$250,000
Implementation Schedule:	2-5 years
Coordinating Agency:	City Manager, Emergency Management Coordinator, Police Chief
Potential Funding Sources:	Operating budget, local funding, PDM, HMGP
Objective:	1.3

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update.

Section 17: Previous Actions

Vidor (Past Action) – 4	
Proposed Action:	Seek funding for enhanced security of hall door entrances and perimeter entrances for City Hall.
BACKGROUND INFORMATION	
Reason for Action:	Enhances security for the employees and visitors at City Hall.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Terrorism, Hazardous Materials
STAPLE-E Summary:	Social, Administrative, Political
Priority (High, Moderate, Low):	High
Estimated Cost:	\$350,000
Implementation Schedule:	2-5 years
Coordinating Agency:	City Manager, Emergency Management Coordinator
Potential Funding Sources:	Operating budget, local funding, PDM, HMGP
Objective:	1.3

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update.

Section 17: Previous Actions

Vidor (Past Action) – 5	
Proposed Action:	Acquisition of Flood prone Properties. Property acquired will remain as open space for perpetuity and will be used for the benefit of the community.
BACKGROUND INFORMATION	
Reason for Action:	To reduce the flood losses that occur in Vidor.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane/Tropical Storm, Thunderstorm/Lightning/Hail/High Wind
STAPLE-E Summary:	Administrative, Environmental, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$150,000
Implementation Schedule:	1-5 years
Coordinating Agency:	City of Vidor
Potential Funding Sources:	HMGP, PDM, FMA, RFC, SRL
Objective:	1.1, 3.3

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. Include Acquisition, Elevation or Mitigation Reconstruction within the Action description.

Section 17: Previous Actions

Vidor (Past Action) – 6	
Proposed Action:	Upgrade School House Ditch Crossing at Alamo Street. This project will begin the upgrading of undersized road crossing culverts in the School House Ditch System. The upgrade of this crossing will involve the replacement of the existing 7' diameter pipe and wooden headwall with 3- 8x8 boxes and concrete headwalls, and the reconstruction of the road base and surface which will be removed during the crossing upgrade.
BACKGROUND INFORMATION	
Reason for Action:	To allow better water conveyance through the drainage ditches.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane/Tropical Storm, Thunderstorm/Lightning/Hail/High Wind
STAPLE-E Summary:	Social, Technical, Administrative, Political, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$1 Million
Implementation Schedule:	1-5 years
Coordinating Agency:	City Public Works
Potential Funding Sources:	HMGP, PDM, and FMA
Objective:	1.1, 1.3, 1.4

2016 Analysis:
Completed.

Section 17: Previous Actions

Vidor (Past Action) – 7	
Proposed Action:	Upgrade School House Ditch Crossing at Walden Road. This project will begin the upgrading of undersized road crossing culverts in the School House Ditch System. Upgrade will involve replacement of single existing 7’ diameter pipe and earthen backfill with 3- 8x8 boxes and concrete headwalls, and will also include the reconstruction of the road base and surface which will be removed during the crossing up-grade.
BACKGROUND INFORMATION	
Reason for Action:	To allow better water conveyance through the drainage ditches.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane, Thunderstorm
STAPLE-E Summary:	Social, Technical, Administrative, Political, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$1 Million
Implementation Schedule:	1-5 years
Coordinating Agency:	City Public Works
Potential Funding Sources:	HMGP, PDM, and FMA
Objective:	1.1, 1.3, 1.4

2016 Analysis:
Completed.

Section 17: Previous Actions

Vidor (Past Action) – 8	
Proposed Action:	Upgrade School House Ditch Crossing at Taylor Road. Upgrade crossing will involve replacement of single existing 7' diameter pipe with 3- 8x8 boxes and concrete headwalls and reconstruction of road base and surface.
BACKGROUND INFORMATION	
Reason for Action:	To allow better water conveyance through the drainage ditches.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane, Thunderstorm
STAPLE-E Summary:	Social, Technical, Administrative, Political, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$1 Million
Implementation Schedule:	1-5 years
Coordinating Agency:	City Public Works
Potential Funding Sources:	HMGP, PDM, and FMA
Objective:	1.1, 1.3, 1.4

2016 Analysis:
Completed.

Section 17: Previous Actions

Vidor (Past Action) – 9	
Proposed Action:	Storm hardening and drainage improvements at Vidor Fire Station.
BACKGROUND INFORMATION	
Reason for Action:	To protect the Vidor Fire Station from flying debris and for better water conveyance through the drainage ditches.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane, Thunderstorm, Tornado
STAPLE-E Summary:	Social, Technical, Administration, Political, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$500,000
Implementation Schedule:	1-5 years
Coordinating Agency:	City Public Works
Potential Funding Sources:	HMGP, PDM, and FMA
Objective:	1.1, 1.3, 1.4

2016 Analysis:
<p>Completed. The drainage improvements have been completed. Defer Action – Will include the rest of the action in the 2016 Plan Update.</p>

Section 17: Previous Actions

Vidor (Past Action) – 10	
Proposed Action:	Upgrade existing or purchase new generators/backup power supplies at the Vidor ISD Police Station and Technology Building.
BACKGROUND INFORMATION	
Reason for Action:	This will provide an alternate power source for the Vidor ISD Police and Technology building during power outages.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane, Thunderstorm, Tornado
STAPLE-E Summary:	Social, Technical, Administration, Political, Legal
Priority (High, Moderate, Low):	High
Estimated Cost:	\$30,000
Implementation Schedule:	1-5 years
Coordinating Agency:	Vidor Emergency Management Coordinator, Vidor Independent School District
Potential Funding Sources:	PDM, HMGP
Objective:	1.1, 1.3, 1.4

2016 Analysis:
<p>Completed. This action has been completed at the Technology Building. Defer Action – Will include the rest of the action in the 2016 Plan Update.</p>

Section 17: Previous Actions

Vidor (Past Action) – 11	
Proposed Action:	Purchase Motorola 800 MHZ radios for mobile units and portable radios for the Vidor Independent School District Police Department and District Office of Emergency Management.
BACKGROUND INFORMATION	
Reason for Action:	This will allow for interoperability between ISD officials and other emergency responders within the region when an emergency occurs.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane, Thunderstorm, Tornado
STAPLE-E Summary:	Social, Technical, Administrative, Political, Legal
Priority (High, Moderate, Low):	High
Estimated Cost:	\$40,000
Implementation Schedule:	1-3 years
Coordinating Agency:	Vidor Emergency Management Coordinator, Vidor Independent School District
Potential Funding Sources:	PDM, HMGP
Objective:	2.1, 5.1, 5.2

2016 Analysis:
<p>Completed. The portable radios have been purchased.</p> <p>Defer Action – Will include the rest of the action in the 2016 Plan Update.</p>

Section 17: Previous Actions

Vidor (Past Action) – 12	
Proposed Action:	Provide emergency lighting sources for classrooms, hallways and stairways during periods where electricity fails. The emergency lights would provide lighting for students, faculty, and visitors to be evacuated.
BACKGROUND INFORMATION	
Reason for Action:	In some of the ISD buildings there are no emergency lighting available when the power goes out that will provide safe passage through the building.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane, Thunderstorm, Tornado
STAPLE-E Summary:	Social, Technical, Administrative, Political, Legal, Environmental, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$50,000
Implementation Schedule:	1-3 years
Coordinating Agency:	Vidor Emergency Management Coordinator, Vidor Independent School District
Potential Funding Sources:	PDM, HMGP
Objective:	2.1

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. Include ‘at Vidor ISD’ within the Action description; Change Estimated Cost to \$80,000.

Section 17: Previous Actions

Vidor (Past Action) – 13	
Proposed Action:	Provide “Go Buckets” which are packets with student information, ICS Organizational Charts and ICS Command Board, and snacks among other things, for teachers in order for safe evacuation of students during disasters.
BACKGROUND INFORMATION	
Reason for Action:	Will provide the ISD staff with tools that will enable them to safely and efficiently evacuate the schools in a timely manner.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hazardous Materials, Hurricane, Thunderstorm, Tornado
STAPLE-E Summary:	Social, Technical, Administrative, Political, Legal, Environmental, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$25,000
Implementation Schedule:	12 months
Coordinating Agency:	City of Vidor Emergency Management Coordinator, Vidor ISD
Potential Funding Sources:	PDM, HMGP
Objective:	2.1, 5.1, 5.2

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. Change “Buckets” to “Bags” within the Action description; Change Estimated Cost to \$50,000.

Section 17: Previous Actions

Vidor (Past Action) – 14	
Proposed Action:	Provide generators/back-up power supplies for the Vidor ISD Transportation Barns. These structures are normally used for maintenance of school busses. However, during disaster events, these transportation hubs are used for fuel for first responders such as the Vidor Police Department, Vidor ISD, Pine Forest, Fire Departments, Sheriff’s Deputies, and EMS.
BACKGROUND INFORMATION	
Reason for Action:	To better prepare the Vidor ISD and first responders in times of severe weather or disasters.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane, Thunderstorm, Tornado
STAPLE-E Summary:	Social, Technical, Administrative, Political, Legal
Priority (High, Moderate, Low):	Medium
Estimated Cost:	\$100,000
Implementation Schedule:	1-3 years
Coordinating Agency:	Vidor Emergency Management Coordinator, Vidor Independent School District
Potential Funding Sources:	PDM, HMGP
Objective:	1.1, 1.3, 1.4

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update.

Section 17: Previous Actions

Vidor (Past Action) – 15	
Proposed Action:	Make FEMA publications (ICC coverage, floodplain maps, etc.) readily available to the citizens by having them at the public library, lobbies of city hall, public works, municipal court, and police and fire departments.
BACKGROUND INFORMATION	
Reason for Action:	Educate citizens of Vidor about potential hazards impacts.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Drought, Extreme Heat, Flood, Hazardous Materials, Hurricane, Thunderstorm, Tornado, Water Contamination, Wildfire
STAPLE-E Summary:	Social, Technical, Administrative, Political, Legal, Economic
Priority (High, Moderate, Low):	Medium
Estimated Cost:	\$100 - \$5,000
Implementation Schedule:	1-5 years
Coordinating Agency:	Emergency Management Office, Local American Red Cross Chapter, Salvation Army, Orange County Emergency Management
Potential Funding Sources:	Operating budget, local funding, HMGP
Objective:	2.1

2016 Analysis:	
Defer Action – Will include in the 2016 Plan Update.	

Section 17: Previous Actions

Vidor (Past Action) – 15	
Proposed Action:	Continue and maintain participation in the National Flood Insurance Program (NFIP).
BACKGROUND INFORMATION	
Reason for Action:	Maintain eligibility for NFIP, insurance against future losses.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Dam Failure, Hurricane/Tropical Storm
STAPLE-E Summary:	Social, Technical, Administrative, Political, Economic
Priority (High, Moderate, Low):	Medium
Estimated Cost:	\$0
Implementation Schedule:	Ongoing, continuous
Coordinating Agency:	City of Vidor
Potential Funding Sources:	N/A
Objective:	1.2, 2.1, 3.2, 4.3

2016 Analysis:
Delete Action.

Section 17: Previous Actions

Vidor (Past Action) – 16	
Proposed Action:	Make presentations to various organizations such as schools, neighborhood watch groups and various civic groups. Make articles available to local newspapers. Make pamphlets available on the various subjects at the Police Department, City Library and City Hall.
BACKGROUND INFORMATION	
Reason for Action:	To educate the citizens of Vidor about the hazards that could impact them.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Drought, Extreme Heat, Flood, Hazardous Materials, Hurricane/Tropical Storm, Thunderstorm/Lightning/Hail/High Wind, Tornado, Water Contamination, Wildfire
STAPLE-E Summary:	Social, Technical, Administrative, Political, Legal, Economic
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$100 - \$5,000
Implementation Schedule:	1-5 years
Coordinating Agency:	Emergency Management Office, Local American Red Cross Chapter, Salvation Army, Orange County Emergency Management
Potential Funding Sources:	Operating budget, local funding, HMGP
Objective:	2.1

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. Include ‘Social Media, Department’s web pages’ to the Action description.

Section 17: Previous Actions

West Orange

West Orange (Past Action) – 1	
Proposed Action:	Perform public structure strengthening on City government offices located at 2700 Western Avenue with the following improvements: retrofit high wind load roof, storm shutters for exterior; non-permeable exterior walls; alternate power supply (generator); and fold down alternate site antenna.
BACKGROUND INFORMATION	
Reason for Action:	West Orange Critical Facilities were not built to withstand severe winds and other effects of hazard events.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane, Thunderstorm, Tornado
STAPLE-E Summary:	Social, Technical, Administrative, Political, Legal
Priority (High, Moderate, Low):	High
Estimated Cost:	\$175,000
Implementation Schedule:	1-5 years
Coordinating Agency:	City of West Orange
Potential Funding Sources:	Operating budget, PDM, HMGP
Objective:	1.1, 1.3, 1.4

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. Change Estimated Cost to \$250,000.

Section 17: Previous Actions

West Orange (Past Action) – 2	
Proposed Action:	Perform public structure strengthening on the Police/Public Safety EOC Facility at 2700 Austin Avenue with the following improvements: retrofit high wind load roof; storm proof shutters; non-permeable exterior walls; and high wind resistant radio tower antenna.
BACKGROUND INFORMATION	
Reason for Action:	West Orange Critical Facilities were not built to withstand severe winds and other effects of hazard events.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane, Thunderstorm, Tornado
STAPLE-E Summary:	Social, Technical, Administrative, Political, Legal
Priority (High, Moderate, Low):	High
Estimated Cost:	\$20,000
Implementation Schedule:	1-5 years
Coordinating Agency:	City of West Orange
Potential Funding Sources:	Operating budget, PDM, HMGP
Objective:	1.1 1.3, 1.4

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. Change Estimated Cost to \$200,000.

Section 17: Previous Actions

West Orange (Past Action) – 3	
Proposed Action:	Install alternate power supply (generator) at the Sewer Treatment Facility located at 1600 Western Avenue.
BACKGROUND INFORMATION	
Reason for Action:	West Orange Critical Facilities were not built to withstand severe winds and other effects of hazard events.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane, Thunderstorm, Tornado
STAPLE-E Summary:	Social, Technical, Administrative, Political, Legal
Priority (High, Moderate, Low):	High
Estimated Cost:	\$100,000
Implementation Schedule:	1-5 years
Coordinating Agency:	City of West Orange
Potential Funding Sources:	Operating budget, PDM, HMGP
Objective:	

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update.

Section 17: Previous Actions

West Orange (Past Action) – 4	
Proposed Action:	Perform public structure strengthening on Utility (Water/Sewer) Offices located at 2600 Western Avenue with the following improvements: retrofit high wind load roof; storm shutters for exterior; and alternate power supply (generator).
BACKGROUND INFORMATION	
Reason for Action:	West Orange Critical Facilities were not built to withstand severe winds and other effects of hazard events.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane/Tropical Storm, Thunderstorm/Lightning/Hail/High Wind, Tornado
STAPLE-E Summary:	Social, Technical, Administrative, Political, Legal
Priority (High, Moderate, Low):	High
Estimated Cost:	\$150,000
Implementation Schedule:	1-5 years
Coordinating Agency:	City of West Orange
Potential Funding Sources:	Operating budget, state funding, local funding, PDM, HMGP
Objective:	1.1, 1.3, 1.4

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update.

Section 17: Previous Actions

West Orange (Past Action) – 5	
Proposed Action:	Install alternate power supply (generator) at the Water Pump Facility located at Williams Dr. Station.
BACKGROUND INFORMATION	
Reason for Action:	West Orange Critical Facilities were not built to withstand severe winds and other effects of hazard events.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Thunderstorm/Lightning/Hail/High Wind, Tornado
STAPLE-E Summary:	Social, Technical, Administrative, Political, Legal
Priority (High, Moderate, Low):	High
Estimated Cost:	\$75,000
Implementation Schedule:	1-5 years
Coordinating Agency:	City of West Orange
Potential Funding Sources:	Operating budgets, state funding, local funding, PDM, HMGP
Objective:	

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update.

Section 17: Previous Actions

West Orange (Past Action) – 6	
Proposed Action:	Install alternate power supply to power ten (10) lift stations throughout the City of West Orange.
BACKGROUND INFORMATION	
Reason for Action:	West Orange Critical Facilities were not built to withstand severe winds and other effects of hazard events.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane/Tropical Storm, Thunderstorm/Lightning/Hail/High Wind, Tornado
STAPLE-E Summary:	Social, Technical, Administrative, Political, Legal
Priority (High, Moderate, Low):	High
Estimated Cost:	\$120,000
Implementation Schedule:	1-5 years
Coordinating Agency:	City of West Orange
Potential Funding Sources:	Operating budget, state funding, local funding, PDM, HMGP
Objective:	1.1, 1.3, 1.4

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update.

Section 17: Previous Actions

West Orange (Past Action) – 7	
Proposed Action:	Renovate a room located inside the Police Department to harden and secure the City’s radio, communication, and computer equipment to withstand high wind events to protect from further damage and be operational in the event of another event.
BACKGROUND INFORMATION	
Reason for Action:	West Orange Critical Facilities were not built to withstand severe winds and other effects of hazard events.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane/Tropical Storm, Thunderstorm/Lightning/Hail/High Wind, Tornado
STAPLE-E Summary:	Social, Technical, Administrative, Political, Legal
Priority (High, Moderate, Low):	High
Estimated Cost:	\$20,000
Implementation Schedule:	1-5 years
Coordinating Agency:	City of West Orange
Potential Funding Sources:	Operating budget, PDM, HMGP
Objective:	1.1, 1.3, 1.4

2016 Analysis:
Completed.

Section 17: Previous Actions

West Orange (Past Action) – 8	
Proposed Action:	Acquisition of Flood prone Properties. Property acquired will remain as open space for perpetuity and will be used for the benefit of the community.
BACKGROUND INFORMATION	
Reason for Action:	To reduce flood losses in the City of West Orange

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane/Tropical Storm
STAPLE-E Summary:	Administrative, Environmental, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$150,000
Implementation Schedule:	1-5 years
Coordinating Agency:	City of West Orange
Potential Funding Sources:	HMGP, PDM, FMA, RFC, SRL
Objective:	1.1, 3.3

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update. Include Acquisition, Elevation and Mitigation Reconstruction to the Action description.

Section 17: Previous Actions

West Orange (Past Action) – 9	
Proposed Action:	Contract to have a Special Study in order to analyze and formulate a Stormwater Management Plan and a Flood Damage Reduction Study under Section 206 of the Flood Control Act of 1960, as amended.
BACKGROUND INFORMATION	
Reason for Action:	A detailed study of our existing stormwater capacity and recommendations for improvements to the system is needed in order to reduce stormwater damage within the City.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane/Tropical Storm, Thunderstorm
STAPLE-E Summary:	Social, Technical, Administrative, Political, Environmental, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$250,000
Implementation Schedule:	3-5 years
Coordinating Agency:	City of West Orange
Potential Funding Sources:	Operating budget, state funding, local funding
Objective:	4.1

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update.

Section 17: Previous Actions

West Orange (Past Action) – 11	
Proposed Action:	Replace the bridge and elevate streets on Newton Street at Adams Bayou Lateral #1.
BACKGROUND INFORMATION	
Reason for Action:	This bridge is older and narrow and has been subject to massive amounts of debris and water flow from recent flooding.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane/Tropical Storm, Thunderstorm/Lightning/Hail/High Wind
STAPLE-E Summary:	Social, Technical, Political
Priority (High, Moderate, Low):	High
Estimated Cost:	\$120,000
Implementation Schedule:	3-5 years
Coordinating Agency:	City of West Orange
Potential Funding Sources:	Operating budget, state funding, local funding, PDM, HMGP
Objective:	1.1, 1.3, 1.4

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update.

Section 17: Previous Actions

West Orange (Past Action) – 12	
Proposed Action:	Replace bridge and elevate street on Lansing Street at Adams Bayou Lateral #1.
BACKGROUND INFORMATION	
Reason for Action:	This bridge is older and narrow and has been subject to massive amounts of debris and water flow from recent flooding.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hurricane/Tropical Storm, Thunderstorm/Lightning/Hail/High Wind
STAPLE-E Summary:	Social, Technical, Political
Priority (High, Moderate, Low):	High
Estimated Cost:	\$120,000
Implementation Schedule:	3-5 years
Coordinating Agency:	City of West Orange
Potential Funding Sources:	Operating budget, state funding, local funding, PDM, HMGP
Objective:	1.1, 1.3, 1.4

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update.

Section 17: Previous Actions

West Orange (Past Action) – 13	
Proposed Action:	Extend Irving Street north to connect with MacArthur Drive to improve evacuation and emergency vehicle access and response times.
BACKGROUND INFORMATION	
Reason for Action:	This would provide a more direct route north from the center of the city to the Highway 87 evacuation route. The streets that currently run north meander a great deal.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hazardous Materials, Hurricane/Tropical Storm, Thunderstorm/Lightning/Hail/High Wind, Tornado, Wildfire
STAPLE-E Summary:	Social, Technical, Political, Legal
Priority (High, Moderate, Low):	High
Estimated Cost:	\$2,500,000
Implementation Schedule:	2-7 years
Coordinating Agency:	City of West Orange
Potential Funding Sources:	Operating budget, PDM, HMGP
Objective:	1.1, 1.3, 1.4, 2.1, 2.2

2016 Analysis:
Defer Action – Will include in the 2016 Plan Update.

Section 17: Previous Actions

West Orange (Past Action) – 14	
Proposed Action:	Continue and maintain participation in the National Flood Insurance Program (NFIP).
BACKGROUND INFORMATION	
Reason for Action:	Maintain eligibility for NFIP, insurance against future losses.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Dam Failure, Hurricane/Tropical Storm
STAPLE-E Summary:	Social, Technical, Administrative, Political, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$0
Implementation Schedule:	Ongoing, Continuous
Coordinating Agency:	City of West Orange
Potential Funding Sources:	N/A
Objective:	1.2, 2.1, 3.2, 4.3

2016 Analysis:
Delete Action.

Section 17: Previous Actions

West Orange (Past Action) – 15	
Proposed Action:	Install Traffic Signals along MacArthur Drive in order to allow northbound traffic to enter MacArthur Drive during evacuations.
BACKGROUND INFORMATION	
Reason for Action:	Minor residential streets that empty onto MacArthur Dr. have no signalization. As a result a westbound movement to the Highway 87 evacuation route is difficult as this is a seven lane roadway.

MITIGATION ACTION DETAILS	
Hazard Addressed:	Flood, Hazardous Materials, Hurricane/Tropical Storm, Thunderstorm/Lightning/Hail/High Wind
STAPLE-E Summary:	Social, Technical, Administrative, Political, Economic
Priority (High, Moderate, Low):	High
Estimated Cost:	\$120,000
Implementation Schedule:	3-5 years
Coordinating Agency:	City of West Orange
Potential Funding Sources:	TXDOT, other state funding, local funding, PDM, HMGP
Objective:	1.1, 1.3, 1.4, 2.1, 2.2

2016 Analysis:
Delete Action.

Section 18: Mitigation Actions

Summary.....	1
Orange County.....	6
Bridge City.....	40
City of Orange.....	49
Pine Forest.....	57
Pinehurst.....	60
Rose City.....	71
Vidor.....	74
West Orange.....	98

Summary

As discussed in Section 2, at the mitigation workshop the planning team and stakeholders met to develop mitigation actions for each of the natural and human-caused hazards included in the Plan. Each of the actions in this section were prioritized based on FEMA’s Social, Technical, Administrative, Political, Legal, Economic and Environmental (STAPLEE) criteria necessary for the implementation of each action. As a result of this exercise, an overall priority was assigned to each mitigation action.

