Hazard Mitigation Action Plan

Somervell County, Texas

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Chapter One: Introduction

1.1 Purpose

Somervell County is susceptible to a number of different natural hazards that have potential to cause property loss, loss of life, economic hardship, and threats to public health and safety. Occurrence of natural disasters cannot be prevented; however hazard mitigation measures minimize the impact that future disasters will have on people and property in the community.

Somervell County Multi-Jurisdictional Natural Hazard Mitigation Plan has been developed by the Somervell County Hazard Mitigation Planning Committee. The plan represents collective efforts of citizens, elected and appointed government officials, business leaders, volunteers of non-profit organizations, and other stakeholders.

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

1.2 Somervell County Hazard Mitigation Action Plan Planning Process

The Somervell County Hazard Mitigation Action Plan (HazMAP) was created in order comply with current federal and state hazard mitigation plan regulations:

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

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

- Somervell County
- City of Glen Rose

Each jurisdiction participated by having a Hazard Mitigation Team (HMT). Each HMT participated in the Hazard Mitigation Action Plan. The North Central Texas Council of Governments Emergency Preparedness Department participated in the HazMAP to assist in compiling the jurisdictional information and prepare the plan for submission. Somervell County Hazard Mitigation Action Plan Meetings were held on October 31, 2013, November 21, 2013, and March 24, 2014.

1.3 HazMAP Planning Process Point of Contact and Demographics

The following are the points of contact during the October 31, 2013 HazMAP planning process:

Somervell County
Fire Marshal/Emergency Management Coordinator

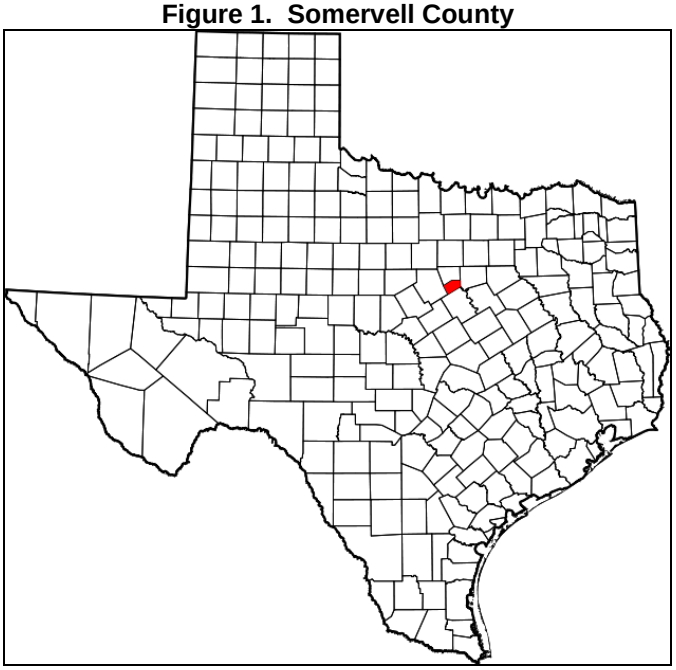
City of Glen Rose
City Manager

Participating Jurisdiction Population Profiles

Jurisdiction	2010 Population	2012 Population
Somervell County	8,490	8,630
City of Glen Rose	2,444	2,460

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

Figure 1. Somervell County



Source: Texas National Resource Inventory

1.4 Somervell County Hazard Mitigation Action Plan Organization

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

Chapter One: Introduction

Describes the process and organization of the Somervell County Hazard Mitigation Action Plan

Chapter Two: Planning Process

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

Chapter Three: Hazard Identification and Risk Assessment

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

Chapter Four: Capabilities Assessment

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

Chapter Five: Mitigation Strategy

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

Chapter Six: Maintenance Process

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

Appendix A: Documentation from Planning and Public Meetings

1.5 Somervell County Hazard Mitigation Strategy Maintenance Process

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

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

1.6 Somervell County Hazard Mitigation Action Plan Adoption

Once the Somervell County Hazard Mitigation Action Plan has received FEMA “Approved Pending Local Adoption” each participating jurisdiction will take the Somervell County HazMAP to their Commissioner’s Courts or City Councils for final public comment and local adoption. A copy of the resolution will be inserted into the Somervell County HazMAP and held on file at the County Courthouse and the Fire Marshal’s office.

1.7 FEMA Disaster Declarations

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

Chapter Two: Planning Process

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

Plan Development and Adoption Process

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

Organizing the Planning Effort

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

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

Existing Data and Plans

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

Source	Data
City and County Appraisal Data 2012	Population and demographics
Regional Hazard Assessment Tool	Hazard occurrences
National Climatic Data Center (NCDC)	Hazard occurrences
Texas Forest Service/Texas Wildfire Risk Assessment Summary Report	Wildfire Threat and Urban Interface
National Inventory of Dams	Dam Information

Planning Committee

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

The Planning Committee was assembled in 2013 with representatives from all jurisdictions including, mayors, police chiefs, fire chiefs, and general public. Somervell County acted as the plan development consultant providing hazard mitigation planning services. The table below provides a list of the primary entity representative for each jurisdiction on the planning team below.

Hazard Mitigation Team – Primary Representatives

Representing	Position	Role
Somervell County	EMC	General oversight & Plan Development
Glen Rose	Mayor	Plan development

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

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

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

1. Coordinated input from representatives of neighborhood stakeholder groups and provided a representative to the County Planning Committee.
2. Attended regular meetings of the planning team as coordinated by Somervell County.
3. Assisted Somervell County staff with identifying hazards and estimating potential losses from future hazard events.
4. Assisted Somervell County in developing and prioritizing mitigation actions to address the identified risks.
5. Assisted Somervell County in coordinating public meetings to develop the plan.
6. Identified the community resources available to support the planning effort.