As part of the economic evaluation of the STAPLEE analysis, jurisdictions analyzed each action in terms of the overall costs, measuring whether the potential benefit to be gained from the action outweighed costs associated with it. As a result of this exercise, priority was assigned to each mitigation action by marking them as High (H), Moderate (M), or Low (L). An action that is ranked as “High” indicates that the action will be implemented as soon as funding is received. A “Moderate” action is one that may not be implemented right away depending on the cost and number of citizens served by the action. Actions ranked as “Low” indicate that they will not be implemented without first seeking grant funding and after “High” and “Moderate” actions have been completed.

All mitigation actions created by Planning Team members are presented in this section in the form of Mitigation Action Worksheets. More than one hazard is sometimes listed for an action, if appropriate. Actions presented in this section represent a comprehensive range of mitigation actions per current State and FEMA Guidelines, including two actions, per hazard, and of two different types.

Section 18: Mitigation Actions

Table 18-1. Orange County and Participating Jurisdictions Mitigation Action Matrix

MITIGATION ACTION MATRIX				
Actions presented in this matrix represent a comprehensive range and minimum number of required mitigation actions per current State and FEMA Guidelines, including two actions per hazard, and of two different types.				
ORANGE COUNTY: MITIGATION ACTION MATRIX				
HAZARDS	Types of Action:			
	LOCAL PLANS/ REGULATIONS	STRUCTURAL/ INFRASTRUCTURE	NATURAL SYSTEM PROTECTION	EDUCATION & AWARENESS
Flood	X	XXXXXXXXXXXX		XXX
Lightning		XXXX		XXX
Hurricane	X	XXXXXXXXXXXX		XXX
Extreme Heat		XXX		X
Hail		XXXXX		XXX
Thunderstorm Wind	X	XXXXXXXXXX		XXX
Tornado	X	XXXXX		XXX
Drought	X		X	XX
Wildfire	XX	XXXX		XX
Winter Storm		XXX		XXX
Dam Failure		XX		XX
CITY OF BRIDGE CITY: MITIGATION ACTION MATRIX				
HAZARDS	Types of Action:			
	LOCAL PLANS/ REGULATIONS	STRUCTURAL/ INFRASTRUCTURE	NATURAL SYSTEM PROTECTION	EDUCATION & AWARENESS
Flood		XXXXXXXXXX		XXX
Lightning		XX		XX
Hurricane	X	XXXXXXXXXX		XXX
Extreme Heat		XX		X
Hail		XX		XX
Thunderstorm Wind	X	XXXXXXXXXX		XXX
Tornado	X	XX		XX
Drought	X		X	XX
Wildfire	X	XX		XXX
Winter Storm		XX		XX
Dam Failure		X		XX

Section 18: Mitigation Actions

CITY OF ORANGE: MITIGATION ACTION MATRIX				
HAZARDS	Types of Action:			
	LOCAL PLANS/ REGULATIONS	STRUCTURAL/ INFRASTRUCTURE	NATURAL SYSTEM PROTECTION	EDUCATION & AWARENESS
Flood		XXXXXXXX		XXX
Lightning		XX		XX
Hurricane	X	XXXXXX		XXX
Extreme Heat		XX		X
Hail		XXX		XX
Thunderstorm Wind	X	XXXXX		XXX
Tornado	X	XXX		XX
Drought	X		X	XX
Wildfire	X	XX		XXX
Winter Storm		XX		XX
Dam Failure		X		XX

CITY OF PINE FOREST: MITIGATION ACTION MATRIX				
HAZARDS	Types of Action:			
	LOCAL PLANS/ REGULATIONS	STRUCTURAL/ INFRASTRUCTURE	NATURAL SYSTEM PROTECTION	EDUCATION & AWARENESS
Flood		XX		XXXX
Lightning		XX		XX
Hurricane	X	XXXX		XXXX
Extreme Heat		XX		X
Hail		XX		XXX
Thunderstorm Wind	X	XXX		XXXX
Tornado	X	XX		XXX
Drought	X		X	XX
Wildfire	X	XX		XXXX
Winter Storm		XX		XX
Dam Failure		X		XXX

Section 18: Mitigation Actions

CITY OF PINEHURST: MITIGATION ACTION MATRIX				
HAZARDS	Types of Action:			
	LOCAL PLANS/ REGULATIONS	STRUCTURAL/ INFRASTRUCTURE	NATURAL SYSTEM PROTECTION	EDUCATION & AWARENESS
Flood		XXXXXX		XXX
Lightning		XX		XX
Hurricane	X	XXXXX		XXX
Extreme Heat		XX		X
Hail		XXX		XX
Thunderstorm Wind	X	XXXX		XXX
Tornado	X	XXX		XX
Drought	X		X	XX
Wildfire	X	XX		XXX
Winter Storm		XX		XX
Dam Failure		X		XX

CITY OF ROSE CITY: MITIGATION ACTION MATRIX				
HAZARDS	Types of Action:			
	LOCAL PLANS/ REGULATIONS	STRUCTURAL/ INFRASTRUCTURE	NATURAL SYSTEM PROTECTION	EDUCATION & AWARENESS
Flood		XXX		XXX
Lightning		XX		XX
Hurricane	X	XXXXX		XXX
Extreme Heat		XX		X
Hail		XXX		XX
Thunderstorm Wind	X	XXXX		XXX
Tornado	X	XXX		XX
Drought	X		X	XX
Wildfire	X	XX		XXX
Winter Storm		XX		XX
Dam Failure		X		XX

Section 18: Mitigation Actions

CITY OF VIDOR: MITIGATION ACTION MATRIX				
HAZARDS	Types of Action:			
	LOCAL PLANS/ REGULATIONS	STRUCTURAL/ INFRASTRUCTURE	NATURAL SYSTEM PROTECTION	EDUCATION & AWARENESS
Flood	X	XXXXXX		XXXXXX
Lightning		XX		XXXX
Hurricane	XX	XXXXXXXX		XXXXXX
Extreme Heat		XX		XXX
Hail		XXXX		XXXXX
Thunderstorm Wind	X	XXXXXXXX		XXXXXX
Tornado	X	XXXX		XXXXX
Drought	X		X	XXXX
Wildfire	X	XX		XXXXXX
Winter Storm		XX		XXXXX
Dam Failure		X		XXXXX

CITY OF WEST ORANGE: MITIGATION ACTION MATRIX				
HAZARDS	Types of Action:			
	LOCAL PLANS/ REGULATIONS	STRUCTURAL/ INFRASTRUCTURE	NATURAL SYSTEM PROTECTION	EDUCATION & AWARENESS
Flood	X	XXXXXXXXXX		XXX
Lightning		XXXX		XX
Hurricane	X	XXXXXXXXXX		XXX
Extreme Heat		XXX		X
Hail		XXXXXX		XX
Thunderstorm Wind	X	XXXXXXXX		XXX
Tornado	X	XXXXXX		XX
Drought	X		X	XX
Wildfire	X	XXXX		XXX
Winter Storm		XXX		XX
Dam Failure		XXX		XX

Section 18: Mitigation Actions

Orange County

Orange County – Action #1	
Proposed Action:	Install additional hydrants throughout the county, additional floating pumps and hose; improve surfaces to existing dry hydrants and other existing water sources.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Targeted county locations currently underserved
Risk Reduction Benefit (Current Cost/Losses Avoided):	Upgrade fire suppression and control equipment for areas within the county that are currently underserved to better enhance response time and minimize damage to structures and timber resources.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Wildfire
Effect on New/Existing Buildings:	Reduce risk to existing and future structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$800,000
Potential Funding Sources:	Operating budgets, local funding, PDM, HMGP grants
Lead Agency/Department Responsible:	Orange County, Fire Districts, Drainage District, Road and Bridge
Implementation Schedule:	Within 12 months of plan adoption pending available funding
Incorporation into Existing Plans:	CWPP

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 3; and Environmentally Sound = 4

Section 18: Mitigation Actions

Orange County – Action #2	
Proposed Action:	Develop a Community Wildfire Protection Plan.
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Assess county vulnerability to wildfire and enhance outreach and education programs aimed at mitigating wildfires and reducing or preventing the exposure of citizens, public agencies, private property owners, and businesses to wildfire or natural hazards.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Wildfire
Effect on New/Existing Buildings:	Reduce risk to existing and future structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$40,000
Potential Funding Sources:	Operating budgets, local funding, PDM, HMGP, USFS grants
Lead Agency/Department Responsible:	Orange County OEM, Local Fire District
Implementation Schedule:	Within 12 months of plan adoption pending available funding
Incorporation into Existing Plans:	CWPP

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

Section 18: Mitigation Actions

Orange County – Action #3	
Proposed Action:	Provide generator power and hardwire quick connections to all four county precinct barns.
BACKGROUND INFORMATION	
Jurisdiction/Location:	County precinct barns
Risk Reduction Benefit (Current Cost/Losses Avoided):	Orange County Road and Bridge provides sandbags to the citizens of Orange County during severe weather events that cause flooding. Providing uninterrupted operation during severe weather events will assist citizens of Orange County.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind
Effect on New/Existing Buildings:	Reduce risk to existing and future structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$1,000,000
Potential Funding Sources:	Operating budgets, local funding, PDM, HMGP, USFS grants
Lead Agency/Department Responsible:	Orange County OEM, Orange County Road and Bridge
Implementation Schedule:	Within 12 months of plan adoption pending available funding
Incorporation into Existing Plans:	Emergency Response Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

Orange County – Action #4	
Proposed Action:	Provide generator power and hardwire quick connection at the Orange County Sheriff's Department.
BACKGROUND INFORMATION	
Jurisdiction/Location:	County Sheriff's Department
Risk Reduction Benefit (Current Cost/Losses Avoided):	Providing uninterrupted emergency operation during severe weather events.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind, Tornado, Winter Storm, Wildfire, Lightning, Extreme Heat, Hail, Dam Failure
Effect on New/Existing Buildings:	Reduce risk to existing and future structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$800,000
Potential Funding Sources:	Operating budgets, local funding, PDM, HMGP
Lead Agency/Department Responsible:	Orange County OEM, Orange County Road and Bridge
Implementation Schedule:	Within 12 months of plan adoption pending available funding
Incorporation into Existing Plans:	Emergency Response Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

Orange County – Action #5	
Proposed Action:	Construct Levy System or other flood protection system for all of Orange County to mitigate storm surge.
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce damages to structure and infrastructure caused by storm surge during coastal storms.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind
Effect on New/Existing Buildings:	Reduce risk to existing and future structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$500,000
Potential Funding Sources:	Operating budgets, local funding, PDM, HMGP, USACE
Lead Agency/Department Responsible:	Orange County OEM, Orange County Road and Bridge, Orange County Drainage District
Implementation Schedule:	Start within 12 months of plan adoption pending available funding
Incorporation into Existing Plans:	Comprehensive Plan, Drainage Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 3; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 3

Section 18: Mitigation Actions

Orange County – Action #6	
Proposed Action:	Retrofit county courthouse, Sheriff’s Department, district attorney’s office, and administration building with storm shutters or laminate film that can resist damage due to flying debris. Retrofit and strengthen roofs/building envelope on county critical facilities.
BACKGROUND INFORMATION	
Jurisdiction/Location:	County critical facilities
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce damages to critical facilities and provide continuity of county government and emergency services after a storm event.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind, Hail, Lightning, Tornado
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$200,000
Potential Funding Sources:	Operating budgets, local funding, PDM, HMGP
Lead Agency/Department Responsible:	Orange County OEM, Orange County Maintenance, Approved Contractor
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Comprehensive Plan, Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

Orange County – Action #7	
Proposed Action:	Acquisition and/or demolition, elevation, or mitigation reconstruction of repetitive loss properties. Property acquired through acquisition will remain as open space for perpetuity and will be used for the benefit of the community.
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide repetitive loss properties
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce or eliminate damages to repetitive loss structures through mitigation measures including acquisition, elevation or reconstruction.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$4,000,000
Potential Funding Sources:	Operating budgets, local funding, PDM, HMGP
Lead Agency/Department Responsible:	Orange County OEM, Orange County Maintenance, Approved Contractor
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Comprehensive Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 3; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 5

Section 18: Mitigation Actions

Orange County – Action #8	
Proposed Action:	Complete detailed study of various watersheds in Orange County; compile data and develop Master Drainage Plan.
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide select watersheds
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce damages to structures and infrastructure through floodplain analysis and comprehensive planning and land use management.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to existing and future structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$300,000
Potential Funding Sources:	Operating budgets, local funding, PDM, HMGP
Lead Agency/Department Responsible:	Orange County OEM, Orange County Maintenance, Orange County Drainage District, Approved Contractor
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Master Drainage Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

Orange County – Action #9	
Proposed Action:	Excavate a connecting channel between Tiger Creek and Ten Mile Creek north of Rose City. Once this phase is completed, a new channel running west toward the Neches River will be excavated. This will alleviate the impact of severe rain events in the north and west portions of the county.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Tiger Creek, Ten Mile Creek
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce flood risk to structures and infrastructure in northern and western portions of the county through reduced backwater and riverine flooding.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to existing and future structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$500,000 - \$1,500,000
Potential Funding Sources:	Operating budgets, local funding, PDM, HMGP
Lead Agency/Department Responsible:	Orange County OEM, Orange County Maintenance, Orange County Drainage District, Approved Contractor
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Master Drainage Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 3; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

Orange County – Action #10	
Proposed Action:	Build Regional Wastewater Treatment Plants.
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Improve water quality by reducing or eliminating risk of water contamination with new facilities.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Water Contamination
Effect on New/Existing Buildings:	Reduce risk to existing and future structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$80,000,000
Potential Funding Sources:	Operating budgets, local funding, PDM, HMGP
Lead Agency/Department Responsible:	Orange County OEM, Orange County Environmental Health, Local Water Districts, Approved Contractor
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Water Quality Improvement Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 4; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 5; and Environmentally Sound = 4</p>

Section 18: Mitigation Actions

Orange County – Action #11	
Proposed Action:	Elevate roads and install upgraded culverts and drainage for West Bluff Road, Pine Bluff Road, 4-Oaks Ranch Road, Connolly Road, South Lakeview Road, Sharon Street and Bailey Road. These 7 roads total 15.6 miles in length and would need to be raised an average of 3 feet.
BACKGROUND INFORMATION	
Jurisdiction/Location:	West Bluff Road, Pine Bluff Road, 4-Oaks Ranch Road, Connolly Road, South Lakeview Road, Sharon Street, and Bailey Road
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce or eliminate flood risk through improved drainage and elevated roads.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to existing and future structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$400,000
Potential Funding Sources:	PDM, HMGP, State funding, local funding, Operating budgets
Lead Agency/Department Responsible:	Orange County Public Works
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Master Drainage Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

Orange County – Action #12	
Proposed Action:	Construct three floodwater retention areas in the Cow Bayou Watershed to mitigate the impact of severe rain events in traditionally flood-prone areas of the county.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Cow Bayou Watershed
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce or eliminate flood risk through improved drainage and storm water retention.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to existing and future structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$500,000
Potential Funding Sources:	PDM, HMGP, State funding, local funding, Operating budgets
Lead Agency/Department Responsible:	Orange County Drainage District, OEM, Orange County Maintenance, Approved Contractor
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Master Drainage Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

Orange County – Action #13	
Proposed Action:	Upgrade sewer facilities, hook up to existing water and sewer facilities to help improve the water quality in the Adams and Cow Bayou Watersheds.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Adams and Cow Bayou Watersheds
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce or eliminate water contamination through improved facilities.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to existing and future structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$500,000
Potential Funding Sources:	PDM, HMGP, State funding, local funding, Operating budgets
Lead Agency/Department Responsible:	Orange County Drainage District, OEM, Orange County Maintenance, Approved Contractor
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Master Drainage Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 4; and Environmentally Sound = 3

Section 18: Mitigation Actions

Orange County County-Wide (1) – Action #14	
Proposed Action:	Develop medium and large scale storm-water conveyance structures to improve drainage for the county and cities.
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide, all participating jurisdictions
Risk Reduction Benefit (Current Cost/Losses Avoided):	Improved floodwater outflow capacity from city centers and industrial complexes is needed to reduce/prevent impacts of flooding, storm surge, and flash flooding.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind
Effect on New/Existing Buildings:	Reduce flooding at existing facilities and structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$5 Million+
Potential Funding Sources:	Operating budgets, local funding, PDM, HMGP, TWDB grants
Lead Agency/Department Responsible:	Public Works, Drainage District
Implementation Schedule:	Within 12 months of plan adoption pending available funding
Incorporation into Existing Plans:	Drainage Plans

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 18: Mitigation Actions

Orange County County-Wide (2) – Action #15	
Proposed Action:	Require fire departments be notified of new business applications for fire plans. Encourage single-family residents to have fire escape plans. Encourage public to evaluate access routes for fire department on their property.
BACKGROUND INFORMATION	
Jurisdiction/Location:	All participating jurisdictions
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of damages and injury from wildfire through increased communication, coordination, and collaboration between owners, local and county officials, fire prevention crews or officials to address risk, existing mitigation measures in place, and enhanced federal assistance.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Wildfire
Effect on New/Existing Buildings:	Reduce risk to existing and future structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$100,000
Potential Funding Sources:	Operating budgets, local funding, PDM, HMGP, USFS grants
Lead Agency/Department Responsible:	Local Fire Districts
Implementation Schedule:	Within 12 months of plan adoption pending available funding
Incorporation into Existing Plans:	CWPP, Emergency Response Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 5; and Environmentally Sound = 5

Section 18: Mitigation Actions

Orange County County-Wide (3) – Action #16	
Proposed Action:	Have adequate electronic signage at major intersections around the county and cities and secondary signage to deploy in neighborhoods when the planning area is under a burn ban or under threat of severe weather event.
BACKGROUND INFORMATION	
Jurisdiction/Location:	All participating jurisdictions
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce damages to structure and infrastructure through early warning, education and preparedness.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind, Wildfire, Drought, Winter Storm, Tornado, Lightning, Hail, Dam Failure
Effect on New/Existing Buildings:	Reduce risk to existing and future structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$2,500,000
Potential Funding Sources:	Operating budgets, local funding, PDM, HMGP
Lead Agency/Department Responsible:	Orange County OEM, Orange County Road and Bridge, Local Fire Departments, Water Control District
Implementation Schedule:	Within 12 months of plan adoption pending available funding
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

Orange County County-Wide (4) – Action #17	
Proposed Action:	All hazard education programs including: presentations at schools, neighborhood watch groups, various civic groups, and special risk groups; publish articles in local newspapers; distribute pamphlets on various hazards to the Sheriff's office, police stations, courthouses, administrative buildings, water control district offices. Water Control district will provide materials and presentations to employees.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Community-wide, All participating jurisdictions
Risk Reduction Benefit (Current Cost/Losses Avoided):	Risk reduction through education programs to mitigate damages and protect lives.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind, Winter Storm, Wildfire, Tornado, Lightning, Extreme Heat, Hail, Dam Failure, Drought
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$250,000 - \$2,000,000
Potential Funding Sources:	Operating budgets, local funding, PDM, HMGP
Lead Agency/Department Responsible:	Orange County OEM, Local Emergency Managers
Implementation Schedule:	Within 12 months of plan adoption pending available funding
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

Section 18: Mitigation Actions

Orange County County-Wide (5) – Action #18	
Proposed Action:	Develop and implement water conservation ordinances to be used during times of drought.
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide, all participating jurisdictions
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce water usage during drought through water conservation regulations.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$1,000
Potential Funding Sources:	Operating budgets, local funding, PDM, HMGP
Lead Agency/Department Responsible:	County and City Administration
Implementation Schedule:	Within 48 months of plan adoption pending available funding
Incorporation into Existing Plans:	Local Ordinances

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 4; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5</p>

Section 18: Mitigation Actions

Orange County County-Wide (6) – Action #19	
Proposed Action:	Acquisition and/or demolition, elevation, or mitigation reconstruction of repetitive loss structures. Acquired land will be cleared and held as open space in perpetuity and will be used for the benefit of the community. Enhanced floodplain management program (NFIP) and reduce damages through mitigation of repetitive loss properties.
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide, all participating jurisdictions – repetitive loss structures
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce or eliminate flood risk to repetitive loss properties through mitigation measures including acquisition, elevation or reconstruction.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	TBD by site and measure
Potential Funding Sources:	PDM, HMGP, FMA, CDBG and other funding as available
Lead Agency/Department Responsible:	Local Public Works and Emergency Managers
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Comprehensive Plans

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 3; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 5

Section 18: Mitigation Actions

Orange County County-Wide (7) – Action #20	
Proposed Action:	Install ignition-resistant roofing materials at all critical facilities in or near the Wildland Urban Interface (WUI).
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide, all participating jurisdictions – critical facilities in or near the WUI
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce or eliminate wildfire threat to critical facilities.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Wildfire
Effect on New/Existing Buildings:	Reduce risk to new and existing structures
Priority (High, Moderate, Low):	Low
Estimated Cost:	TBD per site
Potential Funding Sources:	Local funding, HMGP, Texas Forestry Service
Lead Agency/Department Responsible:	Local Fire Department, Public Works
Implementation Schedule:	Within 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	CWPP

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

Orange County County-Wide (8) – Action #21	
Proposed Action:	Trim trees around power lines to prevent power outages during winter storm events.
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide, all participating jurisdictions
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of damages or injury caused by downed power lines and power outages.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Winter Storm
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	Low
Estimated Cost:	TBD
Potential Funding Sources:	Local budgets, HMGP
Lead Agency/Department Responsible:	Local Public Works
Implementation Schedule:	Within 48 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 3; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 18: Mitigation Actions

Orange County County-Wide (9) – Action #22	
Proposed Action:	Install lightning/surge protection on critical facilities/equipment for protection.
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide, all participating jurisdictions – critical facilities
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of lightning damage to critical facilities and ensures continuity of services.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Lightning
Effect on New/Existing Buildings:	Reduce risk to new and existing critical facilities
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$1,000 per site
Potential Funding Sources:	Local budgets, HMGP
Lead Agency/Department Responsible:	Local Public Works
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan, Comprehensive Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 18: Mitigation Actions

Orange County County-Wide (10) – Action #23	
Proposed Action:	Install canopy covers in public parks or areas of mass gatherings for shade and relief from heat during extreme temperatures.
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide, all participating jurisdictions – public parks or areas of mass gatherings
Risk Reduction Benefit (Current Cost/Losses Avoided):	Protect health of citizens by providing shaded areas in public parks.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Extreme Heat
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$25,000 per site
Potential Funding Sources:	HMGP, Local budgets
Lead Agency/Department Responsible:	Local Public Works
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	Comprehensive Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 18: Mitigation Actions