7. Worked for the support of neighborhood stakeholders for the recommendations resulting from the planning process.
8. Submitted the proposed plan to all appropriate departments for review and comment and worked with Somervell County to incorporate the resulting comments into the proposed plan.

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

Representing	Position	Role
American Red Cross	Ft. Worth Liaison	Review of plan
Comanche Peak	Off-site Planner	Review of plan
Glen Rose ISD	Director of Administration	Review of plan
Somervell Co. Water District	Director	Review of plan
City of Glen Rose	City Manager	Review of plan

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

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

Planning Meetings

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

The following planning meetings were held by Somervell County and included all jurisdictions' participation:

- Somervell County Hazard Mitigation Kickoff Meeting – October 31, 2014
- Somervell County Hazard Analysis Meeting – November 21, 2013
- Somervell County Mitigation Strategies Meeting – March 24, 2014

Public Involvement

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

- The first public meeting was held on February 10, 2014 and advertised in the Glen Rose Reporter and city website inviting the public, neighboring communities, local business, academia, agencies, and nonprofits to comment.

- The second public meeting was held on September 22, 2014. An advertisement was posted in the Glen Rose Reporter and the city website inviting the public, neighboring communities, local business, academia, agencies, and nonprofits to view and comment on the HazMAP prior to plan submission.

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

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

Chapter Three: Hazard Identification and Risk Assessment

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

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

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3.1 Profiling Hazards and Vulnerabilities

The Hazard Mitigation Action Plan for Somervell County is a tool to assist in the identification and documentation of all the hazards faced in the region.
The Somervell County profile is one of many developed by the North Central Texas Council of Governments (NCTCOG) under the FEMA Hazard Mitigation program. These plans are created by compiling data from the NCTCOG regional natural hazards risk assessments, damage assessments, hazard profiling and identification as well as historical data and geographic information.

The Somervell County profile is one of many developed by the North Central Texas Council of Governments (NCTCOG) under the FEMA Hazard Mitigation program. These plans are created by compiling data from NCTCOG regional natural hazards risk assessments, damage assessments, hazard profiling and identification as well as historical data and geographic information. Of the 15 hazards identified in the State of Texas Hazard Mitigation Action Plan, only 11 will be discussed in this plan. The remaining four (expansive soils, land subsidence, coastal erosions, and hurricane/tropical storm) will not be discussed due to their lack of impact on the Somervell County planning area. An additional technical hazard, Nuclear Power Plants, will also be discussed.

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

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

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

Based on a quantitative analysis of the dams currently in place in Somervell County and a qualitative analysis of the potential impacts that dam failures would have on the social, economic, and environmental components of the region, the risk of a dam failure hazard is moderate.

There have not been any inundation studies for the dams in Somervell County and the County does not have information from the owners or Emergency Operations Plans for the dams. Therefore, the County has chosen to cite a data deficiency and include an action item to research better inundation data before the next update.

The data below is from the National Inventory of Dams (NID):

Jurisdiction	Dam Name	Hazard Potential	Completion Year	Owner Type	Dam Height (Ft.)	Water Supply (acre-feet)	Primary Purpose	River	Distance to a City (Mi.)	Condition Assessment
Somervell County	Squaw Creek Dam	High	1977	Private	159	199,427	Recreation	Sqaw Creek	-	Satisfactory
Somervell County	Wheeler Branch Dam	High	1800	Local Government	91	6,248	Irrigation	Wheeler Branch	-	Not Rated

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

Unincorporated Somervell County Drought can affect all residents of Somervell County through depletion of groundwater resources that contribute to drinking water for the entire County. Agricultural production would be impacted depending on the extent and severity of the drought. The entire county would also be more susceptible to wildfire events during a period of drought.

City of Glen Rose Drought can affect all residents of Glen Rose through depletion of groundwater resources that contribute to drinking water for the entire City. Agricultural production would be impacted depending on the extent and severity of the drought. The entire county would also be more susceptible to wildfire events during a period of drought.

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

There is no history of earthquakes occurring within Somervell County, however, there have been earthquakes measuring up to 3.7 on the Richter scale in nearby counties.

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

Unincorporated Somervell County Although slight, there continues to be small tremors in and around the DFW Metroplex. An earthquake could cause damage to CPNPP causing a radiological release.

City of Glen Rose This hazard was identified as having no risk to the jurisdiction.

Extreme Heat Extreme heat is characterized by a combination of a very high temperatures and exceptionally humid conditions. When persisting over a period of time, it is called a heat wave. Extreme heat can also be a factor that drastically impacts drought conditions as high temperatures lead to an increased rate of evaporation. Extreme heat can also lead to heat stroke and even death in vulnerable populations such as the elderly and the very young if exposed to the high temperatures for an extended period of time. Extreme heat may affect the entire planning area equally.

Unincorporated Somervell County Extreme heat can affect all residents of Somervell County, but residents that are very young or very advanced in age are more susceptible. The effects of prolonged durations of extreme heat may often coincide with and exacerbate drought conditions. Extreme heat may stress electrical utility providers, due to increased air conditioning requirements. Need for health providers may also increase due to extreme heat.

City of Glen Rose The lower income areas of the City on the south side may be more vulnerable to effects of extreme heat because of the less efficient housing and the costs associated with air conditioning.

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

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

Unincorporated Somervell County The main areas affected by riverine flooding in Somervell County are along the Brazos River and the Paluxy River. Other areas inside the floodplains are streams and creeks throughout the county.

Flash flooding may potentially affect all residents of the County and cause runoff that becomes fast-rising waters that can cause property and street damage as well as casualties. Unlike riverine flooding, which can be forecasted over a few days, flash flooding is normally a quick onset hazard with little warning.