Orange County County-Wide (11) – Action #24	
Proposed Action:	Install Hail resistant materials at public buildings with an emphasis on critical facilities.
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide, all participating jurisdictions – public buildings and critical facilities
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of hail damage to public buildings and critical facilities.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Hail
Effect on New/Existing Buildings:	Reduce risk to new and existing structures
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	TBD per site
Potential Funding Sources:	Local budgets, HMGP
Lead Agency/Department Responsible:	Local Public Works
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan, Comprehensive Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

Orange County County-Wide (12) – Action #25	
Proposed Action:	Install rainwater harvesting systems at public buildings to water landscaping or groundwater recharge.
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide, all participating jurisdictions
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce water use at public buildings and benefit groundwater recharge.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Natural System Protection

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought
Effect on New/Existing Buildings:	Reduce impacts of drought on new and existing structures
Priority (High, Moderate, Low):	Low
Estimated Cost:	TBD per site
Potential Funding Sources:	Texas Water Development Board, Region M Water Planning Group, HMGP, Local budgets
Lead Agency/Department Responsible:	Local Public Works
Implementation Schedule:	Within 48 months of plan adoption
Incorporation into Existing Plans:	Comprehensive Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 18: Mitigation Actions

Orange County County-Wide (13) – Action #26	
Proposed Action:	Adopt newer building codes that include wind engineering measures/wind resistant construction practices.
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide, all participating jurisdictions
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk to structures and infrastructure through stronger, wind-resistant construction techniques.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Tornado, Thunderstorm Wind, Hurricane
Effect on New/Existing Buildings:	Reduce risk to new structures
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$5,000
Potential Funding Sources:	Local budgets
Lead Agency/Department Responsible:	Local Code Enforcement
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	Local Building Codes

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 18: Mitigation Actions

Orange County County-Wide (14) – Action #27	
Proposed Action:	Retrofit critical facilities using wind engineering measures such as structural bracing, roof straps and clips, laminated or impact resistant glass, and reinforced doors.
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide, all participating jurisdictions – critical facilities
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of damages to critical facilities and ensure continuity of emergency services and emergency response.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Tornado, Thunderstorm Wind, Hurricane
Effect on New/Existing Buildings:	Reduce risk to new and existing structures
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	TBD per site
Potential Funding Sources:	Local budgets, HMGP
Lead Agency/Department Responsible:	Local Public Works
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 18: Mitigation Actions

Orange County Water Control District #1 (1) – Action #28	
Proposed Action:	Provide generators and hardwire connections to all Orange County Water Control District well sites and lift station sites.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Alamo Lift Station – Mission Street, Vidor, TX 77662
Risk Reduction Benefit (Current Cost/Losses Avoided):	To continue wastewater service to the public during emergencies and to prevent overflows of sanitary sewer into ditches and waterways.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind, Winter Storm, Wildfire, Tornado, Lightning, Extreme Heat, Hail, Dam Failure
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$152,500
Potential Funding Sources:	Operating budgets, HMGP, PDM, other grants as available
Lead Agency/Department Responsible:	Orange County OEM, City of Vidor OEM, Orange County WCID#1
Implementation Schedule:	Within 12 months of plan adoption pending available funding
Incorporation into Existing Plans:	Drainage Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

Orange County Water Control District #1 (2) – Action #29	
Proposed Action:	Digitize all water district records.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Orange County Water Control District Office
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce loss of records in case of power outages due to floods, hurricanes, etc.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind, Winter Storm, Lightning, Hail, Tornado
Effect on New/Existing Buildings:	Secures records against total loss
Priority (High, Moderate, Low):	High
Estimated Cost:	\$50,000
Potential Funding Sources:	Operating budgets, HMGP, PDM, other grants as available
Lead Agency/Department Responsible:	Orange County OEM, City of Vidor OEM, Orange County WCID#1
Implementation Schedule:	Within 12 months of plan adoption pending funding
Incorporation into Existing Plans:	Operations Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 3; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 5

Section 18: Mitigation Actions

Orange County Water Control District #1 (3) – Action #30	
Proposed Action:	Provide generators and hardwired quick connections to all Orange County Water Control District well sites and lift stations.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Oaklane Lower Lift Station – 640 Oaklane, Vidor, Texas 77662
Risk Reduction Benefit (Current Cost/Losses Avoided):	To continue wastewater service to the public during emergencies and to prevent overflows of sanitary sewer into ditches and waterways.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind, Winter Storm, Wildfire, Tornado, Lightning, Extreme Heat, Hail, Dam Failure
Effect on New/Existing Buildings:	Provide power to existing facilities within the Water District's responsibilities
Priority (High, Moderate, Low):	High
Estimated Cost:	\$152,500
Potential Funding Sources:	Operating budgets, HMGP, PDM, other grants as available
Lead Agency/Department Responsible:	Orange County OEM, City of Vidor OEM, Orange County WCID#1
Implementation Schedule:	Within 12 months of plan adoption pending available funding
Incorporation into Existing Plans:	N/A

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

Orange County Water Control District #1 (4) – Action #31	
Proposed Action:	Retrofit Water District building with storm shutters or laminate film that can resist damage due to flying debris. Also retrofit and strengthen roofs on critical facilities.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Administrative Office, 460 E. Bolivar, Vidor, TX 77612 Warehouse, 460 E. Bolivar, Vidor, TX 77612 WWTP Offices, 640 Oak Lane, Vidor, TX 77612
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce damages to buildings and property due to high winds, flying debris, etc.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Hurricane, Thunderstorm Wind, Tornado, Hail
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$100,000
Potential Funding Sources:	Operating budgets, TDA, PDM, HMGP, other grants as available
Lead Agency/Department Responsible:	Orange County OEM, City of Vidor OEM, Orange County WCID#1
Implementation Schedule:	Within 12 months of plan adoption pending funding
Incorporation into Existing Plans:	Operation Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

Orange County Water Control District #1 (5) – Action #32	
Proposed Action:	Provide generators and hardwired quick connections to all Orange County Water Control District well sties and lift station sites.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Well Site #4, 2474 Caney Creek, Vidor, Texas 77662
Risk Reduction Benefit (Current Cost/Losses Avoided):	To reduce loss of water supply in case of power outages due to floods, hurricanes, etc. Increase availability of water supply to the public and to fight fire and other emergencies during times of power outages.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind, Winter Storm, Wildfire, Tornado, Lightning, Extreme Heat, Hail, Dam Failure
Effect on New/Existing Buildings:	Provide power to existing facilities within the Water District's responsibilities
Priority (High, Moderate, Low):	High
Estimated Cost:	\$225,000
Potential Funding Sources:	Operating budgets, HMGP, PDM, other grants as available
Lead Agency/Department Responsible:	Orange County OEM, City of Vidor OEM, Orange County WCID#1
Implementation Schedule:	Within 12 months of plan adoption pending funding
Incorporation into Existing Plans:	Operations Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

Orange County Water Control District #1 (6) – Action #33	
Proposed Action:	Provide generators and hardwired quick connections to all Orange County Water Control District well sites and lift station sites.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Well Site #7, 3845 Highway 12, Vidor, Texas 77662
Risk Reduction Benefit (Current Cost/Losses Avoided):	To reduce loss of water supply in case of power outages due to floods, hurricanes, etc. Increase availability of water supply to the public and to fight fire and other emergencies during times of power outages.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind, Winter Storm, Wildfire, Tornado, Lightning, Extreme Heat, Hail, Dam Failure
Effect on New/Existing Buildings:	Provide power to existing facilities within the Water District's responsibilities
Priority (High, Moderate, Low):	High
Estimated Cost:	\$305,000
Potential Funding Sources:	Operating budgets, HMGP, PDM, other grants as available
Lead Agency/Department Responsible:	Orange County OEM, City of Vidor OEM, Orange County WCID#1
Implementation Schedule:	Within 12 months of plan adoption pending funding
Incorporation into Existing Plans:	Operation Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

Orange County Water Control District #1 (7) – Action #34	
Proposed Action:	Provide generators and hardwired quick connections to all Orange County Water Control District well sites and lift station sites.
BACKGROUND INFORMATION	
Jurisdiction/Location:	West Davis Lift Station, 790 W. Davis Loop, Vidor, Texas 77662
Risk Reduction Benefit (Current Cost/Losses Avoided):	To continue wastewater service to the public during emergencies and to prevent overflows of sanitary sewer into ditches and waterways.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind, Winter Storm, Wildfire, Tornado, Lightning, Extreme Heat, Hail, Dam Failure
Effect on New/Existing Buildings:	Provide power to existing facilities within the Water District's responsibilities
Priority (High, Moderate, Low):	High
Estimated Cost:	\$165,000
Potential Funding Sources:	Operating budgets, HMGP, PDM, other grants as available
Lead Agency/Department Responsible:	Orange County OEM, City of Vidor OEM, Orange County WCID#1
Implementation Schedule:	Within 12 months of plan adoption pending funding
Incorporation into Existing Plans:	Operations Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of Bridge City

City of Bridge City – Action #1	
Proposed Action:	Build Levee around Sewer Plant.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Bridge City Sewer Plant 297 Bower, Bridge City, Texas N30 02.392 W093 49.112
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce or eliminate inundation of local sewer plant and contamination of flood waters during a flood event.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Hurricane, Flood, Thunderstorm Wind
Effect on New/Existing Buildings:	Reduce flooding at existing facilities
Priority (High, Moderate, Low):	High
Estimated Cost:	\$400,000
Potential Funding Sources:	Operating budgets, local funding, PDM, HMGP, TDA, GLO
Lead Agency/Department Responsible:	Bridge City Public Works
Implementation Schedule:	Within 12 months of plan adoption pending available funding
Incorporation into Existing Plans:	Comprehensive Plan, Drainage Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of Bridge City – Action #2	
Proposed Action:	Build retention pond for Sewer Plant.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Bridge City Sewer Plant 297 Bower, Bridge City, Texas N30 02.392 W093 49.112
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce or eliminate inundation of local sewer plant and contamination of flood waters during a flood event.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Hurricane, Flood, Thunderstorm Wind
Effect on New/Existing Buildings:	Reduce flooding at existing facilities
Priority (High, Moderate, Low):	High
Estimated Cost:	\$1,400,000
Potential Funding Sources:	Operating budgets, local funding, PDM, HMGP, TDA, GLO
Lead Agency/Department Responsible:	Bridge City Public Works
Implementation Schedule:	Within 12 months of plan adoption pending available funding
Incorporation into Existing Plans:	Comprehensive Plan, Drainage Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of Bridge City – Action #3	
Proposed Action:	Retrofit six (6) lift stations to prevent inundation and ensure function during flood events.
BACKGROUND INFORMATION	
Jurisdiction/Location:	<ul style="list-style-type: none"> • 1040 Sharp, Bridge City, Texas (N30 01.128 W093 49.071) • 1051 Sabine, Bridge City, Texas (N30 01.189 W 093 49.195) • 202 Bradford, Bridge City, Texas (N30 02.616 W093 51.726) • 1199 Arthur, Bridge City, Texas (N30 02.388 W093 51,293) • 106 Mockingbird, Bridge City, Texas (N30 02.617 W093 49.747) • 1400 Turner Ext, Bridge City, Texas (N30 02.561 W093 50.219)
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce threat of flooding through protection of lift station. Reduce damages at lift stations and reduce area flooding and flood water contamination through continuity of operations.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Hurricane, Flood, Thunderstorm Wind
Effect on New/Existing Buildings:	Reduce flooding at existing facilities
Priority (High, Moderate, Low):	High
Estimated Cost:	\$600,000
Potential Funding Sources:	Operating budgets, local funding, PDM, HMGP, TDA, GLO
Lead Agency/Department Responsible:	Bridge City Public Works
Implementation Schedule:	Within 12 months of plan adoption pending available funding
Incorporation into Existing Plans:	Drainage Plan

COMMENTS

Section 18: Mitigation Actions

Additional Considerations:

The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)

Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of Bridge City – Action #4	
Proposed Action:	Purchase three (3) generators for lift stations and hardwire quick generator connections at each location.
BACKGROUND INFORMATION	
Jurisdiction/Location:	202 Bradford, Bridge City, Texas (N30 02.616 W093 51.726) 1199 Arthur, Bridge City, Texas (N30 02.388 W093 51.293) 3600 Blk. Hwy 1442, Bridge City, Texas (N30 02.490 W093 53.505)
Risk Reduction Benefit (Current Cost/Losses Avoided):	Provide power for lift stations during power outages and prevent or reduce potential damages due to flooding and sewage backup.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Hurricane, Flood, Thunderstorm Wind
Effect on New/Existing Buildings:	Reduce flooding and sewage backup at existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$60,000
Potential Funding Sources:	Operating budgets, local funding, PDM, HMGP, TDA, GLO
Lead Agency/Department Responsible:	Bridge City Public Works
Implementation Schedule:	Within 12 months of plan adoption pending available funding
Incorporation into Existing Plans:	Drainage Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of Bridge City – Action #5	
Proposed Action:	Purchase generator for new Police Department and hardwire quick generator connections.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Bridge City Police Department 119 Rachal Ave., Bridge City, Texas
Risk Reduction Benefit (Current Cost/Losses Avoided):	Provide power to Police Department during power outages and ensure continuity of emergency services.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Hurricane, Flood, Thunderstorm Wind, Winter Storm, Wildfire, Tornado, Lightning, Extreme Heat, Hail, Dam Failure
Effect on New/Existing Buildings:	Reduce risk to existing facilities
Priority (High, Moderate, Low):	High
Estimated Cost:	\$50,000
Potential Funding Sources:	Operating budgets, funding from SETRPC-911
Lead Agency/Department Responsible:	Bridge City Public Works, Emergency Management
Implementation Schedule:	Within 12 months of plan adoption pending available funding
Incorporation into Existing Plans:	Emergency Operations Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of Bridge City – Action #6	
Proposed Action:	Upgrade Sewer Lines to prevent infiltration of storm water runoff.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Keep storm water runoff from getting into the sewer system.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce infiltration of sewer lines
Priority (High, Moderate, Low):	High
Estimated Cost:	\$100,000 yearly
Potential Funding Sources:	Operating budgets, TDA, GLO, PDM, HMGP
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	Within 12 months of plan adoption pending available funding
Incorporation into Existing Plans:	Drainage Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 4; Technically Feasible = 5; Administratively Possible = 3; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 18: Mitigation Actions

City of Bridge City – Action #7	
Proposed Action:	Digitize all City Department and Police Department Records.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Records stored at all locations for the City and Police Department
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce loss of records in case of flooding, fire, hurricanes, etc.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Hurricane, Flood, Thunderstorm Wind, Wildfire
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$205,000
Potential Funding Sources:	Operating budgets, TDA, GLO, PDM, HMGP
Lead Agency/Department Responsible:	Emergency Management, Administration
Implementation Schedule:	Within 12 to 24 months of plan adoption pending funding
Incorporation into Existing Plans:	N/A

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 3; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 5

Section 18: Mitigation Actions

City of Bridge City – Action #8	
Proposed Action:	Acquisition and/or demolition, elevation, or mitigation reconstruction of repetitive loss properties. Property acquired through acquisition will remain as open space for perpetuity and will be used for the benefit of the community.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide repetitive loss properties
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce or eliminate flood risk to repetitive loss structures through mitigation measures including acquisition, elevation, or reconstruction.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane
Effect on New/Existing Buildings:	Eliminate risk to existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$150,000
Potential Funding Sources:	PDM, HMGP, FMA
Lead Agency/Department Responsible:	Bridge City Administration
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Comprehensive Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 3; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 5

Section 18: Mitigation Actions

City of Orange

City of Orange – Action #1	
Proposed Action:	Improve and enlarge the drainage ditch and culverts along Coopers Gully.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Coopers Gully area
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce flood risk to structures and infrastructure through improved drainage.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Eliminate risk to existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$3,500,000
Potential Funding Sources:	PDM, HMGP, FMA
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Master Drainage Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 4; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 5; and Environmentally Sound = 4</p>

Section 18: Mitigation Actions

City of Orange – Action #2	
Proposed Action:	Harden city buildings to withstand the effects of potential hazard events. Hardening features may include but is not limited to wind rated roofing systems, wind rated window systems, wind or flood rated door systems, flood proofing systems, hail resistant materials, and fire resistant materials.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City Hall, Fire Station #2, Link Street water plan office building, Jackson Street waste water treatment plan office building, alternate EOC on Meeks Drive
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of damage to critical public structures from multiple hazards through improved construction materials.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind, Wildfire, Tornado, Hail
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$3,500,000
Potential Funding Sources:	PDM, HMGP, FMA
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of Orange – Action #3	
Proposed Action:	Install emergency electrical generators with hardwire generator quick connections and emergency mechanical bypass pumps at major waste water lift stations. The mechanical bypass pumps should have 6” suction and a 4’ discharge and have the capability of pumping with high head pressure and include all associated hose and fittings. Install emergency electrical generators with hardwire generator quick connections at critical facilities.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Roselawn lift station, Sikes Road lift station, MLK & Hwy 87 lift station, Barkins Street lift station, City Hall, other critical facilities as deemed necessary
Risk Reduction Benefit (Current Cost/Losses Avoided):	Maintain wastewater system function during a hazard event and prevent inundation and potential contamination.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind, Winter Storm, Wildfire, Tornado, Lightning, Extreme Heat, Hail, Dam Failure
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$750,000
Potential Funding Sources:	PDM, HMGP, Operating budget, local funding
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of Orange – Action #4	
Proposed Action:	Enlarge existing underground storm water lines and install sluice gates at two outfall lines to Sabine River in the Old Town area.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce flood risk through improved storm drainage capacity.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$1,500,000
Potential Funding Sources:	PDM, HMGP, Operating budget, local funding
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Drainage Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 3; Administratively Possible = 3; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of Orange – Action #5	
Proposed Action:	Acquisition/demolition, elevation, or mitigation reconstruction of repetitive loss structures. Acquired land will be cleared and held as open space in perpetuity and will be used for the benefit of the community.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide repetitive loss structures
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce or eliminate flood risk to repetitive loss properties through mitigation measures including acquisition, elevation, or reconstruction.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$1,000,000
Potential Funding Sources:	PDM, HMGP, FMA, Operating budget, local funding
Lead Agency/Department Responsible:	City of Orange Administration
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Comprehensive Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 3; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of Orange – Action #6	
Proposed Action:	Complete drainage study to improve drainage in the general area between the railroad tracks and 8th Street and Highway IH-10 and Link Street. Implement cost effective improvements identified in the study.
BACKGROUND INFORMATION	
Jurisdiction/Location:	8 th Street, IH-10, and Link Street
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce flood damage to structures and infrastructure in the area through improved drainage capacity.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$500,000 - \$1,000,000
Potential Funding Sources:	PDM, HMGP, Operating budget, local funding
Lead Agency/Department Responsible:	City of Orange Public Works
Implementation Schedule:	Within 48 to 60 months of plan adoption pending available funding
Incorporation into Existing Plans:	Master Drainage Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of Orange – Action #7	
Proposed Action:	Complete drainage study to improve drainage in the general area between the railroad tracks and Simmons Drive, and Front Street and Link Street. Implement cost effective improvements identified in the study.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Simmons Drive, Front Street, and Link Street
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce flood damage to structures and infrastructure in the area through improved drainage capacity.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$500,000 - \$1,000,000
Potential Funding Sources:	PDM, HMGP, Operating budget, local funding
Lead Agency/Department Responsible:	City of Orange Public Works
Implementation Schedule:	Within 48 to 60 months of plan adoption pending available funding
Incorporation into Existing Plans:	Master Drainage Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of Orange – Action #8	
Proposed Action:	Digitize all City Department Records
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce loss of records in case of flooding, fire, hurricanes, rising water, etc.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind, Wildfire
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$175,000
Potential Funding Sources:	PDM, HMGP, TDA, GLO, Operating budget
Lead Agency/Department Responsible:	City of Orange Administration
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	N/A

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 3; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 5</p>

Section 18: Mitigation Actions

City of Pine Forest

City of Pine Forest – Action #1	
Proposed Action:	Retrofit and install permanent storm shutters on the Pine Forest Municipal Building and install emergency power supply with hardwired quick connections.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Pine Forest Municipal Building
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce potential damage to municipal building and provide continuity of services.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Hurricane, Thunderstorm Wind, Tornado, Hail, Winter Storm, Wildfire, Lightning, Extreme Heat, Dam Failure
Effect on New/Existing Buildings:	Reduce risk to existing structure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$80,000
Potential Funding Sources:	PDM, HMGP, Operating budget, local funding
Lead Agency/Department Responsible:	Pine Forest Administration and Orange County OEM
Implementation Schedule:	Within 12 months of plan adoption pending available funding
Incorporation into Existing Plans:	N/A

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of Pine Forest – Action #2	
Proposed Action:	Install outdoor warning siren for Pine Forest.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk to citizens and property through early warning.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Hurricane, Flood, Thunderstorm Wind, Tornado, Hail, Wildfire, Dam Failure
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$100,000 - \$200,000
Potential Funding Sources:	PDM, HMGP, Operating budget, local funding
Lead Agency/Department Responsible:	Pine Forest Administration and Orange County OEM
Implementation Schedule:	Within 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of Pine Forest – Action #3	
Proposed Action:	Digitize all City Department Records.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce loss of records in case of flooding, fire, hurricanes, rising water, etc.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind, Wildfire
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$15,000
Potential Funding Sources:	PDM, HMGP, TDA, GLO, Operating budget
Lead Agency/Department Responsible:	Pine Forest Administration
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	N/A

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 3; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 5</p>