Riverine and flash flooding may occur any time of year, though flooding associated with heavy rains will occur in spring, summer and early fall.

City of Glen Rose Within Glen Rose there is the added risk of localized flooding, flooding caused by temporary blockages in the city's storm drain system. Much of the city has above-ground drainage, and where barrow ditches are crossed with streets or driveways there is a potential for events such as a basketball or garbage can to block culverts creating localized flooding. Further, the normal build-up of impermeable coverings on properties within developed subdivisions and parts of the city will increase flows and velocities of storm water, and then concentrate these flows where the natural drains may be overwhelmed. The main areas of the city that are affected by riverine flooding are the low-lying areas alongside the Paluxy River, which include parks and recreation areas.

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

Unincorporated Somervell County Hail storms are a potentially damaging outgrowth of severe thunderstorms. Hail storms vary tremendously in terms of size, location, intensity and duration. The severity of hail events depend on size of hail, winds and structures in the path of a hail storm. Storms that produce high winds in addition to hail are most damaging and can result in numerous broken windows and damaged siding. Hail storms can cause extensive property damage affecting both urban and rural landscapes. Fortunately, most hail storms produce marble-size or smaller hailstones. These can cause damage to crops, but they normally do not damage buildings or automobiles. Larger hailstones can destroy crops, livestock and wildlife and can cause extensive damage to buildings, including roofs, windows and outside walls. Vehicles can be total losses. When hail breaks windows, water damage from accompanying rains can also be significant. A major hail storm can easily cause damage running into the millions of dollars. Nationwide hail is responsible for over $1 billion in property and crop damages per year.

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

Unincorporated Somervell County All of Somervell County's residents are susceptible to high wind events. These effects will include property damage to residences, businesses, and critical facilities. Utility service is normally interrupted causing loss of productivity and damage caused will create debris that may be dangerous.

Other wind events, including straight-line winds will also produce similar effects to tornadoes.

City of Glen Rose All of Glen Rose's residents are susceptible to high wind events. These effects will include property damage to residences, businesses, and critical facilities. Utility service is normally interrupted causing loss of productivity and damage caused will create debris that may be dangerous.

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

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

Unincorporated Somervell County All of Somervell County's residents are vulnerable to lightning events that occur any time of the year, though instances are more numerous in spring and summer. Lightning effects are localized in nature. Though lightning occurrences are plentiful, major damage from lightning does not occur as much as damage from wind events that occur in thunderstorms. Lightning is very dangerous and may cause human casualties or fires that create property damage.

City of Glen Rose All of Glen Rose's residents are vulnerable to lightning events that occur any time of the year, though instances are more numerous in spring and summer. Lightning effects are localized in nature. Though lightning occurrences are plentiful, major damage from lightning does not occur as much as damage from wind events that occur in thunderstorms. Lightning is very dangerous and may cause human casualties or fires that create property damage.

Nuclear Power Plant The North Central Texas region has 1 nuclear power site maps G.1-4. Somervell County serves as host for the facility, Comanche Peak. The plant currently has 2 functioning reactors and 2 more that are planned. The power plant is located 40 miles from Fort Worth and 60 miles southwest of Dallas, with a population within 10 miles of 30,653, and within 50 miles of 1.76 million. The closest surrounding counties include Bosque, Ellis, Erath, Hill, Hood, Johnson, Parker, Palo Pinto, and Tarrant. According to Duke Power, typical nuclear power plants have the following:

- About one chance in twenty thousand per year that a nuclear power plant will experience a serious accident, and
- About one chance in four million per year that anyone in the public would die as a direct result of a nuclear accident.

Although these statistics suggest that the chances of a serious accident are considered extremely low, annual updates of emergency operation plans for nuclear power plant incidents and regular training exercises are an absolute must to ensure the safety of the public and the environment. The Nuclear Regulatory Commission's estimate of the risk of an earthquake intense enough to cause damage to the reactor has a 1 in 250,000 chance of occurring.

Two Westinghouse pressurized water reactors were built in 1974 and rely on the Squaw Creek Reservoir for cooling water. There has never been a major nuclear power plant incident at Comanche Peak or in the state of Texas.

GIS analysis was performed to get an estimate of total population (at the census tract level) within a 10-mile and 50-mile buffer of the nuclear power sites. Total population within the 10-mile buffer totals 30,653; within the 50-mile buffer, total population is 1.76 million. Given that there have not been any major incidents, further analysis of this hazard was not considered.

Unincorporated Somervell County Comanche Peak Nuclear Power Plant is located within Somervell County. The power plant represents a unique hazard to our County due to nature of nuclear energy and the regulations set forth by Federal and State Governments. Emergency response plans are exercised annually in order to be prepared for an event involving Comanche Peak Nuclear Power Plant. All of Somervell County lies within the 10 mile Emergency Protection Zone and would be affected in the event of an emergency due to a nuclear incident.

Glen Rose Comanche Peak Nuclear Power Plant is located within Somervell County about five miles north of Glen Rose. The power plant represents a unique hazard to our City, but because of the Federal and State regulations, emergency response plans are keep up to date and are exercised in order to be prepared for a radiation or potential radiation hazard.

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

> **Unincorporated Somervell County** Tornados in the County have the ability to occur with little warning and no predictable pattern. A tornado striking the nuclear plant inside our county could disrupt electrical service for hundreds of thousands of residents in the State of Texas. Throughout the County, there are many developments that are all or nearly all mobile home type structures that will offer little to limited protection.
>
> **City of Glen Rose** Glen Rose is a tourist destination and therefore does have several Recreation Vehicle (RV) Parks within and around our City. While these are no more vulnerable to a tornado hitting that area, these RV Parks are far more vulnerable to loss of property and life as well as injuries. Since these people are visitors their immediate needs would create a greater need for the local governments to provide a response to meet those needs.