Section 18: Mitigation Actions

City of Pinehurst

City of Pinehurst – Action #1	
Proposed Action:	Increase the size of the existing drainage ditches and culverts from 40 th Street through Swallow Street, under a designated state highway (Hwy 3247) into existing drainage into Whippoorwill Street.
BACKGROUND INFORMATION	
Jurisdiction/Location:	40 th Street through Swallow Street
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of flood in project area through increased drainage capacity.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$650,000
Potential Funding Sources:	PDM, HMGP, FMA
Lead Agency/Department Responsible:	Pinehurst Administration
Implementation Schedule:	Within 12 to 24 months of plan adopting pending available funding
Incorporation into Existing Plans:	Drainage Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of Pinehurst – Action #2	
Proposed Action:	Engineer and implement a plan to increase and redirect storm water drainage from 35th Street through Pheasant Street to 33rd Street.
BACKGROUND INFORMATION	
Jurisdiction/Location:	35 th Street through Pheasant Street to 33 rd Street
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of flood in project area through increased drainage capacity.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$650,000
Potential Funding Sources:	PDM, HMGP, FMA
Lead Agency/Department Responsible:	Pinehurst Administration
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Drainage Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of Pinehurst – Action #3	
Proposed Action:	Engineer and implement a plan to upgrade existing drainage and to connect to improved drainage on 35th Street and reroute it under Raven Street at the intersection of Harding and Raven and continuing to 33rd Street.
BACKGROUND INFORMATION	
Jurisdiction/Location:	35 th Street through Harding and Raven Street to 33 rd Street
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of flood in project area through increased drainage capacity.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$650,000
Potential Funding Sources:	PDM, HMGP, FMA
Lead Agency/Department Responsible:	Pinehurst Administration
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Drainage Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of Pinehurst – Action #4	
Proposed Action:	Engineer and implement a plan to upgrade existing drainage ditches and culverts on Enchanted Oaks Street from its intersection at Shadow Wood to the intersection of Somerset Street.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Enchanted Oaks Street from its intersection at Shadow Wood to the intersection of Somerset Street
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of flood in project area through increased drainage capacity.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$650,000
Potential Funding Sources:	PDM, HMGP, FMA
Lead Agency/Department Responsible:	Pinehurst Administration
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Drainage Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of Pinehurst – Action #5	
Proposed Action:	Acquisition/demolition, elevation, or mitigation reconstruction of repetitive loss structures. Acquired land will be cleared and held as open space in perpetuity and will be used for the benefit of the community.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide repetitive loss structure
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce or eliminate flood risk to repetitive loss properties through mitigation measures including acquisition, elevation or reconstruction.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$700,000
Potential Funding Sources:	PDM, HMGP, FMA
Lead Agency/Department Responsible:	City of Pinehurst Public Works
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Comprehensive Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 3; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 5

Section 18: Mitigation Actions

City of Pinehurst – Action #6	
Proposed Action:	Implement a plan to upgrade existing drainage ditches and culverts and redirect storm water runoff from the 3500 block of West Park Avenue to Adams Bayou.
BACKGROUND INFORMATION	
Jurisdiction/Location:	3500 block of West Park Avenue to Adams Bayou
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk to flood in project area through increased/improved drainage capacity.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$650,000
Potential Funding Sources:	PDM, HMGP, FMA
Lead Agency/Department Responsible:	Pinehurst Administration
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Drainage Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of Pinehurst – Action #7	
Proposed Action:	Elevate Del Sasso lift station wet well and electrical control height to above record flood elevation and install elevated generator with hardwired quick connection.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Del Sasso lift station
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of damage to lift station and ensure continuity of operations.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind, Winter Storm, Wildfire, Tornado, Lightning, Extreme Heat, Hail, Dam Failure
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$225,000
Potential Funding Sources:	PDM, HMGP, FMA, Operating budget
Lead Agency/Department Responsible:	Pinehurst Administration
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Drainage Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of Pinehurst – Action #8	
Proposed Action:	Public structure strengthening/hardening of city government offices and police/public safety facility at 2497 MLK Jr. Drive with mechanical storm shutters.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City government offices and police/public safety facility at 2497 MLK Jr. Drive
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of damages to critical facility through protection of building envelope.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Hurricane, Thunderstorm Wind, Tornado, Hail
Effect on New/Existing Buildings:	Reduce risk to existing structure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$100,000
Potential Funding Sources:	PDM, HMGP, Operating budget
Lead Agency/Department Responsible:	Pinehurst Administration
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of Pinehurst – Action #9	
Proposed Action:	Elevate Broad Street lift station wet well and electrical control height to above record flood elevation and install elevated generator with hardwired quick connection.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Broad Street lift station
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of damage to lift station and ensure continuity of operations.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind, Winter Storm, Wildfire, Tornado, Lightning, Extreme Heat, Hail, Dam Failure
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$155,000
Potential Funding Sources:	PDM, HMGP, Operating Budget
Lead Agency/Department Responsible:	Pinehurst Administration
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Drainage Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of Pinehurst – Action #10	
Proposed Action:	Elevate 33 rd Street lift station wet well and electrical control height to above record flood elevation and install elevated generator with hardwired quick connection.
BACKGROUND INFORMATION	
Jurisdiction/Location:	33 rd Street lift station
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of damage to lift station and ensure continuity of operations.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind, Winter Storm, Wildfire, Tornado, Lightning, Extreme Heat, Hail, Dam Failure
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$180,000
Potential Funding Sources:	PDM, HMGP, Operating budget
Lead Agency/Department Responsible:	Pinehurst Administration
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Drainage Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of Pinehurst – Action #11	
Proposed Action:	Digitize all City Department Records
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce loss of records in case of flooding, fire, hurricanes, rising water, etc.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind, Wildfire
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$75,000
Potential Funding Sources:	PDM, HMGP, TDA, GLO, Operating budget
Lead Agency/Department Responsible:	Pinehurst Administration
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	N/A

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 3; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 5</p>

Section 18: Mitigation Actions

City of Rose City

City of Rose City – Action #1	
Proposed Action:	Retrofit public critical facilities with permanent storm shutters.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Rose City Municipal Building and other critical facilities
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of damage to critical facilities with storm shutter protection.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Hurricane, Thunderstorm Wind, Tornado, Hail
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$150,000
Potential Funding Sources:	PDM, HMGP, Operating budget
Lead Agency/Department Responsible:	Rose City Administration and Orange County OEM
Implementation Schedule:	Within 12 months of plan adoption pending available funding
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 18: Mitigation Actions

City of Rose City – Action #2	
Proposed Action:	Install auxiliary power supply and hardwired quick generator connections on two Rose City water system locations at 370 Rose City Drive and Flamingo Street to ensure continuity of operations during hazard events.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Rose City water system locations
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of damage to critical facilities with redundant power and to ensure continuity of operations during hazard events.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind, Winter Storm, Wildfire, Tornado, Lightning, Extreme Heat, Hail, Dam Failure
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$200,000
Potential Funding Sources:	PDM, HMGP, Operating budget
Lead Agency/Department Responsible:	Rose City Administration and Orange County OEM
Implementation Schedule:	Within 12 months of plan adoption pending available funding
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of Rose City – Action #3	
Proposed Action:	Digitize all City Department Records.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce loss of records in case of flooding, fire, hurricanes, rising water, etc.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind, Wildfire
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$50,000
Potential Funding Sources:	PDM, HMGP, TDA, GLO, Operating Budget
Lead Agency/Department Responsible:	Rose City Administration
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	N/A

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 3; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 5</p>

Section 18: Mitigation Actions

City of Vidor

City of Vidor – Action #1	
Proposed Action:	Install enhanced security entrances and perimeter entrances for Police Department building and gate/fenced area of parking lot and air conditioning/generator area.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Police Department
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of damage to critical facility with additional security measures.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Terrorism
Effect on New/Existing Buildings:	Reduce risk to existing structure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$250,000
Potential Funding Sources:	Operating budget, local funding
Lead Agency/Department Responsible:	Vidor EMC, Police Chief
Implementation Schedule:	Within 12 months of plan adoption pending available funding
Incorporation into Existing Plans:	Anti-Terrorism

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of Vidor – Action #2	
Proposed Action:	Install enhanced security entrances and perimeter entrances for City Hall.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City Hall
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of damage to critical facility with additional security measures.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Terrorism, Hazardous Materials
Effect on New/Existing Buildings:	Reduce risk to existing structure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$250,000
Potential Funding Sources:	Operating budget, local funding
Lead Agency/Department Responsible:	Vidor EMC, Police Chief
Implementation Schedule:	Within 12 months of plan adoption pending available funding
Incorporation into Existing Plans:	Anti-Terrorism

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of Vidor – Action #3	
Proposed Action:	Acquisition and/or demolition, elevation, or mitigation reconstruction of repetitive loss structures. Acquired land will be cleared and held as open space in perpetuity and will be used for the benefit of the community.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide repetitive loss structures
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce or eliminate flood risk to repetitive loss properties through mitigation measures including acquisition, elevation or reconstruction.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$150,000
Potential Funding Sources:	PDM, HMGP, FMA
Lead Agency/Department Responsible:	City of Vidor Administration
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Comprehensive Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 3; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 5</p>

Section 18: Mitigation Actions

City of Vidor – Action #4	
Proposed Action:	Harden Vidor Fire Station.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Fire Station
Risk Reduction Benefit (Current Cost/Losses Avoided):	Ensure continuity of emergency services and reduce threat of damages to fire station through retrofit/hardening of building envelope.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Hurricane, Thunderstorm Wind, Tornado, Hail
Effect on New/Existing Buildings:	Reduce risk to existing structure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$500,000
Potential Funding Sources:	PDM, HMGP
Lead Agency/Department Responsible:	City of Vidor Public Works
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 18: Mitigation Actions

City of Vidor – Action #5	
Proposed Action:	Purchase and install generator and hardwire quick connection at Vidor ISD police station.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Vidor ISD police station
Risk Reduction Benefit (Current Cost/Losses Avoided):	Ensure continuity of emergency services and reduce threat of damages to police station.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind, Winter Storm, Wildfire, Tornado, Lightning, Extreme Heat, Hail, Dam Failure
Effect on New/Existing Buildings:	Reduce risk to existing structure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$30,000
Potential Funding Sources:	PDM, HMGP
Lead Agency/Department Responsible:	City of Vidor Public Works
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of Vidor – Action #6	
Proposed Action:	Purchase and distribute portable radios for the Vidor ISD police department, district offices, and campuses for emergency management.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Vidor ISD locations
Risk Reduction Benefit (Current Cost/Losses Avoided):	Protect employees and students of Vidor ISD through early warning and communication.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind, Winter Storm, Wildfire, Tornado, Lightning, Extreme Heat, Hail, Dam Failure, Drought
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$40,000
Potential Funding Sources:	PDM, HMGP
Lead Agency/Department Responsible:	City of Vidor Public Works
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of Vidor – Action #7	
Proposed Action:	Provide emergency kits to ISD's with student information, ICS organizational charts and Command Boards, snacks, and instructional/educational material for evacuation during disasters.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Vidor ISD locations
Risk Reduction Benefit (Current Cost/Losses Avoided):	Protect employees and students of Vidor ISD through preparation and emergency preparedness.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind, Tornado, Hail, Winter Storm, Dam Failure, Wildfire
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$50,000
Potential Funding Sources:	PDM, HMGP
Lead Agency/Department Responsible:	City of Vidor EMC, Vidor ISD
Implementation Schedule:	Within 12 months of plan adoption pending available funding
Incorporation into Existing Plans:	Emergency Management Plan, ISD Procedures

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 5

Section 18: Mitigation Actions

City of Vidor – Action #8	
Proposed Action:	Provide generators and hardwired quick connections for the Vidor ISD Transportation Barns. These structures are normally used for maintenance of school busses. However, during disaster events, these transportation hubs are used for fuel for first responders such as the Vidor Police Department, Vidor ISD, Pine Forest, Fire Departments, Sheriff's Deputies and EMS.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Vidor ISD Transportation Barns
Risk Reduction Benefit (Current Cost/Losses Avoided):	Provide continuity of emergency services during disaster events.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind, Winter Storm, Wildfire, Tornado, Lightning, Extreme Heat, Hail, Dam Failure
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$100,000
Potential Funding Sources:	PDM, HMGP
Lead Agency/Department Responsible:	City of Vidor EMC, Vidor ISD
Implementation Schedule:	Within 12 months of plan adoption pending available funding
Incorporation into Existing Plans:	Emergency Management Plan, ISD Procedures

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of Vidor – Action #9	
Proposed Action:	Make FEMA publications (ICC Coverage, floodplain maps, Mitigation Ideas, etc.) readily available to the citizens by having them at the public library, lobbies of city hall, public works, municipal court, and police and fire departments.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Public library, lobbies of city hall, public works, municipal court, and police and fire departments
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of damages and injury through education of citizens.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind, Tornado, Hail, Winter Storm, Dam Failure, Wildfire, Lightning, Extreme Heat, Drought, Hazardous Materials, Water Contamination
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$5,000
Potential Funding Sources:	PDM, HMGP, Operating budget, local funding
Lead Agency/Department Responsible:	City of Vidor EMC, Local Red Cross Chapter, Salvation Amy, Orange County Emergency Management
Implementation Schedule:	Within 48 months of plan adoption pending available funding
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 5

Section 18: Mitigation Actions

City of Vidor – Action #10	
Proposed Action:	Digitize all City Department Records
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce loss of records in case of flooding, fire, hurricanes, rising water, etc.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind, Wildfire
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$125,000
Potential Funding Sources:	PDM, HMGP, TDA, GLO, Operating budget
Lead Agency/Department Responsible:	Vidor City Administration
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	N/A

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 3; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 5

Section 18: Mitigation Actions

City of Vidor – Action #11	
Proposed Action:	Retrofit City Hall, Police Department, Maintenance buildings with storm shutters or laminate film that can resist damage from flying debris. Also retrofit and strengthen roofs on critical facilities.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City of Vidor City Hall, Vidor Police Department, Vidor Maintenance Buildings, Library
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce damages to buildings and property due to high winds, flying debris, etc.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind, Tornado, Hail
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$150,000
Potential Funding Sources:	PDM, HMGP, TDA, Operating budget
Lead Agency/Department Responsible:	Vidor Administration, Emergency Management
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of Vidor – Action #12	
Proposed Action:	<p>Improve drainage and reduce flooding in the upper reaches of Anderson Gully. The upper reaches of Anderson Gully are centrally located in Vidor, Texas. The Gully then flows in a generally southwest direction toward the Neches River. The area of concern include flood prone areas within the City limits lying in the Anderson Gully drainage basin. Phase I of the project will include surveying, field observations, development of a Hydrologic and Hydraulic (H&H) model for the entire reach of Anderson Gully and the development of recommendations and Benefit/Cost Analyses for basin improvements. This model will serve as the Anderson Gully Drainage Basin Study and is expected to evaluate and include, but not be limited to, Gully crossing upgrades, detention/ retention facilities, and channel improvements as necessary to cost effectively address 100 year flooding in the basin. Phase II of the project will utilize information developed in the Anderson Gully Drainage Basin Study and will focus on crossing replacements or upgrades. This phase will include the engineering design and acquisition of properties necessary for the replacement or upgrading of crossings deemed undersized through the work performed in Phase I of the project. Phase III will include the bidding, administration of contracts and construction of identified crossings. This project will serve to mitigate the impacts to traditionally flood-prone areas with recurring repetitive losses, City infrastructure damage and downstream environmental impacts due to overbank flooding.</p>
BACKGROUND INFORMATION	
Jurisdiction/Location:	Anderson Gully
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce flood damages through improved drainage.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

Section 18: Mitigation Actions

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind
Effect on New/Existing Buildings:	Reduce risk to existing and future structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$12,000,000
Potential Funding Sources:	PDM, HMGP, TDA, Operating Budget
Lead Agency/Department Responsible:	Vidor OEM, Engineer, Street and Drainage Department, Orange County Drainage Department, Approved Contractor
Implementation Schedule:	Start within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Master Drainage Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 18: Mitigation Actions

City of Vidor – Action #13	
Proposed Action:	<p>Improve drainage and reduce flooding in the upper reaches of Anderson Gully. The upper reaches of Anderson Gully are centrally located in Vidor, Texas. The Gully then flows in a generally southwest direction and ultimately discharges to the Neches River. The area of concern include flood prone areas within the City limits lying in the Anderson Gully drainage basin. This project will include two phases. Phase I will include utilizing information developed in the Anderson Gully Drainage Basin Study and will focus on engineering design and acquisition for channel improvements, detention/retention ponds facilities or other elements recommended by the Drainage Basin Study to alleviate flooding and flooding impacts. Phase II will include the bidding, administration of contracts and construction of improvements. This project will serve to further mitigate the impacts of severe rain events in traditionally flood-prone areas with recurring repetitive loses, City infrastructure damage and downstream environmental impacts due to overbank flooding. Project will strive to integrate stream corridor restoration as part of the channel improvements and develop possible secondary uses for detention facilities.</p>
BACKGROUND INFORMATION	
Jurisdiction/Location:	Anderson Gully
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce flood damages through improved drainage.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

Section 18: Mitigation Actions

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind
Effect on New/Existing Buildings:	Reduce risk to existing and future structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$11,000,000
Potential Funding Sources:	PDM, HMGP, TDA, Operating budget
Lead Agency/Department Responsible:	Vidor OEM, Engineer, Street and Drainage Department, Orange County Drainage Department, Approved Contractor
Implementation Schedule:	Start within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Master Drainage Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 18: Mitigation Actions

City of Vidor – Action #14	
Proposed Action:	<p>Improve drainage and reduce flooding in the upper reaches of Terry Gully located on the eastern side of Vidor. The areas of concern include the Terry Gully Sub-Basins identified as “Terry A” and “Terry B” in the 2002 Cow Bayou Watershed Study which generally includes the reach from the proposed Terry B Basin northeast to the headwaters of Terry Gully. The Project may be expected to include new detention/retention facilities, channel widening, and increased size of originally proposed storm water detention ponds as outlined by the 2002 Cow Bayou Study or other possible drainage improvements. To determine the best mitigating course of action, the project will include surveying, field observations and review of the existing Cow Bayou Study Hydrologic and Hydraulic (H&H) model and modification of the model to update to current conditions. The Project will mitigate the impact of severe rain events in traditionally flood-prone areas with recurring repetitive losses and City infrastructure flooding. Implement as phased project that incorporates surveying and data collection, H&H study, and BCA as Phase I, and actual construction as Phase II.</p>
BACKGROUND INFORMATION	
Jurisdiction/Location:	Terry Gully
Risk Reduction Benefit (<i>Current Cost/Losses Avoided</i>):	Reduce flood damages through improved drainage.
Type of Action (<i>Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness</i>)	Structure and Infrastructure

Section 18: Mitigation Actions

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind
Effect on New/Existing Buildings:	Reduce risk to existing and future structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$6,000,000
Potential Funding Sources:	PDM, HMGP, TDA, Operating budget
Lead Agency/Department Responsible:	Vidor OEM, Engineer, Street and Drainage Department, Orange County Drainage Department, Approved Contractor
Implementation Schedule:	Start within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Master Drainage Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 18: Mitigation Actions

City of Vidor – Action #15	
Proposed Action:	Replace existing School House Ditch crossing structure at Old Spanish Trail to mitigate/prevent potential structure failure due to heavy flooding and hurricane events. This activity will include reviewing and utilizing flow information developed in the School House Ditch Drainage Study for hydrologic and hydraulic information, surveying, collection of geotechnical information and developing engineering plans and specifications for the structure replacement structure. This action item will include bidding, project management and construction of proposed engineered structure.
BACKGROUND INFORMATION	
Jurisdiction/Location:	School House Ditch crossing structure at Old Spanish Trail
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce flood damages through improved drainage.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$800,000
Potential Funding Sources:	PDM, HMGP, TWDB, Operating budget
Lead Agency/Department Responsible:	Vidor OEM, Engineer, Street and Drainage Department, Orange County Drainage Department, Approved Contractor
Implementation Schedule:	Start within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Master Drainage Plan

COMMENTS

Section 18: Mitigation Actions

Additional Considerations:

The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)

Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of Vidor – Action #16	
Proposed Action:	Replace undersized drainage facilities in Orange Street draining into School House Ditch on the east side of the Ditch serving the Vidor Independent School District facilities. The project will mitigate/prevent documented public structure flooding, damage to safety issues related to school Children access to school facilities and public facilities damage due to high standing water during and after heavy flooding rain events. This activity will include reviewing and utilizing existing Hydrologic and Hydraulic information developed in the School House Ditch Drainage Study, performance of topographic survey, collection of geotechnical information and the engineering for the development of plans and specifications for drainage structure replacement. This action item will include bidding, project management, and construction of proposed drainage facilities. Due to the location of the undersized drainage facilities, this project will also include the replacement of the road surface from School House Ditch to approximately Woodland Street.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Orange Street
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce flood damages through improved drainage.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

Section 18: Mitigation Actions

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$950,000
Potential Funding Sources:	PDM, HMGP, TWDB, Operating budget
Lead Agency/Department Responsible:	Vidor OEM, Engineer, Street and Drainage Department, Orange County Drainage Department, Approved Contractor
Implementation Schedule:	Start within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Master Drainage Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 18: Mitigation Actions

City of Vidor – Action #17	
Proposed Action:	Develop or adopt existing Orange County Drainage Criteria and update residential and commercial development ordinances to help to prevent localized drainage and flooding issues.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce flood damages through more stringent building requirements.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane
Effect on New/Existing Buildings:	Reduce risk to existing and future structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$45,000
Potential Funding Sources:	PDM, HMGP, TWDB, Operating budget, local funding
Lead Agency/Department Responsible:	Vidor OEM, Engineer, Street and Drainage Department, Orange County Drainage Department, Approved Contractor
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Local Ordinance, Building Codes

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 5

Section 18: Mitigation Actions

City of Vidor – Action #18	
Proposed Action:	Upgrade the School House Ditch Crossing at Alamo Street to protect the bridge structure from continued erosion during flooding events. This project will include the permanent stabilization of the ditch bottom and banks under the Alamo Street bridge crossing at School House Ditch. This project will include the removal of the eroded and unstable earthen and concrete ditch bottom and sides, reshaping and placement of fill and construction of new concrete lining system to protect the bridge structure. This project will include Corps of Engineers permitting, geotechnical study, engineering design, bidding and construction activities.
BACKGROUND INFORMATION	
Jurisdiction/Location:	School House Ditch crossing at Alamo Street
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce flood damages through improved drainage. Mitigate potential structure failure of the Alamo Street Bridge during heavy rain events affecting public safety and emergency access to residential areas. Mitigate economic losses to damage to Public infrastructure.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$175,000
Potential Funding Sources:	PDM, HMGP, TWDB, Operating Budget
Lead Agency/Department Responsible:	Vidor Public Works
Implementation Schedule:	Start within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Master Drainage Plan

COMMENTS

Section 18: Mitigation Actions

Additional Considerations:

The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)

Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of West Orange

City of West Orange – Action #1	
Proposed Action:	Perform public structure strengthening on city government offices including high wind load roof, storm shutters for exterior, non-permeable exterior walls, generator with hardwired quick connections, and fold down alternate site antenna.
BACKGROUND INFORMATION	
Jurisdiction/Location:	2700 Western Avenue
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of damages to public building through building envelope protection.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind, Winter Storm, Wildfire, Tornado, Lightning, Extreme Heat, Hail, Dam Failure
Effect on New/Existing Buildings:	Reduce risk to existing structure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$250,000
Potential Funding Sources:	PDM, HMGP, Operating budget
Lead Agency/Department Responsible:	City of West Orange Administration
Implementation Schedule:	Within 12 months of plan adoption pending available funding
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of West Orange – Action #2	
Proposed Action:	Perform public structure strengthening on Police/Public Safety EOC including high wind load hail resistant roof, storm shutters for exterior, non-permeable exterior walls, and high wind resistant radio tower antenna.
BACKGROUND INFORMATION	
Jurisdiction/Location:	2700 Austin Avenue
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of damages to public building through building envelope protection.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind, Tornado, Hail
Effect on New/Existing Buildings:	Reduce risk to existing structure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$200,000
Potential Funding Sources:	PMD, HMGP, Operating budget
Lead Agency/Department Responsible:	City of West Orange Administration
Implementation Schedule:	Within 12 months of plan adoption pending available funding
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 18: Mitigation Actions