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

> **Unincorporated Somervell County**
> 94% of the county's population lives in the Wildland Urban Interface, according to the Texas Forest Service Wildfire Risk Assessment Summary.
>
> **City of Glen Rose**
> 83% of the city's population lives in the Wildland Urban Interface, according to the Texas Forest Service Wildfire Risk Assessment Summary.

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

> **Unincorporated Somervell County** A freezing rain or ice storm occurs when the surface temperature falls below freezing. High winds accompanied by freezing rain are more likely to

become an ice storm. Liquid that falls and freezes on impact results in a coat of ice glazed on exposed objects. An ice storm may range from a thin glaze to a heavy coating. A heavy accumulation of ice, especially when accompanied by high winds, devastates trees and power lines. Streets and highways become extremely hazardous to motorists and pedestrians, trees fall, and power outages occur. A severe storm could cause severe damage to county and state critical infrastructure.

City of Glen Rose In Glen Rose the areas of town on the ridges above the Paluxy River valley may be more susceptible to transportation problems when an ice storm coats the roads coming off of those ridges. In addition, the type of trees normally found in Glen Rose are also more apt to collect ice and therefore have a potential for their falling limbs to take out electric services or even transmission lines.

3.2 Location of Hazards

The following maps illustrate the location of the hazards in Somervell County. Maps concerning tornado and hail incidents are in reverence to previous events as they have the potential to occur equally throughout the county. Winter storms, extreme heat, and drought have the potential to occur equally throughout the county and their previous events data is not represented by a map. Please note that at the time of this plan the floodzones for Somervell County were under review by FEMA and were unavailable for analysis.

Map Series A **Dams and Flood Zones**

Map A.1 Somervell County Dams and Flood Zones
Map A.2 City of Glen Rose Dams and Flood Zones

Map Series B **Land Use, Critical Infrastructure, and Flood Zones**

Map B.1 Somervell County Land Use, Critical Infrastructure, and Flood Zones
Map B.2 City of Glen Rose Land Use, Critical Infrastructure, and Flood Zones

Map Series C **Hail Incident**

Map C.1 Somervell County Hail Incidents
Map C.2 City of Glen Rose Hail Incidents

Map Series D **Tornado Incident**

Map D.1 Somervell County Tornado Incident
Map D.2 City of Glen Rose Tornado Incident

Map Series E **Wildfire Threat**

Map E.1 Somervell County Wildfire Threat
Map E.2 City of Glen Rose Wildfire Threat

Map Series F **Wildland Urban Interface**

Map F.1 Somervell County Wildland Urban Interface
Map F.2 City of Glen Rose Wildland Urban Interface

Map Series G **Nuclear Power Plant**

Map G.1 Evacuation Time Estimates
Map G.2 Evacuation Time Estimates with Population
Map G.3 Evacuation Routes
Map G.4 Transit Dependent Bus Routes

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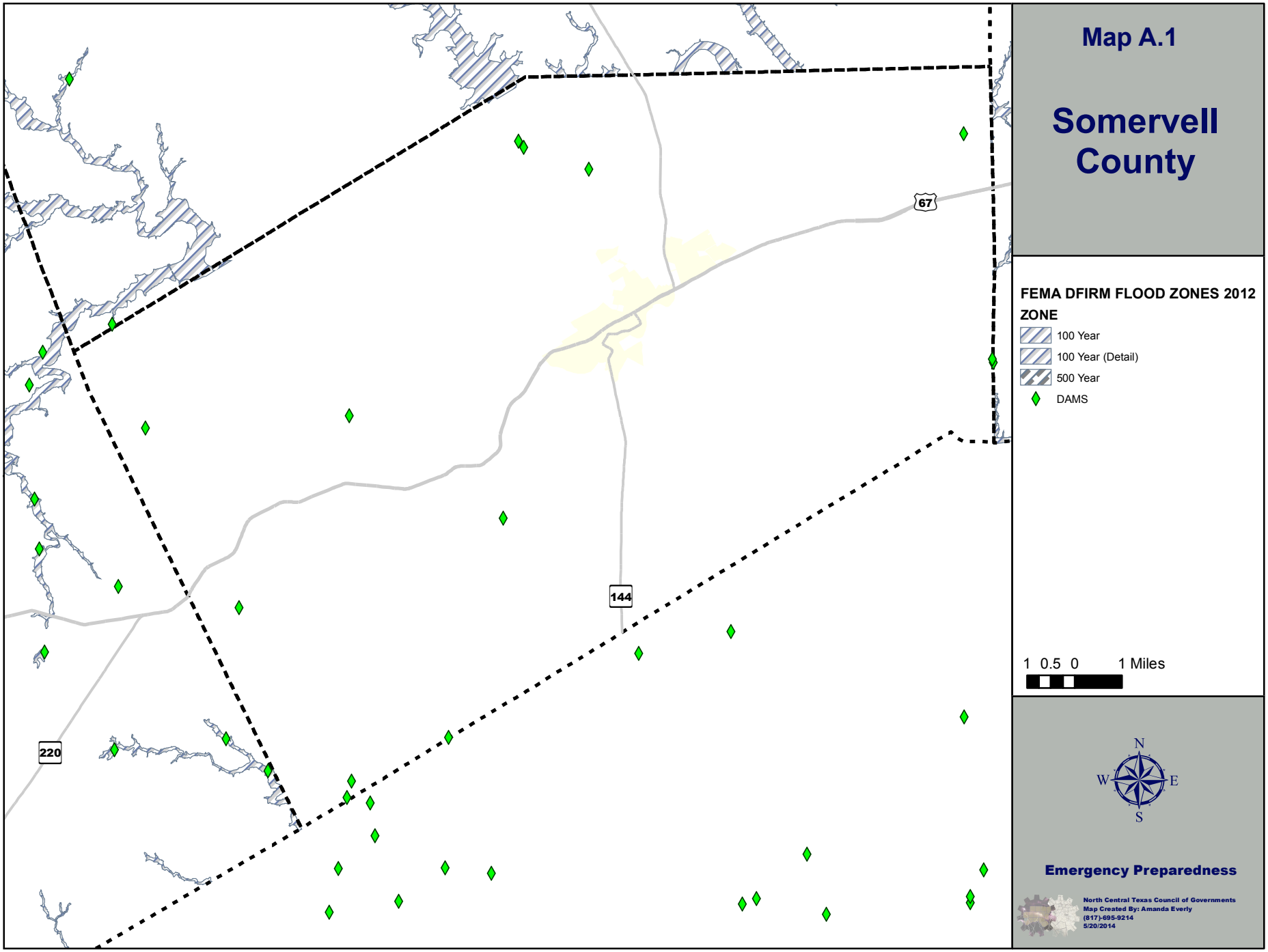