City of West Orange – Action #3	
Proposed Action:	Perform public structure strengthening on Utility (Sewer/Water) Offices including high wind load hail resistant roof, storm shutters for exterior, generator power supply and hardwire quick connections.
BACKGROUND INFORMATION	
Jurisdiction/Location:	2600 Wester Avenue
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of damages to public building through building envelope protection.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind, Winter Storm, Wildfire, Tornado, Lightning, Extreme Heat, Hail, Dam Failure
Effect on New/Existing Buildings:	Reduce risk to existing structure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$150,000
Potential Funding Sources:	PDM, HMGP, Operating budget
Lead Agency/Department Responsible:	City of West Orange Administration
Implementation Schedule:	Within 12 months of plan adoption pending available funding
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of West Orange – Action #4	
Proposed Action:	Install alternate power supply (generator) at the Water Pump Facility with hardwired quick connection.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Williams Drive Station
Risk Reduction Benefit (Current Cost/Losses Avoided):	Continuity of service through redundant power supply.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind, Winter Storm, Wildfire, Tornado, Lightning, Extreme Heat, Hail, Dam Failure
Effect on New/Existing Buildings:	Reduce risk to existing structure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$75,000
Potential Funding Sources:	PDM, HMGP, Operating budget, State funding
Lead Agency/Department Responsible:	City of West Orange Administration
Implementation Schedule:	Within 12 months of plan adoption pending available funding
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of West Orange – Action #5	
Proposed Action:	Install alternate power supply (generator) and hardwired quick connections at ten (10) lift stations throughout the City of West Orange.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Various locations throughout the city
Risk Reduction Benefit (Current Cost/Losses Avoided):	Continuity of service through redundant power supply.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind, Winter Storm, Wildfire, Tornado, Lightning, Extreme Heat, Hail, Dam Failure
Effect on New/Existing Buildings:	Reduce risk to existing structure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$120,000
Potential Funding Sources:	PDM, HMGP, Operating budget, State funding
Lead Agency/Department Responsible:	City of West Orange Administration
Implementation Schedule:	Within 12 months of plan adoption pending available funding
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of West Orange – Action #6	
Proposed Action:	Renovate a room inside the police department to harden and secure the city's radio, telephone, communication, and computer equipment to withstand high wind events to protect from damage and provide continuity of emergency services.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Police Department
Risk Reduction Benefit (Current Cost/Losses Avoided):	Continuity of service and protection of equipment through retrofit of facilities.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Hurricane, Thunderstorm Wind, Tornado, Hail, Flood, Lightning
Effect on New/Existing Buildings:	Reduce risk to existing structure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$20,000
Potential Funding Sources:	PDM, HMGP, Operating budget
Lead Agency/Department Responsible:	City of West Orange Administration
Implementation Schedule:	Within 12 months of plan adoption pending available funding
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of West Orange – Action #7	
Proposed Action:	Acquisition/demolition, elevation, or mitigation reconstruction of repetitive loss structures. Acquired land will be cleared and held as open space in perpetuity and will be used for the benefit of the community.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide repetitive loss structures
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce or eliminate flood risk to repetitive loss properties through mitigation measures including acquisition, elevation or reconstruction.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$150,000
Potential Funding Sources:	PDM, HMGP, FMA
Lead Agency/Department Responsible:	City of West Orange Administration
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Comprehensive Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 3; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 5</p>

Section 18: Mitigation Actions

City of West Orange – Action #8	
Proposed Action:	Contract to have a special study to analyze current storm water system and develop storm water management plan and a flood damage reduction study. Implement cost effective drainage solutions identified in the study.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce or eliminate flood risk throughout the city through improved drainage.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure; Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to existing and future structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$250,000 - \$1,000,000
Potential Funding Sources:	PDM, HMGP, State funding, local funding, Operating budget
Lead Agency/Department Responsible:	City of West Orange Administration
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Master Drainage Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of West Orange – Action #9	
Proposed Action:	Upgrade the bridge and raise the streets on Newton Street and Adams Bayou Lateral #1.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Newton Street and Adams Bayou Lateral #1
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce or eliminate flood risk throughout the city through improved drainage.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to existing and future structure and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$120,000
Potential Funding Sources:	PDM, HMGP, State funding, local funding, Operating budget
Lead Agency/Department Responsible:	City of West Orange Administration
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Master Drainage Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 18: Mitigation Actions

City of West Orange – Action #10	
Proposed Action:	Upgrade the bridge and raise the streets on Lansing Street and Adams Bayou Lateral #1.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Lansing Street and Adams Bayou Lateral #1
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce or eliminate flood risk throughout the city through improved drainage.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to existing and future structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$120,000
Potential Funding Sources:	PDM, HMGP, State funding, local funding, Operating budget
Lead Agency/Department Responsible:	City of West Orange Administration
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Master Drainage Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 18: Mitigation Actions

City of West Orange – Action #11	
Proposed Action:	Extend Irving Street north to connect with MacArthur Drive to improve evacuation and emergency vehicle access and response times.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Irving Street
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk to citizens through additional egress route for emergency services and evacuation.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Thunderstorm Wind, Hail, Tornado, Hurricane, Dam Failure, Wildfire
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$2,500,000
Potential Funding Sources:	PDM, HMGP, State funding, Operating budget
Lead Agency/Department Responsible:	City of West Orange Administration
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	Emergency Response Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

Section 18: Mitigation Actions

City of West Orange – Action #12	
Proposed Action:	Digitize all City Department records.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce loss of records in case of flooding, fire, hurricane, rising water, etc.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Thunderstorm Wind, Wildfire
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$125,000
Potential Funding Sources:	PDM, HMGP, TDA, Operating budget
Lead Agency/Department Responsible:	City of West Orange Administration
Implementation Schedule:	Within 12 to 24 months of plan adoption pending available funding
Incorporation into Existing Plans:	N/A

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 3; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 5</p>

Section 19: Plan Maintenance

Plan Maintenance Procedures	1
Incorporation	1
Process of Incorporation.....	1
Monitoring and Evaluation.....	3
Monitoring.....	4
Evaluation.....	4
Updating.....	4
Plan Amendments	4
Five (5) Year Review	5
Continued Public Involvement.....	5

Plan Maintenance Procedures

The following is an explanation of how Orange County, participating jurisdictions, and the general public will be involved in implementing, evaluating, and enhancing the Plan over time. The sustained hazard mitigation planning process consists of four main parts:

- Incorporation
- Monitoring and Evaluation
- Updating
- Continued Public Involvement

Incorporation

Orange County and participating jurisdictions will be responsible for further development and implementation of mitigation actions. Each action has been assigned to a specific department within the County and participating jurisdictions. The following describes the process by which Orange County will incorporate elements of the mitigation plan into other planning mechanisms.

Process of Incorporation

Once the Plan is adopted, Orange County and participating jurisdictions will implement actions based on priority and the availability of funding. The County currently implements policies and programs to reduce loss to life and property from hazards. The mitigation actions developed for this Plan Update enhance this ongoing effort and will be implemented through other program mechanisms where possible.

The potential funding sources listed for each identified action may be used when the jurisdiction seeks funds to implement actions. An implementation time period or a specific implementation date has been assigned to each action as an incentive for completing each task and gauging whether actions are implemented in a timely manner.

Orange County and participating jurisdictions will integrate implementation of their mitigation actions with other plans and policies such as construction standards and emergency management plans, and

Section 19: Plan Maintenance

ensure that these actions, or proposed projects, are reflected in other planning efforts. Coordinating and integrating components of other plans and policies into goals and objectives of the Plan will further maximize funding and provide possible cost-sharing of key projects, thereby reducing loss of lives and property, and mitigating hazards affecting the area.

Upon formal adoption of the Plan Update, planning team members from each participating jurisdiction will work to integrate the hazard mitigation strategies into other plans and codes, as they are developed. Participating team members will conduct periodic review of plans and policies, once per year at a minimum, and analyze the need for amendments in light of the approved Plan Update. The planning team will review all comprehensive land use plans, capital improvement plans, annual budget reviews, emergency operations or management plans, transportation plans, and any building codes to guide and control development. Participating jurisdictions will ensure that capital improvement planning in the future will also contribute to the goals of this hazard mitigation Plan Update to reduce the long-term risk to life and property from all hazards. Within one year of formal adoption of the hazard mitigation Plan Update, existing planning mechanisms will be reviewed by each jurisdiction.

Orange County is committed to supporting the cities, communities, and participating jurisdictions as they implement their mitigation actions. Orange County and participating planning team members will review and revise, as necessary, the long-range goals and objectives in strategic plan and budgets to ensure that they are consistent with this mitigation action plan. Additionally, the County will work to advance the goals of this hazard mitigation plan through its routine, ongoing, long-range planning, budgeting, and work processes.

Table 19.1 – Methods of Incorporation of the Plan

Planning Mechanism	Department/Title Responsible	Incorporation of Plan
Grant Applications	Orange County: EMC Bridge City: EMC City of Orange: EMC Pine Forest: EMC Pinehurst: EMC Rose City: City Secretary Vidor: EMC West Orange: EMC	The Plan Update will be evaluated by Orange County and participating jurisdictions when grant funding is sought for mitigation projects. If a project is not in the Plan Update, an amendment may be necessary to include the action in the Plan Update.
Annual Budget Review	Orange County: EMC Bridge City: EMC City of Orange: EMC Pine Forest: EMC Pinehurst: EMC Rose City: City Secretary Vidor: EMC West Orange: EMC	Various departments and key personnel that participated in the planning process for Orange County and participating jurisdictions will review the Plan Update and mitigation actions therein when conducting their annual budget review. Allowances will be made in accordance with grant applications sought, and mitigation actions that will be undertaken, according to the

Section 19: Plan Maintenance

Planning Mechanism	Department/Title Responsible	Incorporation of Plan
		implementation schedule of the specific action.
Regulatory Plans	Orange County: EMC Bridge City: EMC City of Orange: EMC Pine Forest: EMC Pinehurst: EMC Rose City: City Secretary Vidor: EMC West Orange: EMC	Currently, Orange County and participating jurisdictions have regulatory plans in place, such as Emergency Management Plans, Continuity of Operations Plans, Economic Development, and Evacuation Plans. The Plan Update will be consulted when County and City departments review or revise their current regulatory planning mechanisms, or in the development of regulatory plans that are not currently in place.
Capital Improvement Plans	Bridge City: EMC West Orange: EMC	A few participating jurisdictions have a Capital Improvement Plan (CIP) in place. Prior to any revisions to the CIP, County and City departments will review the risk assessment and mitigation strategy sections of the HMAP, as limiting public spending in hazardous zones is one of the most effective long-term mitigation actions available to local governments.
Floodplain Management Plans	Orange County: Floodplain Manager Bridge City: Floodplain Manager City of Orange: Floodplain Manager Pine Forest: Floodplain Manager Pinehurst: Floodplain Manager Rose City: Floodplain Manager Vidor: Floodplain Manager West Orange: Floodplain Manager	Floodplain management plans include preventative and corrective actions to address the flood hazard. Therefore, the actions for flooding, and information found in Section 5 of this Plan Update discussing the people and property at risk to flood, will be reviewed and revised when Orange County updates their management plans or develops new plans.

Monitoring and Evaluation

Periodic revisions of the Plan Update are required to ensure that goals, objectives, and mitigation actions are kept current. Revisions may be required to ensure the Plan Update is in compliance with federal and state statutes and regulations. This section outlines the procedures for completing Plan revisions, updates, and review. Table 19-2 indicates the department and title of the party responsible for Plan monitoring, updating, and review of the Plan.

Section 19: Plan Maintenance

Table 19-2. Team Members Responsible for Plan Monitoring, Updating and Review of the Plan

JURISDICTION	TITLE
Orange County	Emergency Management Coordinator
Bridge City	Emergency Management Coordinator
City of Orange	Deputy Chief / Emergency Management Coordinator
Pine Forest	Emergency Management Coordinator
Pinehurst	Emergency Management Coordinator
Rose City	City Secretary
Vidor	Emergency Management Coordinator
West Orange	Emergency Management Coordinator

Monitoring

Designated Planning Team members are responsible for monitoring, updating, and reviewing the Plan Update, as shown in Table 19-2. Individuals holding the title listed in Table 19-2 will be responsible for monitoring the Plan Update on an annual basis. Plan monitoring, includes reviewing and incorporation into the Plan other existing planning mechanisms that relate or support goals and objectives of the Plan; monitoring the incorporation of the Plan into future updates of other existing planning mechanisms as appropriate; reviewing mitigation actions submitted and coordinating with various County and City departments to determine if mitigation actions need to be re-evaluated and updated; evaluating and updating the Plan as necessary; and monitoring plan maintenance to ensure that the process described is being followed, on an annual basis, throughout the planning process. The Planning Team will develop a brief report that identifies if changes to the Plan Update are needed, such as recommending an action for funding. A summary of meeting notes will report the particulars involved in developing an action into a project.

Evaluation

As part of the evaluation process, the Planning Team will assess changes in risk; determine whether the implementation of mitigation actions is on schedule; determine whether there are any implementation problems, such as technical, political, legal, or coordination issues; and identify changes in land development or programs that affect mitigation priorities for each respective department or organization.

The Planning Team will meet on an annual basis to evaluate the Plan and identify any needed changes. The annual evaluation process will help to determine if any changes are necessary.

Updating

Plan Amendments

At any time, minor technical changes may be made to update the Orange County Hazard Mitigation Plan Update. Material changes to mitigation actions or major changes in the overall direction of the

Section 19: Plan Maintenance

Plan Update or the policies contained within it, must be subject to formal adoption by the County and participating jurisdictions.

The County will review proposed amendments and vote to accept, reject, or amend the proposed change. Upon ratification, the amendment will be transmitted to TDEM.

In determining whether to recommend approval or denial of a Plan Update amendment request, the County will consider the following factors:

- Errors or omissions made in the identification of issues or needs during the preparation of the Plan Update;
- New issues or needs that were not adequately addressed in the Plan Update; and
- Changes in information, data, or assumptions from those on which the Plan Update was based.

Five (5) Year Review

The Plan will be thoroughly reviewed by the Planning Team at the end of three years from the approval date, to determine whether there have been significant changes in the planning area that necessitate changes in the types of mitigation actions proposed. Factors that may affect the content of the Plan include new development in identified hazard areas, increased exposure to hazards, disaster declarations, increase or decrease in capability to address hazards, and changes to federal or state legislation.

The Plan review process provides the County and participating jurisdictions an opportunity to evaluate mitigation actions that have been successful, identify losses avoided due to the implementation of specific mitigation measures, and address mitigation actions that may not have been successfully implemented as assigned.

It is recommended that the full Advisory Planning Team (Section 2, Table 2-2) meet to review the Plan at the end of three years because grant funds may be necessary for the development of a five-year update. Reviewing planning grant options in advance of the five-year Plan update deadline is recommended considering the timelines for grant and planning cycles can be in excess of a year.

Following the Plan review, any revisions deemed necessary will be summarized and implemented according to the reporting procedures and Plan amendment process outlined herein. Upon completion of the review, update, and amendment process the revised Plan will be submitted to TDEM for final review and approval in coordination with FEMA.

Continued Public Involvement

Public input was an integral part of the preparation of this Plan and will continue to be essential for Plan updates. The Public will be directly involved in the annual review and cyclical updates. Changes or suggestions to improve or update the Plan will provide opportunities for additional public input.

The public can review the Plan Update on Orange County's website as well as the participating jurisdiction's websites, where officials and the public are invited to provide ongoing feedback, as phone numbers and/or emails will be provided on the websites.

- Orange County: www.co.orange.tx.us/OCOEM 409-745-9717 (EMC)
- Bridge City: www.bridgecitytex.com 409-735-6801 (Captain)
- City of Orange: www.orangetexas.net 409-883-1050 (Deputy Chief)

Section 19: Plan Maintenance

- Pine Forest: www.co.orange.tx.us/OCOEM 409-745-9717 (EMC)
- Pinehurst: www.cityofpinehursttexas.com 409-886-2221 (Chief)
- Rose City: www.co.orange.tx.us/OCOEM 409-745-9717 (EMC)
- Vidor: www.cityofvidor.com 409-238-6448 (Sergeant)
- West Orange: www.cityofwestorange.com 409-883-7574 (Chief)

Additionally, hard copies of the Plan Update will be kept at the following locations:

- Orange County Office of Emergency Management
- Bridge City Public Library
- City of Orange Public Library
- Pine Forest City Hall
- Pinehurst City Hall
- Rose City City Hall
- Vidor Public Library
- West Orange City Hall

The Planning Team may also designate voluntary citizens from the County, or willing stakeholder members from the private sector businesses that were involved in the Plan's development to provide feedback on an annual basis. It is important that stakeholders and the immediate community maintain a vested interest in preserving the functionality of the planning area as it pertains to the overall goals of the mitigation plan. The Planning team is responsible for notifying stakeholders and community members on an annual basis, and maintaining the Plan.

Media, including local newspaper and radio stations, will be used to notify the public of any maintenance or periodic review activities during the implementation, monitoring, and evaluation phases. Additionally, local news media will be contacted to cover information regarding Plan updates, status of grant applications, and project implementation. Local and social media outlets, such as Facebook and Twitter, will keep the public and stakeholders apprised of potential opportunities to fund and implement mitigation projects identified in the Plan Update.

Appendix A: Low Risk and Manmade Hazards

Overview	1
Study Area Definition	2
Hazard Profiles, Vulnerability, and Impact.....	2
Geologic Hazard.....	3
Tsunami.....	4
Earthquake	4
Water Contamination.....	6
Hazard Profile.....	6
Location	7
Extent	7
Previous Occurrences	7
Probability of Future Events.....	7
Vulnerability and Impact	7
Hazardous Materials Incident (Fixed and Mobile).....	7
Hazard Profile.....	7
Location	8
Extent	9
Previous Occurrences	10
Probability of Future Events.....	10
Vulnerability and Impact	10
Terrorism	10
Hazard Profile.....	10
Location	11
Extent	11
Previous Occurrences	12
Probability of Future Events.....	12
Vulnerability and Impact	12

Overview

During the early stages of the planning process the team analyzed several natural hazards that were considered low risk. These hazards include Earthquake, Tsunami, and Geologic Hazards. In addition, the team reviewed technological hazards including Hazardous Material Incidents, Terrorism, and Water Contamination. A description of the hazard and Orange County’s overall vulnerability to that

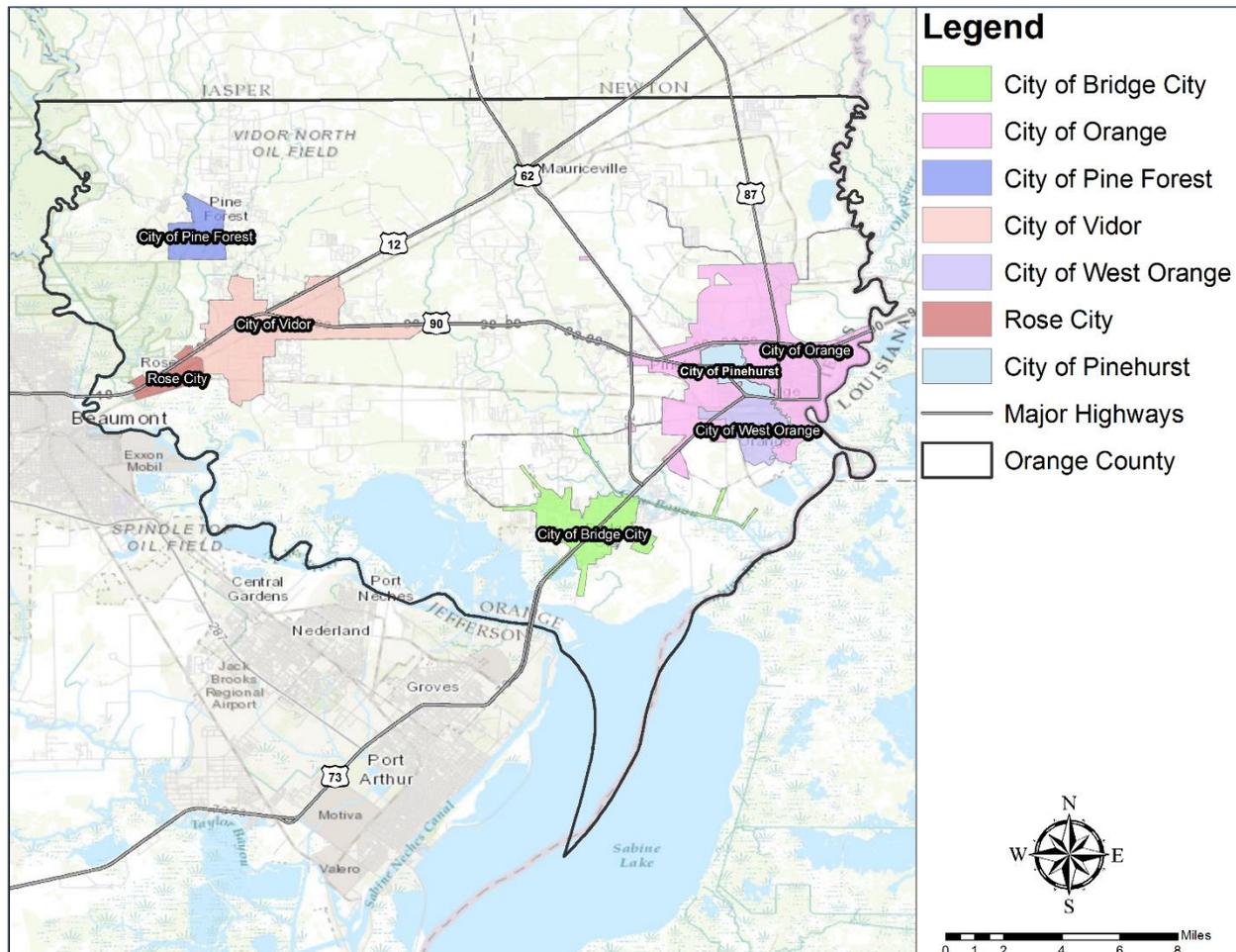
Appendix A: Low Risk and Manmade Hazards

hazard was developed. Annualized loss data is provided where available and impact is addressed looking at the warning time or potential speed of onset of the hazard.

Study Area Definition

All areas of Orange County and participating jurisdictions are included. Figure A-1 shows the study area for the Orange County HMAP Update.

Figure A-1. Orange County Study Area



Hazard Profiles, Vulnerability, and Impact

Each low risk natural hazard includes a description of the hazard and a summary of the planning area's risk. For each of the three technological hazards, a description of the hazard and Orange County's overall vulnerability to that hazard was developed. Impact is addressed looking at the warning time or potential speed of onset of the hazard. Impact statements are defined in Table A-1 below.

Appendix A: Low Risk and Manmade Hazards

Table A-1. Impact Statements

POTENTIAL SEVERITY	DESCRIPTION
Substantial	Multiple deaths. Complete shutdown of facilities for 30 days or more. More than 50 percent of property destroyed or with major damage.
Major	Injuries and illnesses resulting in permanent disability. Complete shutdown of critical facilities for at least two weeks. More than 25 percent of property destroyed or with major damage.
Minor	Injuries and illnesses do not result in permanent disability. Complete shutdown of critical facilities for more than one week. More than 10 percent of property destroyed or with major damage.
Limited	Injuries and illnesses are treatable with first aid. Shutdown of critical facilities and services for 24 hours or less. Less than 10 percent of property destroyed or with major damage.

The term, “technological hazards,” refers to the origins of incidents that can arise from human activities such as (for the purposes of this risk assessment) the use of gas and oil pipeline and their manufacture, transportation, and storage. The use of hazardous materials across all industries is a technological hazard, as well as water contamination and acts of terrorism.

The scope of this risk assessment assumes that hazardous material incidents and water contamination events addressed in this section would be accidental in nature and that their consequences are unplanned and unintended.

Geologic Hazard

A geologic hazard is a natural geologic event that can endanger human lives and threaten property and infrastructure. While geologic hazards are by definition a natural event, they can be caused or exacerbated by human activities. For the purpose of this Hazard Mitigation Action Plan Update for Orange County, included in this hazard type are riverine erosion, landslides, and land subsidence (sinkholes). The U.S. Geological Survey (USGS) serves as the primary data and forecasting source for geologic hazards.

Riverine erosion is defined as downstream flow, shifting, or removal of sediment from a watershed. Caving river and stream banks are common associations with the migration of river channel alignment, and can threaten structures, undermine bridge foundations, and pose public safety risk.

Landslide is a general term used to describe the process of movement of material (i.e., soil, rock, mud, etc.) down a slope by falling, sliding or flowing under the force of gravity. The major causes of landslides are earthquakes, volcanic eruptions, or extreme rain events. Landslides are commonly associated with areas of steep slopes, but can also occur in relatively level topography on un-retained constructed slopes and dirt embankments. Sloughing fill material can cause property and infrastructure damage, and indirectly threaten public safety.

Land Subsidence can occur either gradually or dramatically (as in sinkhole occurrence), and refers to the loss of surface elevation due to remove of subsurface support. Land subsidence can be caused by crustal deformation; sediment compaction; withdrawal of groundwater, hydrocarbons (crude oil and

Appendix A: Low Risk and Manmade Hazards

natural gas), geothermal fluids or minerals (Sulphur); or increased surface load associated with high-rise buildings.

All three geologic hazards were researched for previous occurrences. Impacts of geologic hazards in Orange County are not widespread, and historically have been limited to minor land loss along rivers and Sabine Lake. Probability of future events is considered unlikely. Due to relatively isolated occurrence of impacts and no recorded occurrence of damages, injuries or fatalities, the hazard is considered to have a negligible impact on the planning area and is therefore considered a nuisance.

Tsunami

The National Oceanic and Atmospheric Administration (NOAA) describes a tsunami as a series of ocean waves generated by sudden displacements in the sea floor, landslides, volcanic activity or other large, abrupt disturbance of the sea-surface. Tsunamis have reached heights of more than 100 feet. As the waves approach shallow coastal waters, they appear normal and the speed decreases. If the disturbance is close to the coastline, tsunamis can demolish coastal communities within minutes, and a large disturbance can cause inundation and destruction thousands of miles away from its epicenter.

The USGS monitors earthquakes through network of seismic detectors. This information is critical to understand when a tsunami wave might be generated. The USGS and NOAA's National Ocean Service has the responsibilities for providing ocean bathymetry, coastlines and topography. The information is critical to understand how and where a tsunami wave will come ashore. NOAA research develops models that forecast tsunamis impacts and create inundation maps of modeled events. NOAA research provides the forecast models to the NOAA's Weather Service forecasters and the inundation models and maps to state and national planner and emergency managers. NOAA monitors sea height through a network of buoys and tide gauges. This information is critical to understand the height a tsunami wave may be when it comes ashore. NOAA completed the original 6-buoy operational array in 2001 and expanded to a full network of 30 stations in March 2008 which includes the Gulf of Mexico.

According to the National Oceanic and Atmospheric Administration (NOAA), since 1900, over 200 tsunami events have affected the coasts of the United States and its territories, causing more than 500 deaths. Tsunami events are well documented in the Pacific Ocean Basin. Tsunamis have also occurred in the Gulf of Mexico. In 1991, a magnitude 7.6 earthquake in Costa Rica produced a six foot high tsunami that flooded nearly 1,000 feet inland on the Caribbean side of the country. The Caribbean also has a number of active submarine volcanoes and fault systems that are capable of producing large earthquakes like that in Haiti, which could generate a tsunami. There are no recorded occurrences of tsunami impacts in Orange County.

The National Tsunami Hazard Mitigation Program produced an assessment in August 2008 that assigned a "very low" hazard classification for the U.S. Gulf Coast based on previous frequency and local earthquake probability. Probability of future events is considered unlikely. Overall vulnerability to tsunami is considered very low based on the remote potential for causal.

Earthquake

An earthquake is a sudden motion or trembling of the earth caused by an abrupt release of stored energy in the rocks beneath the earth's surface. The energy released results in vibrations known as seismic waves that are responsible for the trembling and shaking of the ground during an earthquake. Ground motion is expressed as peak ground acceleration (PGA). PGA is expressed as a percent of gravity or "g".

Appendix A: Low Risk and Manmade Hazards

Earthquakes are typically described in terms of magnitude and intensity. The traditional measurement of amplitude of the seismic wave through the assignment of a single number to quantify the amount of seismic energy released by an earthquake is the Richter scale. The intensity of how strong the shock was felt at a particular location is the Modified Mercalli Intensity (MMI) scale. The scale quantifies the effects of an earthquake on the Earth's surface, humans, objects of nature and man-made structures. Table A-2 below is a combined earthquake magnitude and intensity comparison from the United States Geological Survey.

Table A-2. Earthquake Magnitude/Intensity Comparison¹

PGA (% g)	Magnitude (Richter)	Intensity (MMI)	Description
<0.17	1.0 - 3.0	I	I. Not felt except by a very few under especially favorable conditions.
0.17 - 1.4	3.0 - 3.9	II - III	II. Felt only by a few persons at rest, especially on upper floors of buildings. III. Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
1.4 - 9.2	4.0 - 4.9	IV - V	IV. Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably. V. Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
9.2 - 34	5.0 - 5.9	VI - VII	VI. Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight. VII. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
34 - 124	6.0 - 6.9	VII - IX	VIII. Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. IX. Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
>124	7.0 and higher	VIII or higher	X. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

¹ Source: Wald, D., et al., 1999, "Relationship between Peak Ground Acceleration, Peak Ground Motion, and Modified Mercalli Intensity in California," *Earthquake Spectra*, v. 15, p. 557 – 564.

USGS Magnitude/Intensity Comparison http://earthquake.usgs.gov/learn/topics/mag_vs_int.php

Appendix A: Low Risk and Manmade Hazards

PGA (% g)	Magnitude (Richter)	Intensity (MMI)	Description
			<p>XI. Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly</p> <p>XII. Damage total. Lines of sight and level are distorted. Objects thrown into the air.</p>

There are no recorded earthquakes with epicenters in Orange County, and the planning area is roughly 250 miles from the region of recent (minor) seismic activity in Northeast Texas. The annual probability for earthquakes capable of structural damage in the planning area is considered very low. The magnitude or intensity of a potential earthquake in the planning area based on historical data is an Intensity level of I or II (Table A-2). Based on the probability of future occurrences and magnitude/severity the overall vulnerability is considered low and the hazard is considered to have a negligible impact on the planning area.

Water Contamination

Hazard Profile

Water Contamination is the introduction of point and non-point source pollutants into public ground and/or surface water supplies. Microbiological and chemical contaminants can enter water supplies. Chemicals can leach through soils from leaking underground storage tanks, feedlots and waste disposal sites. Human wastes and pesticides can also be carried into surface waters during high water events.

The Environmental Protection Agency (EPA) is the federal agency authorized to protect the environment and public health. Congress writes the laws and the President signs them into law. The EPA is a regulatory agency with the duty to prepare administrative rules and procedures on how these laws and Presidential Executive Orders will be implemented and enforced.

The Clean Water Act establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. Under the Clean Water Act, the EPA has implemented pollution control programs. The Clean Water Act made it unlawful to discharge any pollutant from a point source into navigable waters, unless a permit was obtained. The EPA's National Pollution Discharge Elimination System (NPDES) permit program controls discharges.

Further, the EPA is the federal authority to protect drinking water. The Safe Water Drinking Act was established to protect the quality of drinking water in the U.S. The law focuses on all water actually or potentially designed for drinking use, whether from above ground or underground sources. The Act authorizes the EPA to establish minimum standards to protect tap water and requires all owners or operators of public water systems to comply with these primary health related standards. (Source: EPA)

States must adopt rules that are at least as restrictive as the Clean Water Act and the Safe Water Drinking Act standards. The Texas Commission on Environmental Quality establishes State rules and regulations for public water systems and also specifies construction and operational standards for public water supply systems.

Disasters such as hurricanes and floods can disrupt drinking water supply and wastewater disposal systems. The Texas Commission on Environmental Quality provides guidance on remediation of public water supply systems after potential contamination due to natural disasters. Further the Orange County Emergency Management Plan provides guidance regarding emergency water supplies after a disaster.

Appendix A: Low Risk and Manmade Hazards

Location

Potential and ongoing water contamination is present along all waterways and in the groundwater supply. Per a 1990 report by the Texas Water Development Board, surface water supplies the majority of municipal and industrial demands, which make up the largest portion of total water use in the planning area. Ground-water needs, including all municipal requirements in Orange County, were met almost entirely from the lower Chicot Aquifer.

Extent

In general, any water contamination capable of influencing public health is severe. Accordingly, magnitude and severity of water contamination is considered substantial by the planning team, with potential public safety risks present and the potential for extended loss of function for water processing facilities. The high concentration of hazardous materials processing and shipping facilities in the planning area, low topographic gradient influencing river discharge rates and levels of dissolved oxygen, and relatively high total maximum daily load readings (TMDLs) in monitored surface water, all contribute to the magnitude and severity assessment by the HMT.

Previous Occurrences

Water contamination is occurring on an ongoing basis due to malfunctioning septic systems, affecting both ground water and surface water at various locations throughout the county not served by municipal waste water treatment facilities. Orange County is currently implementing a program to encourage and assist property owners with necessary upgrades for malfunctioning/sub-standard septic systems, funded in part by a grant from the Texas Commission on Environmental Quality (TCEQ). The invasive waterborne plant Giant Salvinia also presents water quality issues on an ongoing basis in the waterways of Orange County. Giant Salvinia slows the flow of water, raising water temperatures and contributing to elevated bacteria levels.

According to the Evaluation of Water Resources of Orange and Eastern Jefferson Counties (Texas Water Development Board, 1990), the main ground-water quality problem is elevated chloride concentrations caused by saline-water encroachment in areas of concentrated pumpage, although from the late 1970's to 1988, chloride concentrations have not changed significantly due to decreased ground-water withdrawals. Regarding surface water, Cow Bayou is noted for high levels of sediment in recent years.

Probability of Future Events

Considering ongoing problems and previous water quality monitoring results, probability of future occurrence is considered highly likely.

Vulnerability and Impact

Water contamination can have a "substantial" impact. Overall vulnerability for the planning area could result in multiple deaths during extreme contamination events.

Hazardous Materials Incident (Fixed and Mobile)

Hazard Profile

In a hazardous materials incident, solid, liquid, and/or gaseous contaminants may be released from fixed or mobile containers, although this profile focuses on fixed sites. Weather conditions will directly affect how the hazard develops.

The location of the most concentrated and potentially hazardous materials in the planning area are: fixed industrial facilities including oil and gas wells and storage facilities, pipelines, large and small industrial complexes that use or process chemicals or petroleum products, highways, and railroads. Numerous other sources are also present across the planning area, including storage areas for

Appendix A: Low Risk and Manmade Hazards

insecticides, herbicides, and fertilizers, wrecking yards, retail fueling stations, and abandoned industrial facilities. Within regard to pipeline locations, roughly one third (1/3) of the 367,000 linear miles of pipelines transporting hazardous materials in the state of Texas are located in the southeast region of the state. This concentration of pipelines in the region that includes Orange County relates to a corresponding high probability of hazardous material transport accidents.

The Toxics Release Inventory (TRI) is a publicly available database from the federal Environmental Protection Agency (EPA) that contains information on toxic chemical releases and other waste management activities reported annually by certain covered industry groups, as well as federal facilities. This inventory was established under the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) and expanded by the Pollution Prevention Act of 1990. Each year, facilities that meet certain activity thresholds must report their releases and other waste management activities for listed toxic chemicals to EPA and to their state or tribal entity. A facility must report if it meets the following three criteria:

- The facility falls within one of the following industrial categories: manufacturing; metal mining; coal mining; electric generating facilities that combust coal and/or oil; chemical wholesale distributors; petroleum terminals and bulk storage facilities; RCRA Subtitle C treatment, storage and disposal (TSD) facilities; and solvent recovery services.
- Have 10 or more full-time employee equivalents.
- Manufactures or processes more than 25,000 pounds or otherwise uses more than 10,000 pounds of any listed chemical during the calendar year. Persistent, bioaccumulative and toxic (PBT) chemicals are subject to different thresholds of 10 pounds, 100 pounds or 0.1 grams, depending on the chemical.

Tier 2 data is a publicly available database from the Texas Department of State Health Services Tier 2 Chemical Reporting Program. Under the community right-to-know program laws upheld at the state and federal level, all facilities which store significant quantities of hazardous chemicals must share this information with state and local emergency responders and planners. Facilities in Texas share this information by filing annual hazardous chemical inventories with the state, with Local Emergency Planning Committees (LEPCs) and with local fire departments. The Texas Tier 2 Reports contain facility identification information and detailed chemical data about hazardous chemicals stored at the facility.

A facility must report if it meets the following criteria:

- Any company using chemicals that could present a physical or health hazard must report them, according to Tier 2 requirements.
- If an industry has an OSHA deemed hazardous chemical that exceeds the appropriate threshold at a certain point in time, that chemical must be reported. These chemicals may be on the list of 356 Extremely Hazardous Substances (EHS) or could be one of the 650,000 reportable hazardous substances (not on the EHS list). This reporting format is for a "snapshot in time." EHS chemicals have to be reported if the quantity is either greater than 500 pounds, or if the Threshold Planning Quantity (TPQ) amount is less than 500 pounds.

Location

The locations of available TRI and Tier 2 toxic sites in the Orange County planning area are shown below in Table A-3.

Appendix A: Low Risk and Manmade Hazards

Table A-3. Toxic Sites in Orange County²

JURISDICTION	FACILITY NAME	ADDRESS	NUMBER OF CHEMICALS
ROSE CITY	TMS INTERNATIONAL LLC	100 OLD HWY 90	2
VIDOR	GERDAU AMERISTEEL BEAUMONT	100 OLD HWY 90 W	8
ORANGE	ORION ENGINEERED CARBONS ORANGE PLANT	1513 ECHO RD	10
ORANGE	INTERNATIONAL PAPER ORANGE MILL	1750 INLAND RD	10
ORANGE	CHEM32 LLC	3007 BURNETT ST	6
ORANGE	INVISTA SARL - ORANGE SITE	3055A FM 1006	25
ORANGE	GE WATER & PROCESS TECHNOLOGIES ORANGE FACILITY	3901 WILLIAMS DR	8
ORANGE	HONEYWELL INTERNATIONAL INC	3927 FARM RD 1006	4
ORANGE	SOLVAY SPECIALTY POLYMERS USA LLC	4059 FM 1006	5
ORANGE	ARLANXEO	4647 FM 1006	10
ORANGE	CHEVRON PHILLIPS CHEMICAL CO LP-ORANGE	5309 FM 1006	1
ORANGE	FIRESTONE POLYMERS LLC	5713 FM 1006	4
ORANGE	CONRAD ORANGE SHIPYARD INC	710 MARKET STREET	5
ORANGE	WEBCO INDUSTRIES INC TX DIST DIV	750 N. MARTIN LUTHER KING	5
ORANGE	WESTPORT ORANGE SHIPYARD LLC	91 W FRONT AVE	1
ORANGE	DUPONT SABINE RIVER WORKS	FARM RD 1006	51

Extent

From a hazardous materials incident, the micro-meteorological effects of the buildings and terrain can alter travel and duration of agents. Shielding in the form of sheltering-in-place can protect people and property from harmful effects. Non-compliance with fire and building codes, as well as failure to maintain existing fire and containment features can substantially increase the damage from a

² Source: EPA Toxic Release Inventory

Appendix A: Low Risk and Manmade Hazards

hazardous materials release. The duration of a hazardous materials incident can range from hours to days. Warning time for hazardous materials incidents is minimal to none.

Previous Occurrences

Hazardous materials are substances which if released or misused can cause death, serious injury, long-lasting health effects, and damage to structure and other properties as well as to the environment. Many products containing hazardous chemicals are used and stored in homes routinely. These products are also shipped daily on the nation's highways, railroads, waterways, and pipelines.

A total of 126 transportation incidents have been reported in the Orange County planning area over the last 67 years. The data collected is from 1950 to 2016 and identifies the hazardous materials transportation incidents as in-transit, loading, and unloading of transport vehicles. A summary of reported events are listed in Table A-4 below by jurisdiction.

Table A-4. Orange County Hazardous Material Incident Events, by Jurisdiction³

JURISDICTION	NUMBER OF INCIDENTS	DEATHS	INJURIES	PROPERTY AND CROP DAMAGE
Bridge City	5	0	0	\$2,719
City of Orange	98	2	2	\$394,751
Pine Forest	0	0	0	\$0
Pinehurst	0	0	0	\$0
Rose City	4	0	0	\$70,701
Vidor	15	0	0	\$263,447
West Orange	0	0	0	\$0
Orange County	4	0	0	\$4,201
TOTAL LOSSES	126	2	2	\$784,898

Probability of Future Events

Based on the historic incident records, the frequency of occurrence is highly likely and an event is probable in the next year in the Orange County planning area.

Vulnerability and Impact

Hazardous materials or toxic releases can have a "substantial" impact. Such events can cause multiple deaths, completely shut down facilities for 30 days or more, and cause more than 50 percent of affected properties to be destroyed or suffer major damage.

Terrorism

Hazard Profile

The Federal Bureau of Investigation (FBI) categorizes terrorism in the United States as one of two types—domestic terrorism or international terrorism. Domestic terrorism involves groups or individuals

³ Values are in 2016 dollars.

Appendix A: Low Risk and Manmade Hazards

whose terrorist activities are directed at elements of our government or population without foreign direction. International terrorism involves groups or individuals whose terrorist activities are foreign-based and/or directed by countries or groups outside of the United States, or whose activities transcend their national boundaries.

A terrorist attack can take several forms, depending on the technological means available to the terrorist, the nature of issue motivating the attack, and the points of weakness of the terrorist's target. Bombings are the most frequently used terrorist method in the United States. A terrorist using a chemical or biological weapon is of particular concern to officials. Special training and equipment is needed in order to safely manage a Weapons of Mass Destruction incident.

Biological agents are infectious microbes or toxins used to produce illness or death in people, animals or plants. Biological agents can be dispersed as aerosols or airborne particles. Terrorists may use biological agents to contaminate food or water, as they are extremely difficult to detect.

Chemical agents kill or incapacitate people, destroy livestock, or ravage crops. Some chemical agents are odorless and tasteless and are therefore difficult to detect. These chemical agents can have an immediate effect (a few seconds to a few minutes) or a delayed effect (several hours to several days).

The Department of Defense estimates that as many as 26 nations may possess chemical agents and/or weapons, and an additional 12 may be seeking to develop them. The Central Intelligence Agency reports that at least 10 countries are believed to possess or are currently conducting research on biological agents for weaponization.

Terrorist incidents – as with other natural and technological disasters – involve the application of one or more modes of harmful force to the built environment. These modes include contamination (as in the case of chemical, biological radiological or nuclear hazards), energy (explosives, arson, and even electromagnetic waves), or denial of service (sabotage, infrastructure breakdown, and transportation service disruption).

Location

There is no distinct geographic boundary to the threat of terrorism. An event is possible throughout the Orange County planning area.

Extent

The Homeland Security Advisory System, issued by the U. S. Department of Homeland Security, previously used a color-coded terrorism warning system that identified five threat levels. In 2011, the Department of Homeland Security (DHS) replaced the color-coded alerts of the Homeland Security Advisory System (HSAS) with the National Terrorism Advisory System (NTAS), designed to more effectively communicate information about terrorist threats by providing timely, detailed information to the American public.

NTAS now consists of two types of advisories: Bulletins and Alerts. DHS has added Bulletins to the advisory system to be able to communicate current developments or general trends regarding threats of terrorism. NTAS Bulletins permit the Secretary to communicate critical terrorism information that, while not necessarily indicative of a specific threat against the United States, can reach homeland security partners or the public quickly, thereby allowing recipients to implement necessary protective measures. Because DHS may issue NTAS Bulletins in circumstances not warranting a more specific warning, NTAS Bulletins provide the Secretary with greater flexibility to provide timely information to stakeholders and members of the public.

When there is specific, credible information about a terrorist threat against the United States, DHS will share an NTAS Alert with the American public when circumstances warrant doing so. The Alert may

Appendix A: Low Risk and Manmade Hazards

include specific information, if available, about the nature of the threat, including the geographic region, mode of transportation, or critical infrastructure potentially affected by the threat, as well as steps that individuals and communities can take to protect themselves and help prevent, mitigate or respond to the threat. The Alert may take one of two forms: Elevated, if there is credible threat information, but only general information about timing and target such that it is reasonable to recommend implementation of protective measures to thwart or mitigate against an attack, or Imminent, if the threat is believed credible, specific, and impending in the very near term. Terrorism Advisory System Alerts are described in Figure A-1.⁴

The Red Cross also issues Advisory System Recommendations for individuals, families, neighborhoods, schools and businesses for each alert level. These may be found at: www.redcross.org.

Heightened periods for terrorism risk are based on intelligence and other information. A potential terrorist event could devastate the community physically, economically and psychologically for many years to come. Warning time for terrorism is minimal to none.

Previous Occurrences

The history of terrorism on United States soil includes the attacks of September 11, 2001, on the World Trade Center in New York and the Pentagon in Washington, D.C. and the ensuing anthrax attacks; the 1995 bombing of the Murrah Federal Building in Oklahoma City; and the bombing of the World Trade Center in 1993.

Orange County has not experienced a terrorist act. While complete prevention of an attack may not be attainable, the County can lessen the likelihood and/or the potential effects of an incident. The County continues to improve its readiness to respond to a terrorist incident through participation in state and federal programs that provide training and equipment for agencies that would respond to a local terrorist incident, and in exercises that help to improve agency coordination and test local response plans.

Probability of Future Events

The types, frequencies, and locations of many natural hazards are identifiable and, even in some cases, predictable, as the laws of physics and nature govern them. Malevolence, however, cannot be forecast with any accuracy. There is, therefore, some potential for most, if not all, types of intentional terrorist acts to occur anywhere and at any time.