Map A.1

Somervell County

FEMA DFIRM FLOOD ZONES 2012

ZONE

- 100 Year
- 100 Year (Detail)
- 500 Year
- DAMS

1 0.5 0 1 Miles

N
W E
S

Emergency Preparedness

North Central Texas Council of Governments
Map Created By: Amanda Everly
(817)-695-9214
5/20/2014

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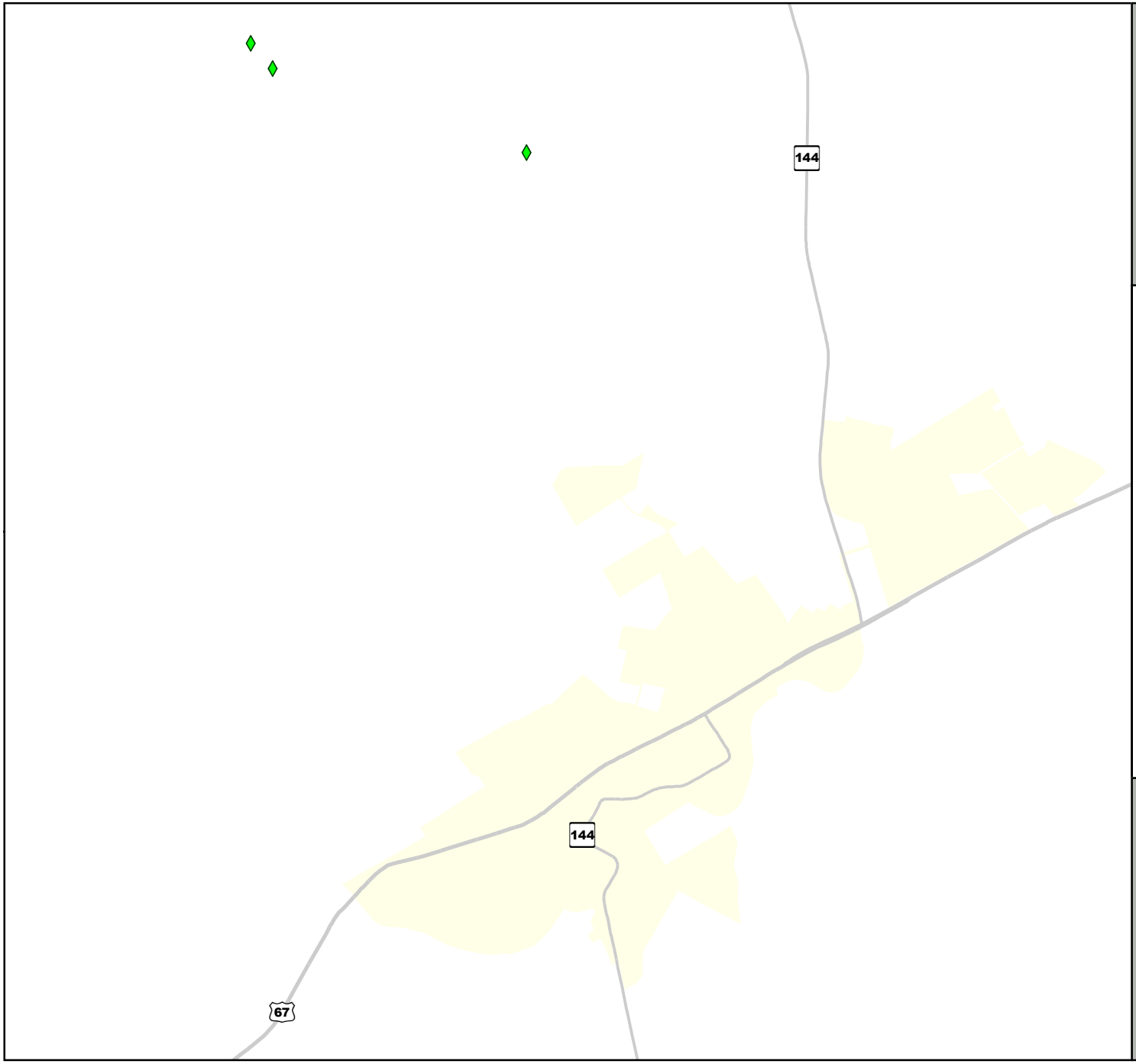

Map A.2

City of Glen Rose

FEMA DFIRM FLOOD ZONES 2012

ZONE

- 100 Year
- 100 Year (Detail)
- 500 Year
- DAMS

0.4 0.2 0 0.4 Miles

N
W E
S

Emergency Preparedness

North Central Texas Council of Governments
Map Created By: Amanda Everly
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5/20/2014

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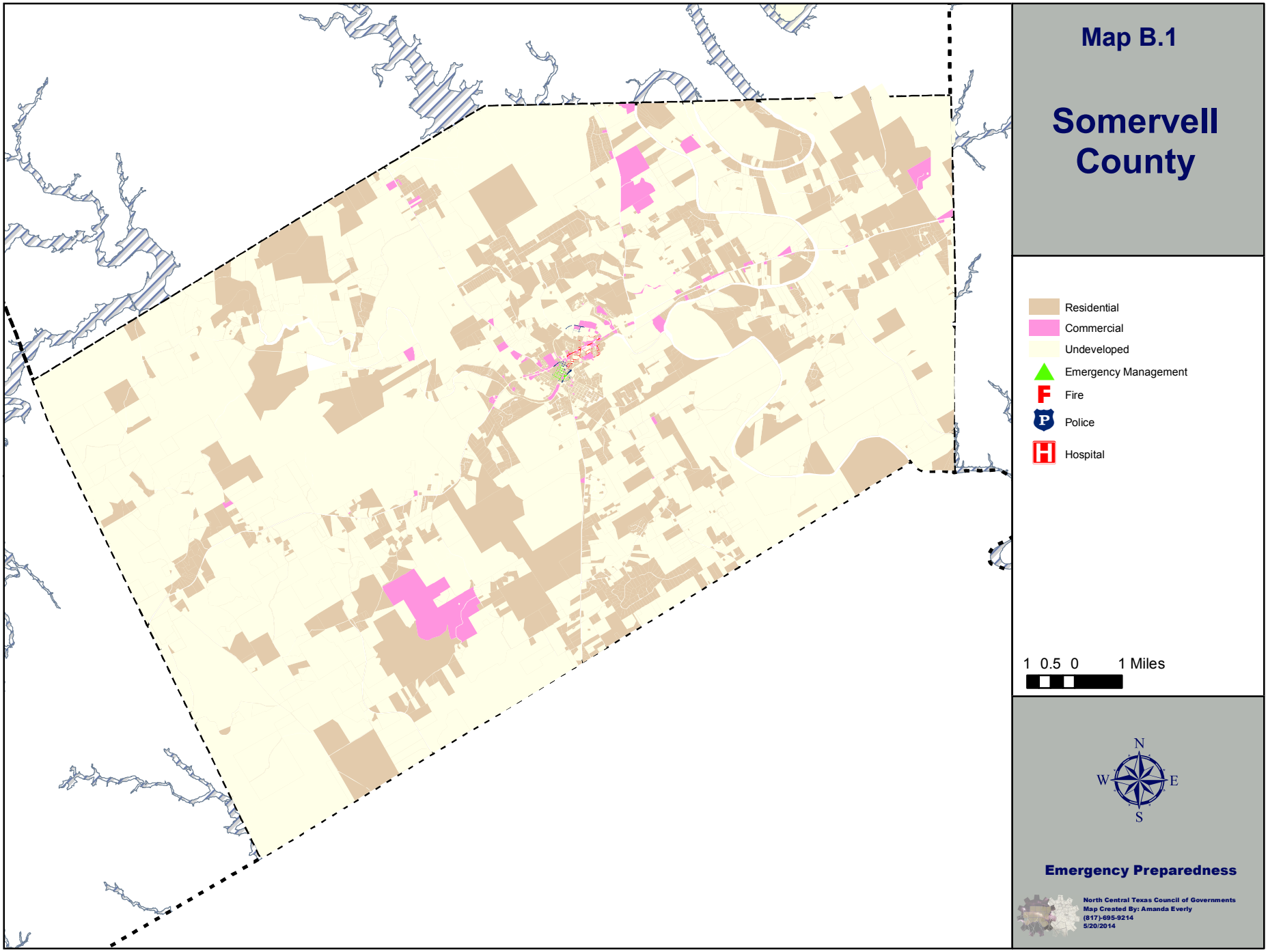
Map B.1
Somervell County
Residential
Commercial
Undeveloped
Emergency Management
Fire
Police
Hospital
1 0.5 0 1 Miles
N
W
E
S
Emergency Preparedness
North Central Texas Council of Governments
Map Created By: Amanda Everly
(817)-695-9214
5/20/2014