Vulnerability and Impact

There is no defined geographic boundary for a terrorist event. All of the population, buildings, critical facilities, infrastructure and lifelines and hazardous materials facilities are considered exposed to the hazards of terrorism and could potentially be affected.

Figure A-1. National Terrorism Advisory System



⁴ Source: Department of Homeland Security, <https://www.dhs.gov/national-terrorism-advisory-system>

Appendix A: Low Risk and Manmade Hazards

There are no past local events. Therefore, all assets and facilities are potentially at risk to damages that may, for the most part, be secondary.

Terrorist events can have a “substantial” severity of impact. They can cause multiple deaths, completely shut down facilities for 30 days or more, and cause more than 50 percent of affected properties to be destroyed or suffer major damage.

Appendix B: Planning Team

Planning Team Members 1
 Stakeholders 2

Planning Team Members

The Orange County Plan Update 2016 (Plan or Plan Update), was organized using a direct representative model. An Executive Planning Team from Orange County and participating jurisdictions, shown in Table B-1, was formed to coordinate planning efforts, and request input and participation in the planning process. Table B-2 reflects the Advisory Planning Team, consisting of representatives from area organizations and departments that participated throughout the planning process. Table B-3 is comprised of stakeholders who were invited to provide Plan Update input. Public outreach efforts and meeting documentation is provided in Appendix F.

Table B-1. Executive Planning Team

ORGANIZATION	TITLE
City of Bridge City	Emergency Management Coordinator
City of Orange	Deputy Chief/Emergency Management Coordinator
City of Pinehurst	Emergency Management Coordinator
City of Pine Forest	Emergency Management Coordinator
City of Rose City	City Secretary
City of Vidor Police Department	Emergency Management Coordinator
City of West Orange	Emergency Management Coordinator
Orange County	Interim Emergency Management Coordinator
Orange County	Tax Assessor-Collector
Orange County Office of Emergency Management	Emergency Management Coordinator
Orange County Publishing	Writer

Appendix B: Planning Team

Table B-2. Advisory Planning Team

ORGANIZATION	TITLE
City of Vidor Police Department	Chief
City of West Orange Public Works	Manager
City of West Orange Public Works	Supervisor
Orange County Economic Development Center	Director
Orange County Emergency Services District #1	Chief
Orange County Emergency Services District #2	Chief
Orange County Environmental Health	Director
Orange County Human Resources	Director
Orange County Information Technology	Director
Orange County Maintenance Department	Director
Orange County Public Health	Public Health Emergency Preparedness Planner
Orange County Sheriff	Captain
Orange County Water Control #1	Finance Director
South East Texas Regional Planning Commission	Homeland Security and Emergency Management Planning Director
Vidor Independent School District Police Department	Sergeant
Vidor Independent School District Police Department	Interim Director

Stakeholders

The following groups listed in Table B-3 represent a list of organizations invited to stakeholder meetings, public meetings and workshops throughout the planning process and include: non-profit organizations; private businesses; universities; and legislators. The public were also invited to participate via e-mail throughout the planning process. Many of the invited organizations and stakeholders participated and were integral to providing comments and data for the Plan Update. For a list of attendees at meetings, please see Appendix F¹.

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

Appendix B: Planning Team

Table B-3. Stakeholders

AGENCY	TITLE
Colonial Pipeline	Manager
Lamar University	Assistant Professor
Local Emergency Planning Committee	Chairperson
Orange Church of God	Senior Pastor
Orange County Public Health	Public Health Emergency Preparedness Planner
RPS	Senior Consulting Engineer
South East Texas Disaster Recovery Group	Executive Director
Texas House of Representatives	Texas US Representatives
Texas State Senate	Texas State Senator
United Way	Executive Director

Appendix C: Public Survey Results

Overview	1
Public Survey Results	2

Overview

Orange County prepared a public survey that requested public opinion on a wide range of questions relating to natural hazards. The survey was made available on websites including the City of Vidor’s website. This survey link was also distributed at public meetings and stakeholder events throughout the planning process.

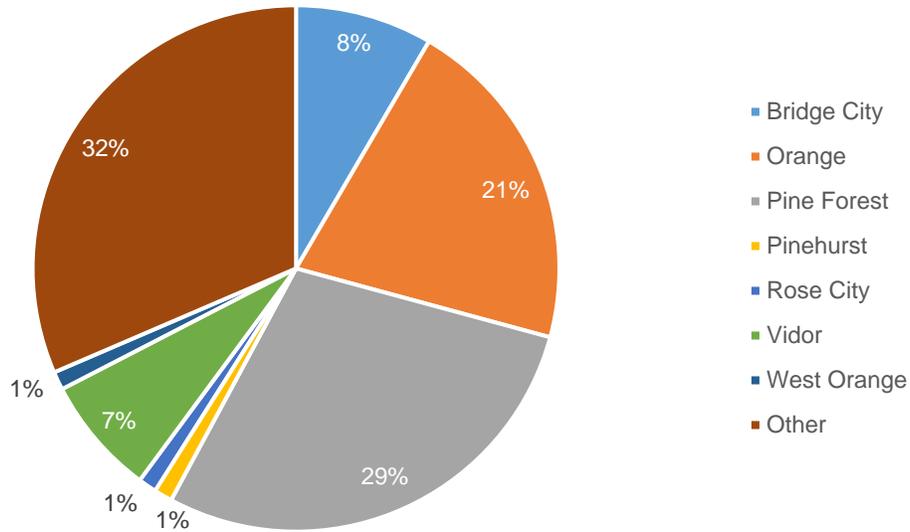
A total of 163 surveys were collected, the results of which are analyzed in Appendix C. The purpose of the survey was twofold: 1) to solicit public input during the planning process, and 2) to help the jurisdictions identify any potential actions or problem areas.