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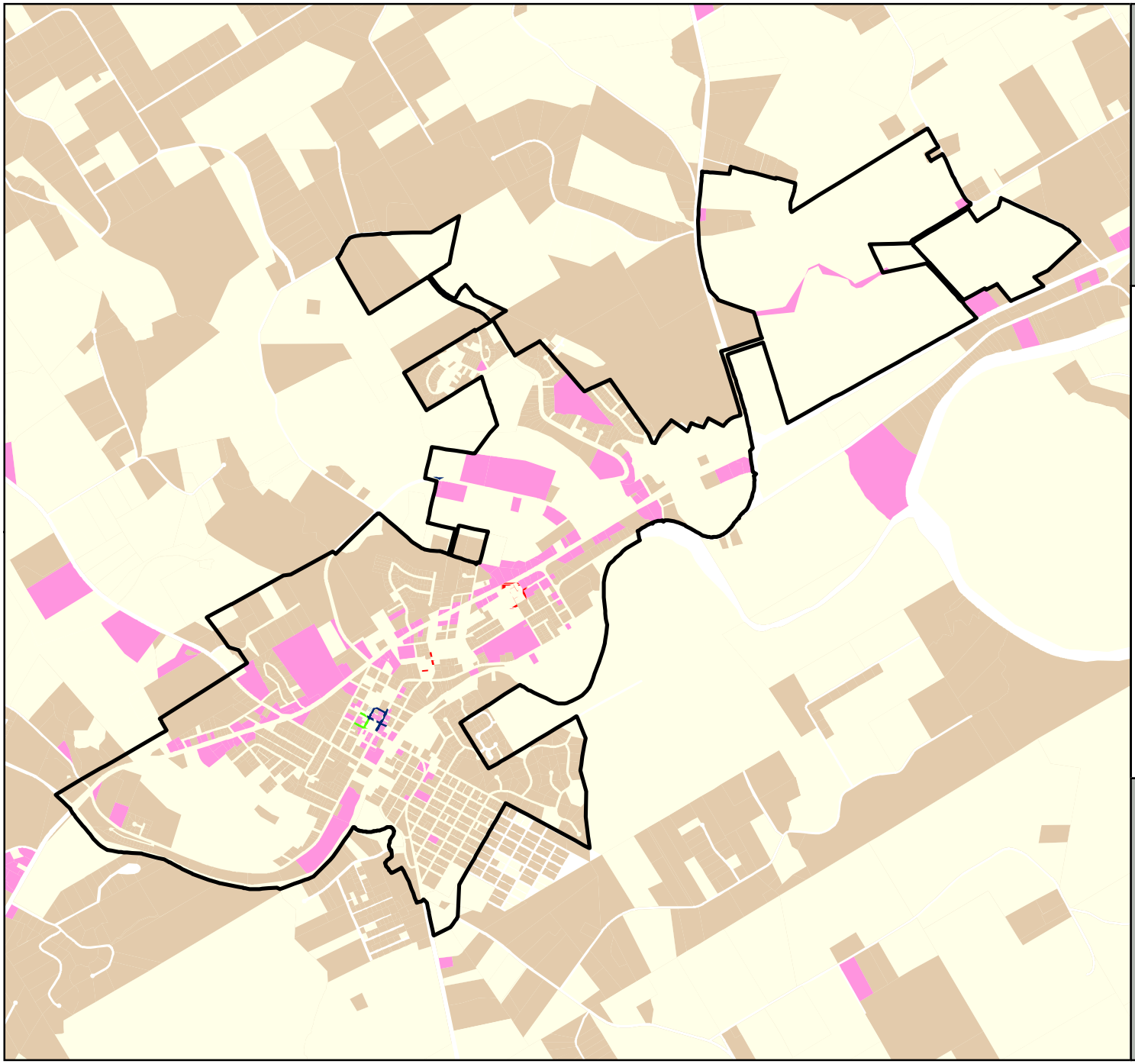

Map B.2

City of Glen Rose

Undeveloped
Commercial
Residential
Emergency Management
Fire
Police
Hospital

0.3 0.15 0 0.3 Miles

N
W E
S

Emergency Preparedness

North Central Texas Council of Governments
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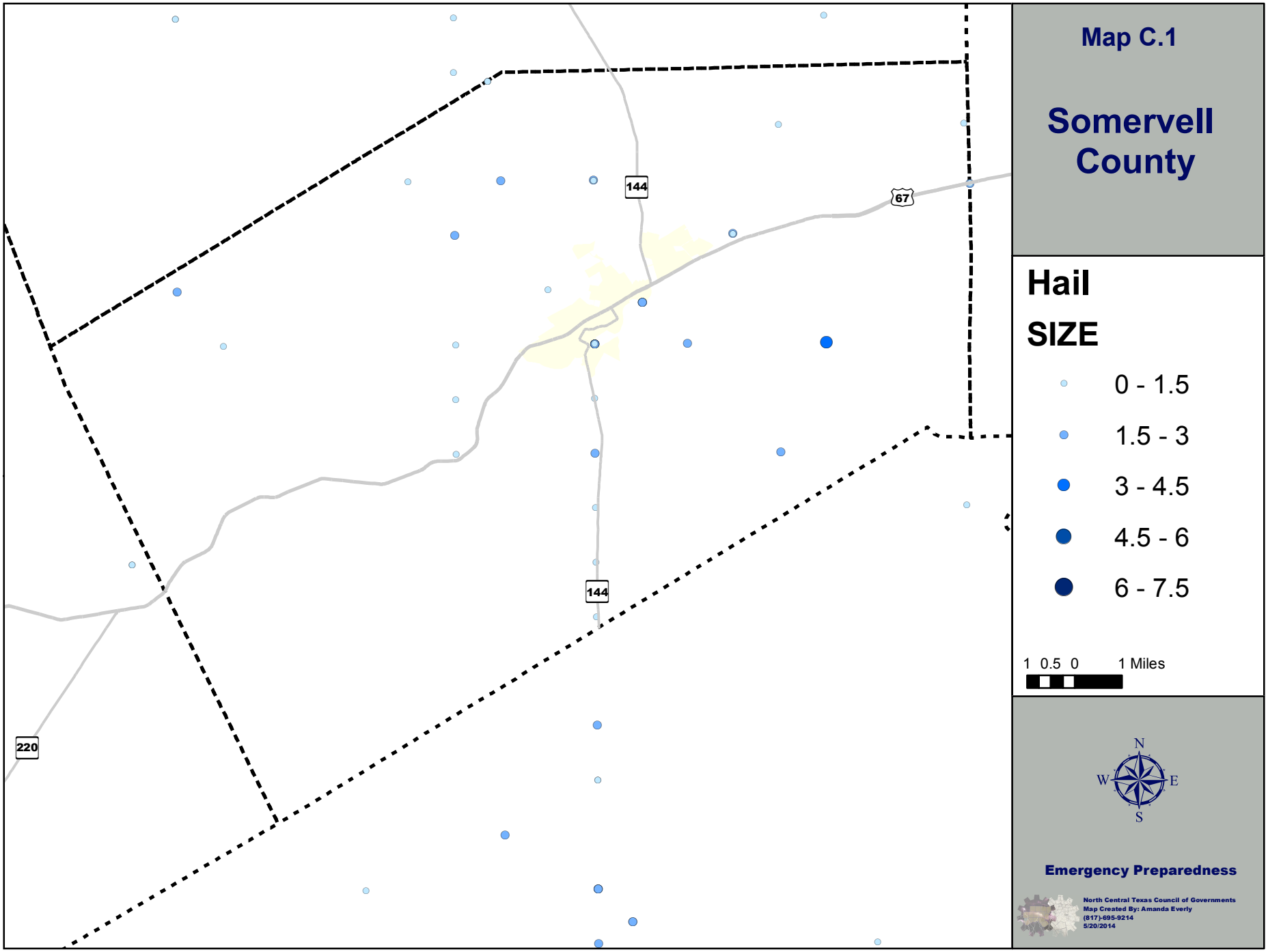