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

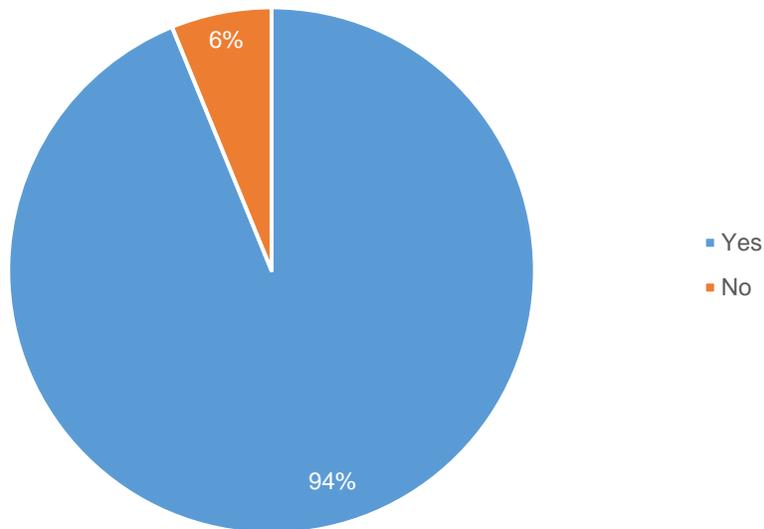
Appendix C: Public Survey Results

Public Survey Results

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

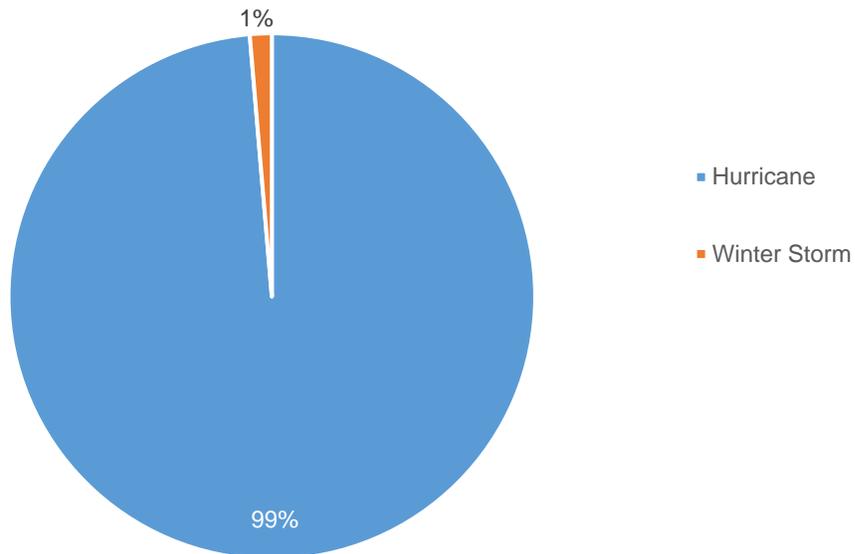


2. A. Have you ever experienced or been impacted by a disaster?

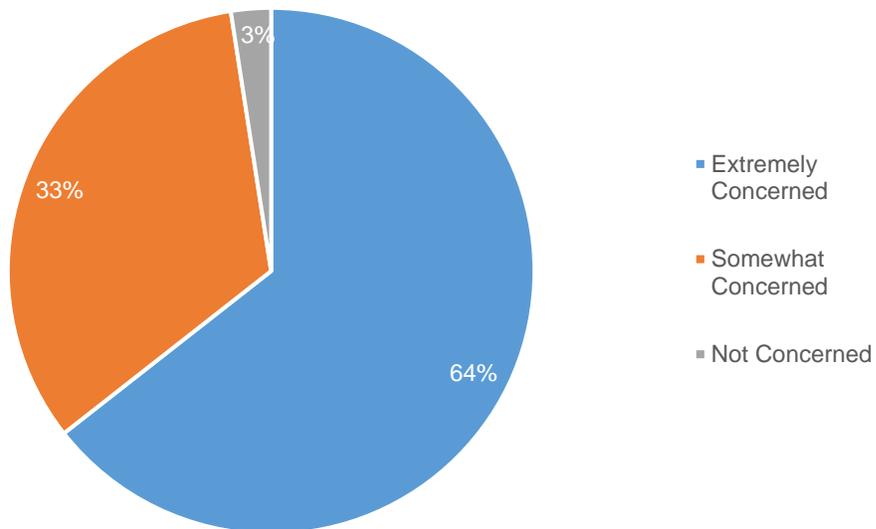


Appendix C: Public Survey Results

2. B. If "Yes", please explain:

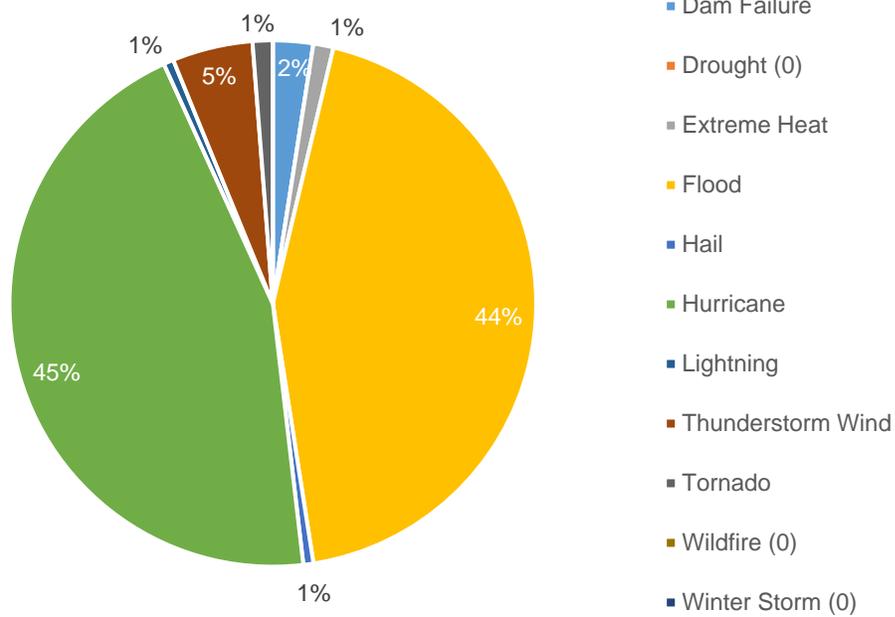


3. How concerned are you about the possibility of your community being impacted by a disaster?

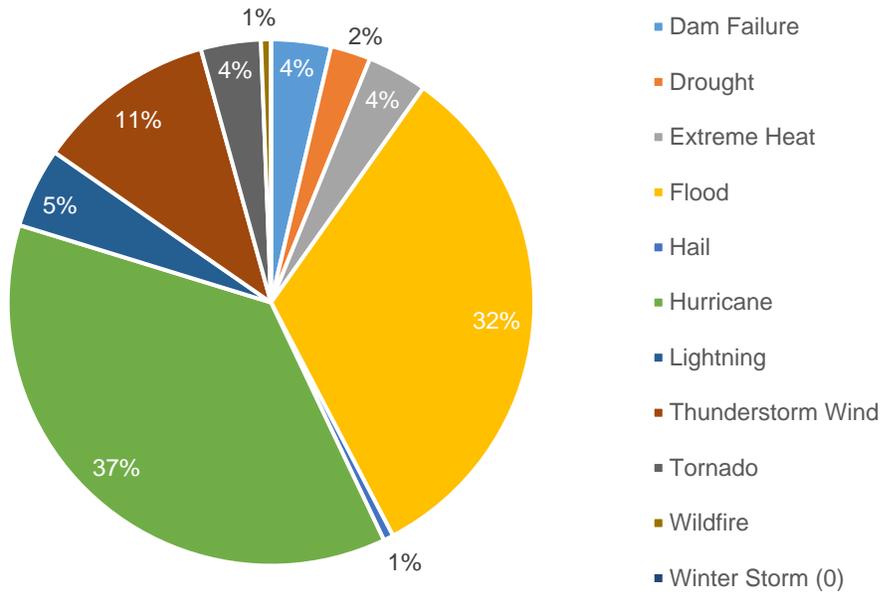


Appendix C: Public Survey Results

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

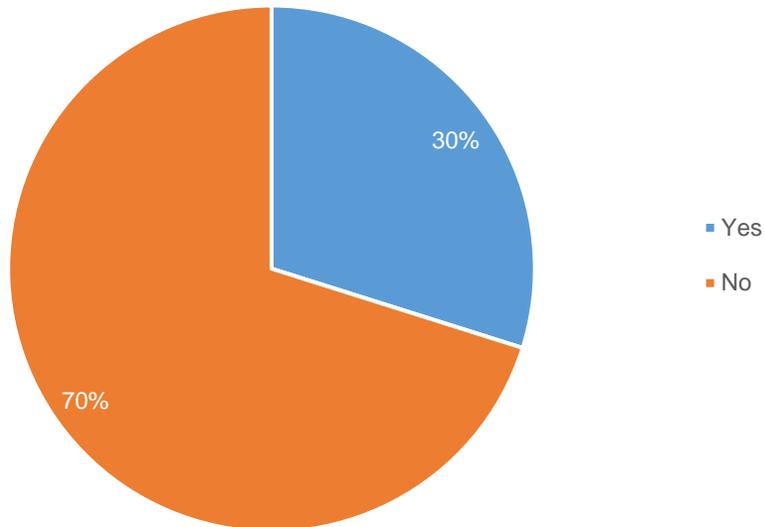


5. Please select the one hazard you think is the second highest threat to your neighborhood:

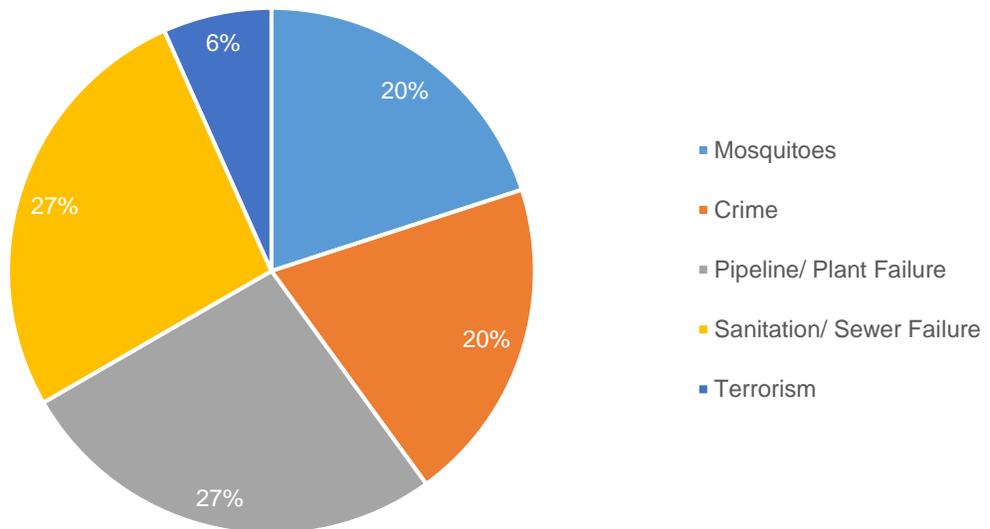


Appendix C: Public Survey Results

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

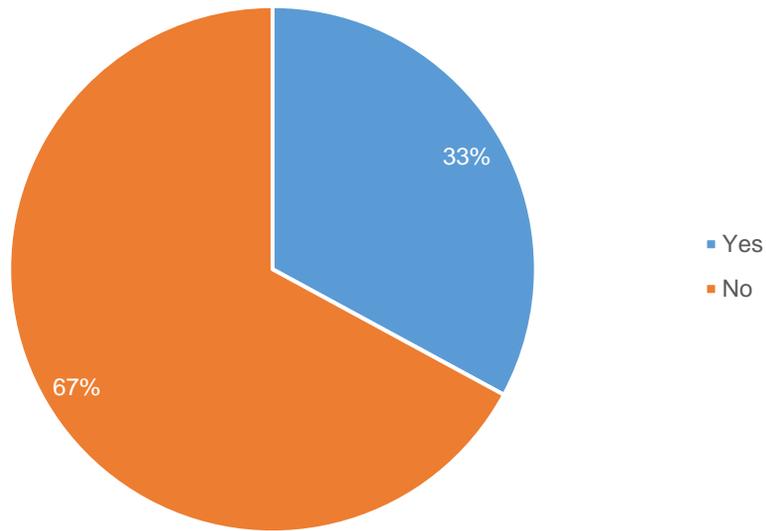


6. B. If "Yes", please explain:

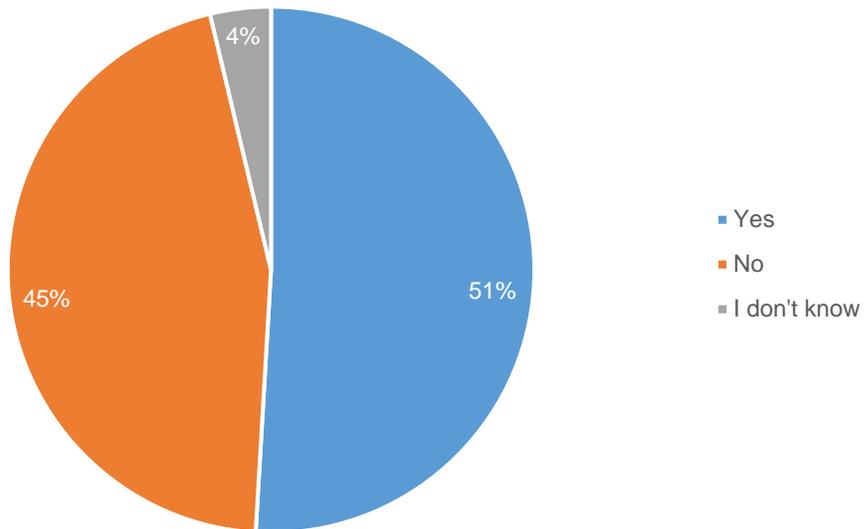


Appendix C: Public Survey Results

7. Is your home located in a floodplain?

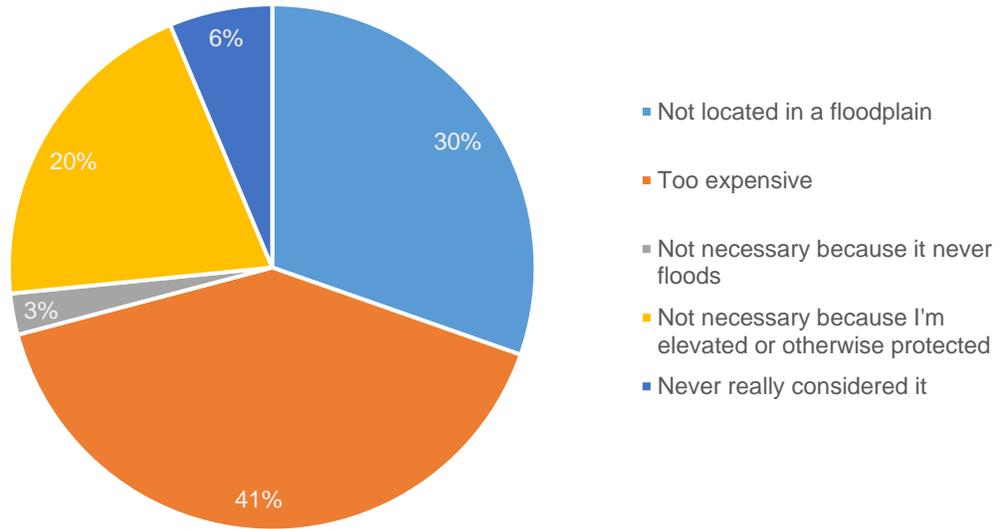


8. Do you have flood insurance?

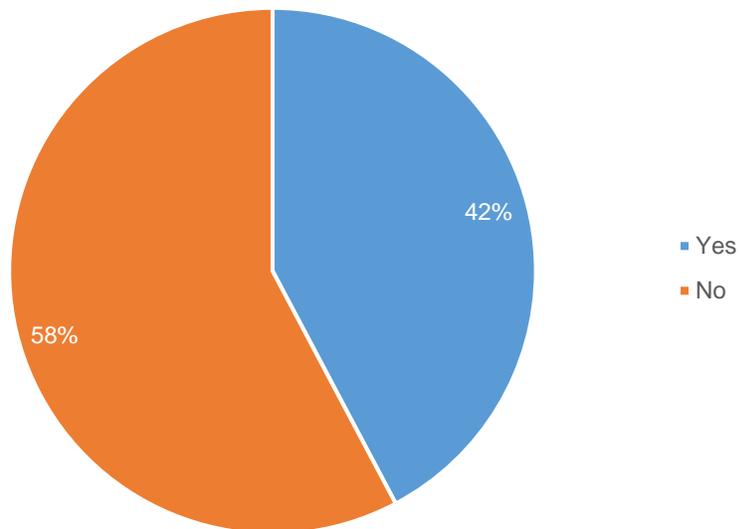


Appendix C: Public Survey Results

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

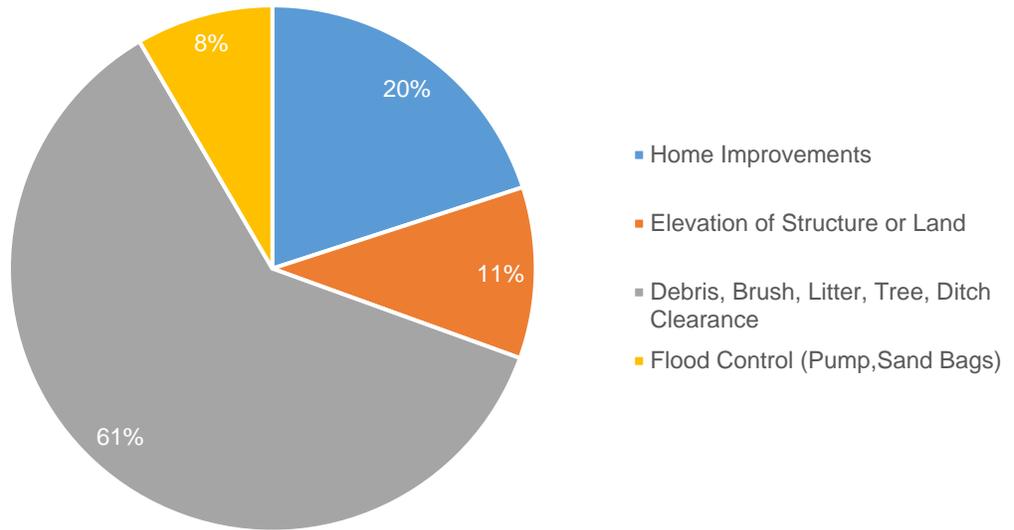


10. A. Have you taken any actions to make your home or neighborhood more resistant to hazards?

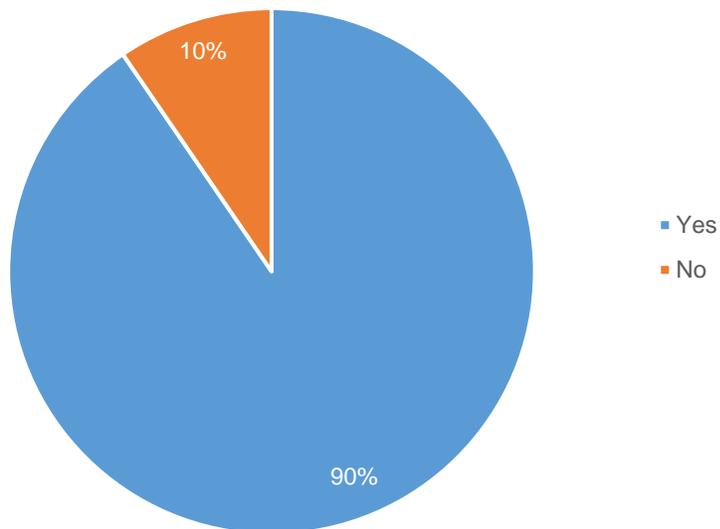


Appendix C: Public Survey Results

10. B. What have you done?

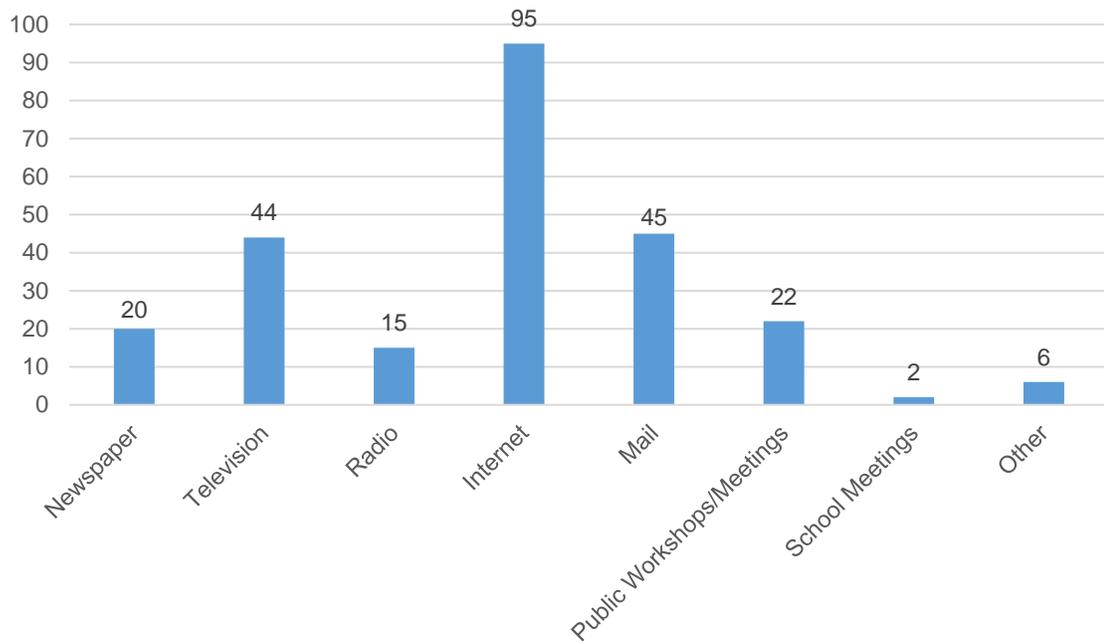


11. Are you interested in making your home or neighborhood more resistant to hazards?

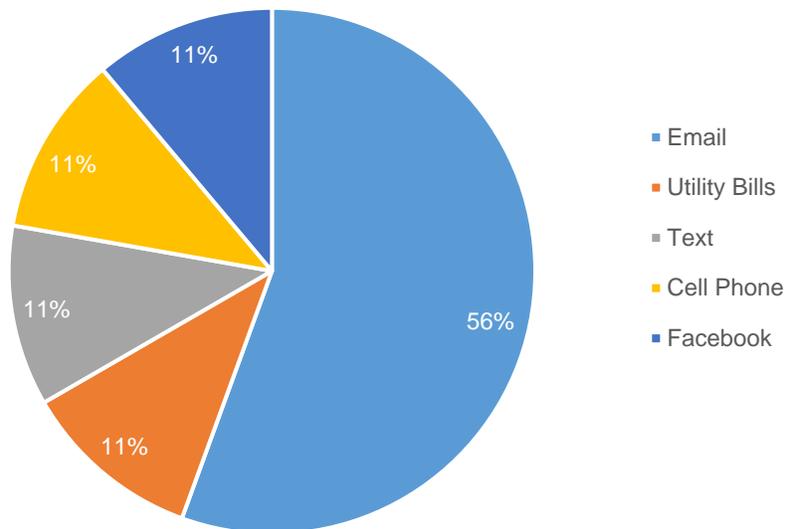


Appendix C: Public Survey Results

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

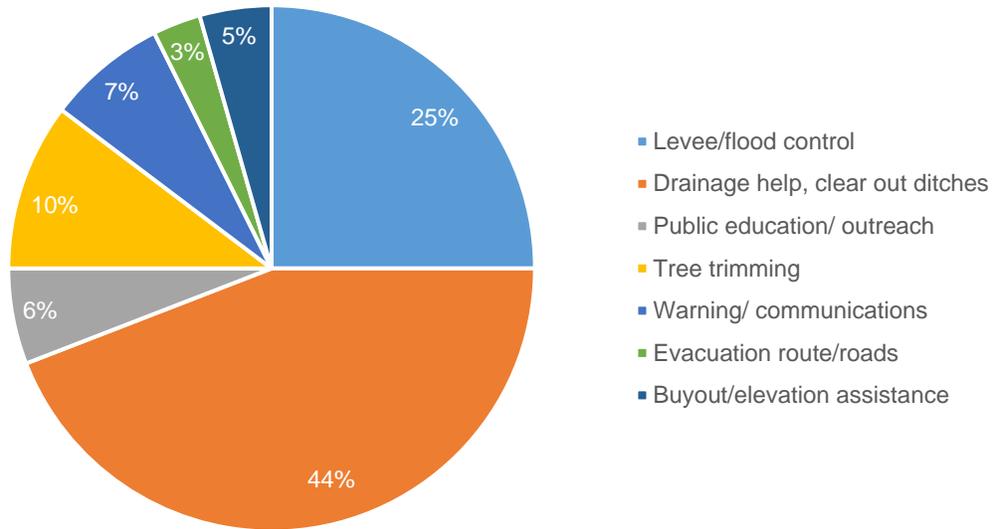


12. B. If "Other", please specify.

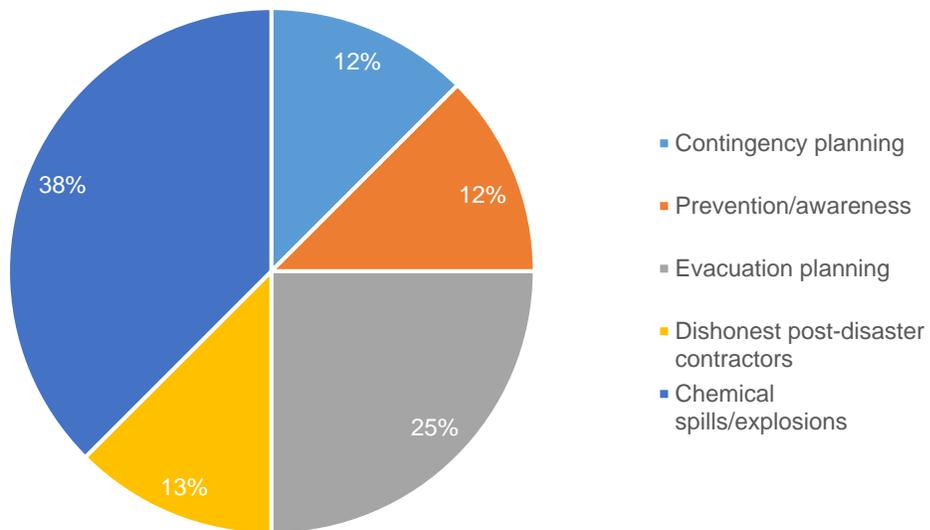


Appendix C: Public Survey Results

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

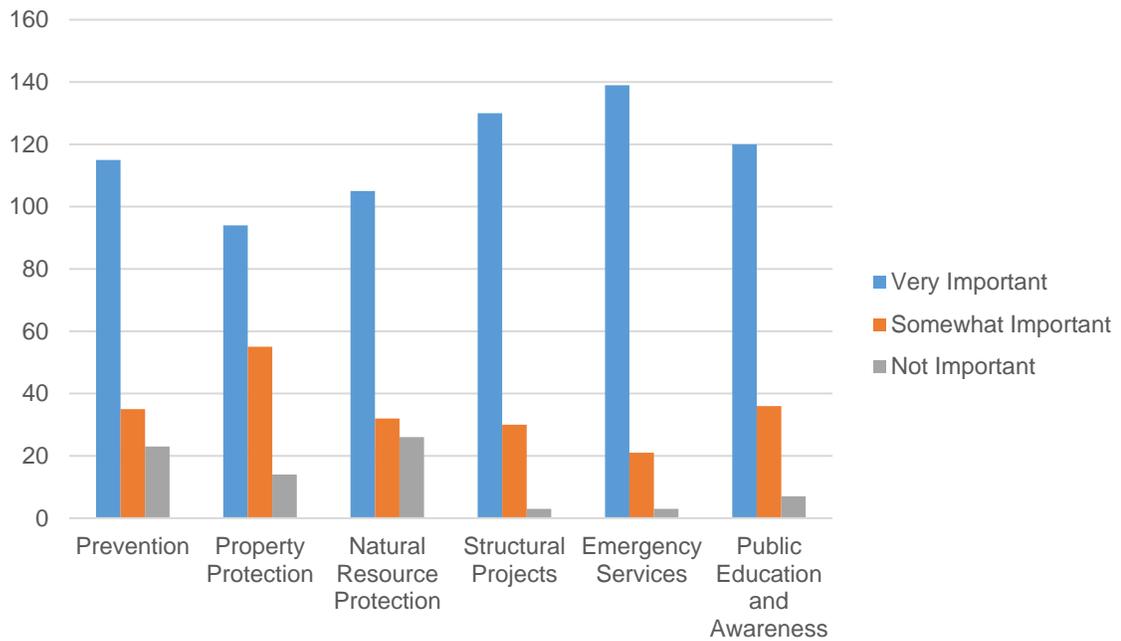


14. Are there any other issues regarding the reduction of risk and loss associated with hazards or disasters in the community that you think are important?



Appendix C: Public Survey Results

15. A number of community-wide activities can reduce our risk from hazards. In general, these activities fall into one of the following six broad categories. Please tell us how important you think each one is for your community to consider pursuing.



Prevention / Local Plans & Regulations - Administrative or regulatory actions that influence the way land is developed and buildings are built. Examples include planning and zoning, building codes, open space preservation, and floodplain regulations.

Property Protection - Actions that involve the modification of existing buildings to protect them from a hazard or removal from the hazard area. Examples include acquisition, relocation, elevation, structural retrofits, and storm shutters.

Natural Resource Protection - Actions that in addition to minimizing hazard losses also preserve or restore the functions of natural systems. Examples include: floodplain protection, habitat preservation, slope stabilization, riparian buffers, and forest management.

Structural Projects - Actions intended to lessen the impact of a hazard by modifying the natural progression of the hazard. Examples include dams, levees, seawalls detention / retention basins, channel modification, retaining walls and storm sewers.

Emergency Services - Actions that protect people and property during and immediately after a hazard event. Examples include warning systems, evacuation planning, emergency response training, and protection of critical facilities or systems.

Public Education and Awareness - Actions to inform citizens about hazards and techniques they can use to protect themselves and their property. Examples include outreach projects, school education programs, library materials and demonstration events.

Appendix D: Critical Facilities

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

Appendix E: Dam Locations

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

Appendix F: Meeting Documentation

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

Appendix G: Capability Assessment

Overview	1
Orange County Capability Assessment.....	2
City of Bridge City Capability Assessment	3
City of Orange Capability Assessment.....	5
City of Pine Forest Capability Assessment.....	6
City of Pinehurst Capability Assessment.....	8
City of Rose City Capability Assessment	9
City of Vidor Capability Assessment	11
City of West Orange Capability Assessment.....	12

Overview

The Planning Team completed a Capability Assessment Survey at the beginning of the planning process. The completed Capability Assessment Checklist, included in Appendix G, provides information on existing policies, plans, and regulations for Orange County and the participating jurisdictions.

A Capability Assessment is an integral component of the Plan Update development process. The Capability Assessment serves to evaluate a community’s existing planning and regulatory capabilities to support implementation of the Plan’s Mitigation Strategy Objectives.

Each community has a unique set of capabilities including policies, programs, staff, funding, and other resources available to accomplish hazard mitigation objectives and reduce long-term vulnerability. The Planning Team identified existing capabilities in each jurisdiction that currently reduce disaster losses or could be used to reduce losses in the future, and capabilities that inadvertently increase risks in the community.

Appendix G: Capability Assessment

Orange County Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Planning/Regulatory Tool	In Place	Under Development
Hazard Mitigation Plan	X	
Comprehensive Land Use Plan		
Stormwater Management Plan/Ordinance	X	
Emergency Operations Plan	X	
Capital Improvements Plan		
Floodplain Management Plan	X	
Flood Response Plan	X	
Historic Preservation Plan		
Continuity of Operations Plan	X	
Evacuation Plan	X	
National Flood Insurance Program (NFIP)	X	
NFIP Community Rating System		
NFIP Floodplain Ordinance	X	
Building Code		
Fire Code		
Other Plans		
Administrative and Technical Capability	Yes	No
Planners		
Engineers	X	
Emergency Manager	X	
Floodplain Manager	X	

Appendix G: Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Personnel skilled in Geographic Information Systems (GIS)		
Resource development staff or grant writers	X	
Financial Resources	Yes	No
Capital Improvement Programming		
Community Development Block Grants (CDBG)	X	
Stormwater Utility Fees	X	
Development Impact Fees	X	
Partnering Agreements or Intergovernmental Agreements		
Other		

City of Bridge City Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Planning/Regulatory Tool	In Place	Under Development
Hazard Mitigation Plan	X	
Comprehensive Land Use Plan		
Stormwater Management Plan/Ordinance	X	
Emergency Operations Plan	X	
Capital Improvements Plan		X
Floodplain Management Plan	X	
Flood Response Plan	X	
Historic Preservation Plan		
Continuity of Operations Plan	X	
Evacuation Plan	X	

Appendix G: Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
National Flood Insurance Program (NFIP)	X	
NFIP Community Rating System		
NFIP Floodplain Ordinance	X	
Building Code	X	
Fire Code	X	
Other Plans		
Administrative and Technical Capability	Yes	No
Planners		
Engineers		
Emergency Manager	X	
Floodplain Manager	X	
Personnel skilled in Geographic Information Systems (GIS)		
Resource development staff or grant writers	X	
Financial Resources	Yes	No
Capital Improvement Programming	X	
Community Development Block Grants (CDBG)		X
Stormwater Utility Fees		X
Development Impact Fees		X
Partnering Agreements or Intergovernmental Agreements	X	
Other		

Appendix G: Capability Assessment

City of Orange Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Planning/Regulatory Tool	In Place	Under Development
Hazard Mitigation Plan	X	
Comprehensive Land Use Plan		
Stormwater Management Plan/Ordinance	X	
Emergency Operations Plan	X	
Capital Improvements Plan		
Floodplain Management Plan	X	
Flood Response Plan	X	
Historic Preservation Plan		
Continuity of Operations Plan	X	
Evacuation Plan	X	
National Flood Insurance Program (NFIP)	X	
NFIP Community Rating System		
NFIP Floodplain Ordinance	X	
Building Code	X	
Fire Code	X	
Other Plans/Codes		
Administrative and Technical Capability		
Planners		
Engineers		
Emergency Manager	X	
Floodplain Manager	X	

Appendix G: Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Personnel skilled in Geographic Information Systems (GIS)		
Resource development staff or grant writers	X	
Financial Resources	Yes	No
Capital Improvement Programming	X	
Community Development Block Grants (CDBG)		X
Stormwater Utility Fees		X
Development Impact Fees		X
Partnering Agreements or Intergovernmental Agreements	X	
Other		

City of Pine Forest Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Planning/Regulatory Tool	In Place	Under Development
Hazard Mitigation Plan	X	
Comprehensive Land Use Plan		
Stormwater Management Plan/Ordinance	X	
Emergency Operations Plan	X	
Capital Improvements Plan		
Floodplain Management Plan	X	
Flood Response Plan	X	
Historic Preservation Plan		
Continuity of Operations Plan	X	
Evacuation Plan	X	

Appendix G: Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
National Flood Insurance Program (NFIP)	X	
NFIP Community Rating System		
NFIP Floodplain Ordinance	X	
Building Code	X	
Fire Code	X	
Other Plans		
Administrative and Technical Capability	Yes	No
Planners		
Engineers		
Emergency Manager	X	
Floodplain Manager	X	
Personnel skilled in Geographic Information Systems (GIS)		
Resource development staff or grant writers	X	
Financial Resources	Yes	No
Capital Improvement Programming		
Community Development Block Grants (CDBG)		X
Stormwater Utility Fees		X
Development Impact Fees		X
Partnering Agreements or Intergovernmental Agreements		
Other		

Appendix G: Capability Assessment

City of Pinehurst Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Planning/Regulatory Tool	In Place	Under Development
Hazard Mitigation Plan	X	
Comprehensive Land Use Plan		
Stormwater Management Plan/Ordinance	X	
Emergency Operations Plan		
Capital Improvements Plan		
Floodplain Management Plan	X	
Flood Response Plan	X	
Historic Preservation Plan		
Continuity of Operations Plan	X	
Evacuation Plan	X	
National Flood Insurance Program (NFIP)	X	
NFIP Community Rating System		
NFIP Floodplain Ordinance	X	
Building Code	X	
Fire Code	X	
Other Plans		
Administrative and Technical Capability	Yes	No
Planners		
Engineers		
Emergency Manager	X	
Floodplain Manager	X	

Appendix G: Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Personnel skilled in Geographic Information Systems (GIS)		
Resource development staff or grant writers	X	
Financial Resources	Yes	No
Capital Improvement Programming		
Community Development Block Grants (CDBG)		X
Stormwater Utility Fees		X
Development Impact Fees		X
Partnering Agreements or Intergovernmental Agreements		
Other		

City of Rose City Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Planning/Regulatory Tool	In Place	Under Development
Hazard Mitigation Plan	X	
Comprehensive Land Use Plan		
Stormwater Management Plan/Ordinance	X	
Emergency Operations Plan	X	
Capital Improvements Plan		
Floodplain Management Plan	X	
Flood Response Plan	X	
Historic Preservation Plan		
Continuity of Operations Plan	X	
Evacuation Plan	X	

Appendix G: Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
National Flood Insurance Program (NFIP)	X	
NFIP Community Rating System		
NFIP Floodplain Ordinance	X	
Building Code	X	
Fire Code	X	
Other Plans		
Administrative and Technical Capability	Yes	No
Planners		
Engineers		
Emergency Manager	X	
Floodplain Manager	X	
Personnel skilled in Geographic Information Systems (GIS)		
Resource development staff or grant writers	X	
Financial Resources	Yes	No
Capital Improvement Programming		
Community Development Block Grants (CDBG)	X	
Stormwater Utility Fees	X	
Development Impact Fees	X	
Partnering Agreements or Intergovernmental Agreements		
Other		

Appendix G: Capability Assessment

City of Vidor Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Planning/Regulatory Tool	In Place	Under Development
Hazard Mitigation Plan	X	
Comprehensive Land Use Plan		
Stormwater Management Plan/Ordinance		
Emergency Operations Plan	X	
Capital Improvements Plan		
Floodplain Management Plan	X	
Flood Response Plan	X	
Historic Preservation Plan		
Continuity of Operations Plan	X	
Evacuation Plan	X	
National Flood Insurance Program (NFIP)	X	
NFIP Community Rating System		
NFIP Floodplain Ordinance	X	
Building Code	X	
Fire Code	X	
Other Plans		
Administrative and Technical Capability	Yes	No
Planners		
Engineers		
Emergency Manager	X	
Floodplain Manager	X	

Appendix G: Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Personnel skilled in Geographic Information Systems (GIS)		
Resource development staff or grant writers	X	
Financial Resources	Yes	No
Capital Improvement Programming		
Community Development Block Grants (CDBG)	X	
Stormwater Utility Fees	X	
Development Impact Fees	X	
Partnering Agreements or Intergovernmental Agreements		
Other		

City of West Orange Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Planning/Regulatory Tool	In Place	Under Development
Hazard Mitigation Plan		
Comprehensive Land Use Plan		
Stormwater Management Plan/Ordinance		
Emergency Operations Plan		
Capital Improvements Plan	X	
Floodplain Management Plan		
Flood Response Plan		
Historic Preservation Plan		
Continuity of Operations Plan	X	
Evacuation Plan	X	

Appendix G: Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
National Flood Insurance Program (NFIP)	X	
NFIP Community Rating System		
NFIP Floodplain Ordinance	X	
Building Code	X	
Fire Code	X	
Other Plans		
Administrative and Technical Capability	Yes	No
Planners		
Engineers		
Emergency Manager	X	
Floodplain Manager	X	
Personnel skilled in Geographic Information Systems (GIS)		
Resource development staff or grant writers	X	
Financial Resources	Yes	No
Capital Improvement Programming		
Community Development Block Grants (CDBG)	X	
Stormwater Utility Fees	X	
Development Impact Fees	X	
Partnering Agreements or Intergovernmental Agreements		
Other		