Map C.1

Somervell County

Hail SIZE

- 0 - 1.5
- 1.5 - 3
- 3 - 4.5
- 4.5 - 6
- 6 - 7.5

1 0.5 0 1 Miles

N
W E
S

Emergency Preparedness

North Central Texas Council of Governments
Map Created By: Amanda Everly
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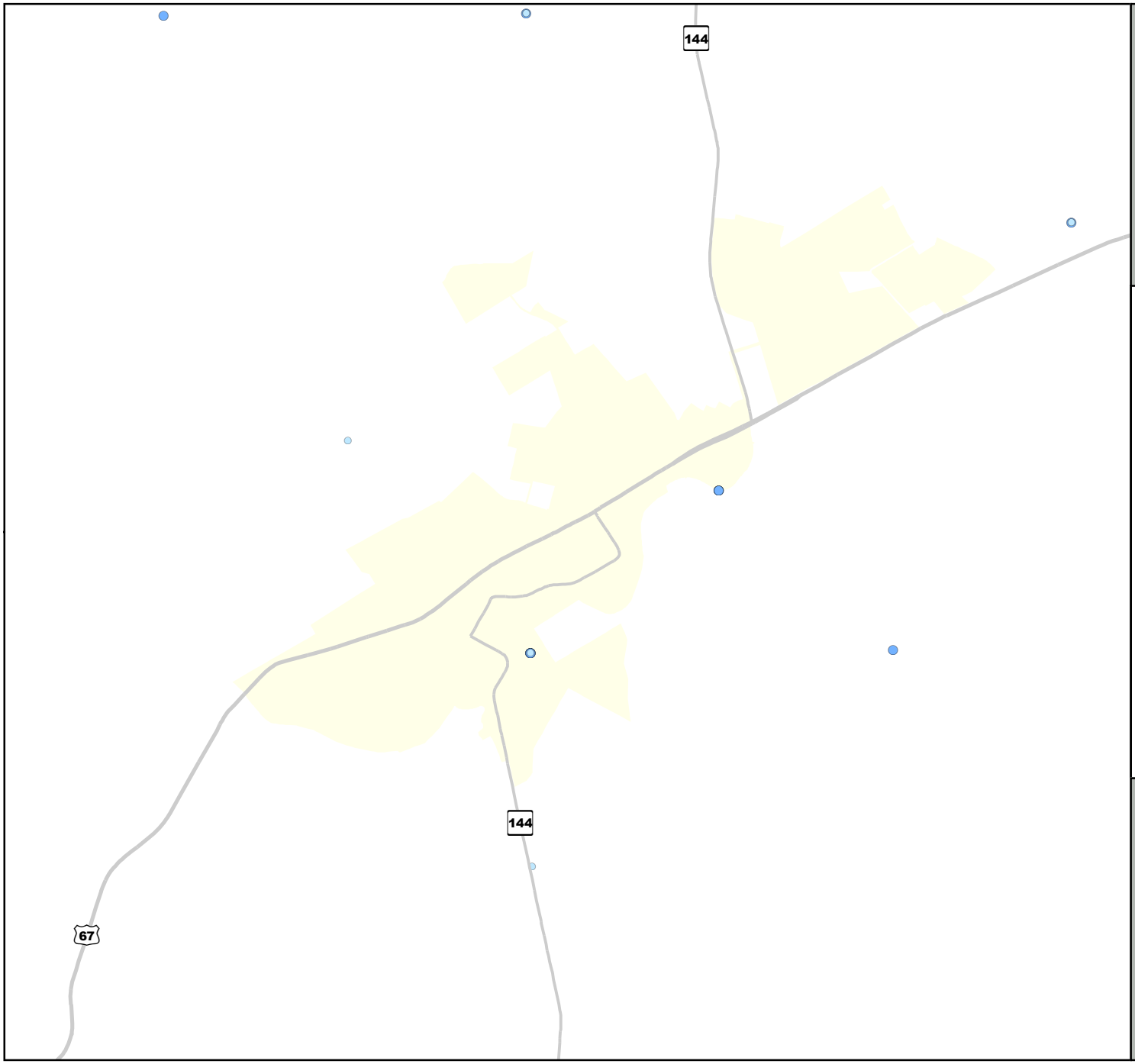

Map C.2

City of Glen Rose

Hail

SIZE

- 0 - 1.5
- 1.5 - 3
- 3 - 4.5
- 4.5 - 6
- 6 - 7.5

0.4 0.2 0 0.4 Miles

N
W E
S

Emergency Preparedness

North Central Texas Council of Governments
Map Created By: Amanda Everly
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5/20/2014

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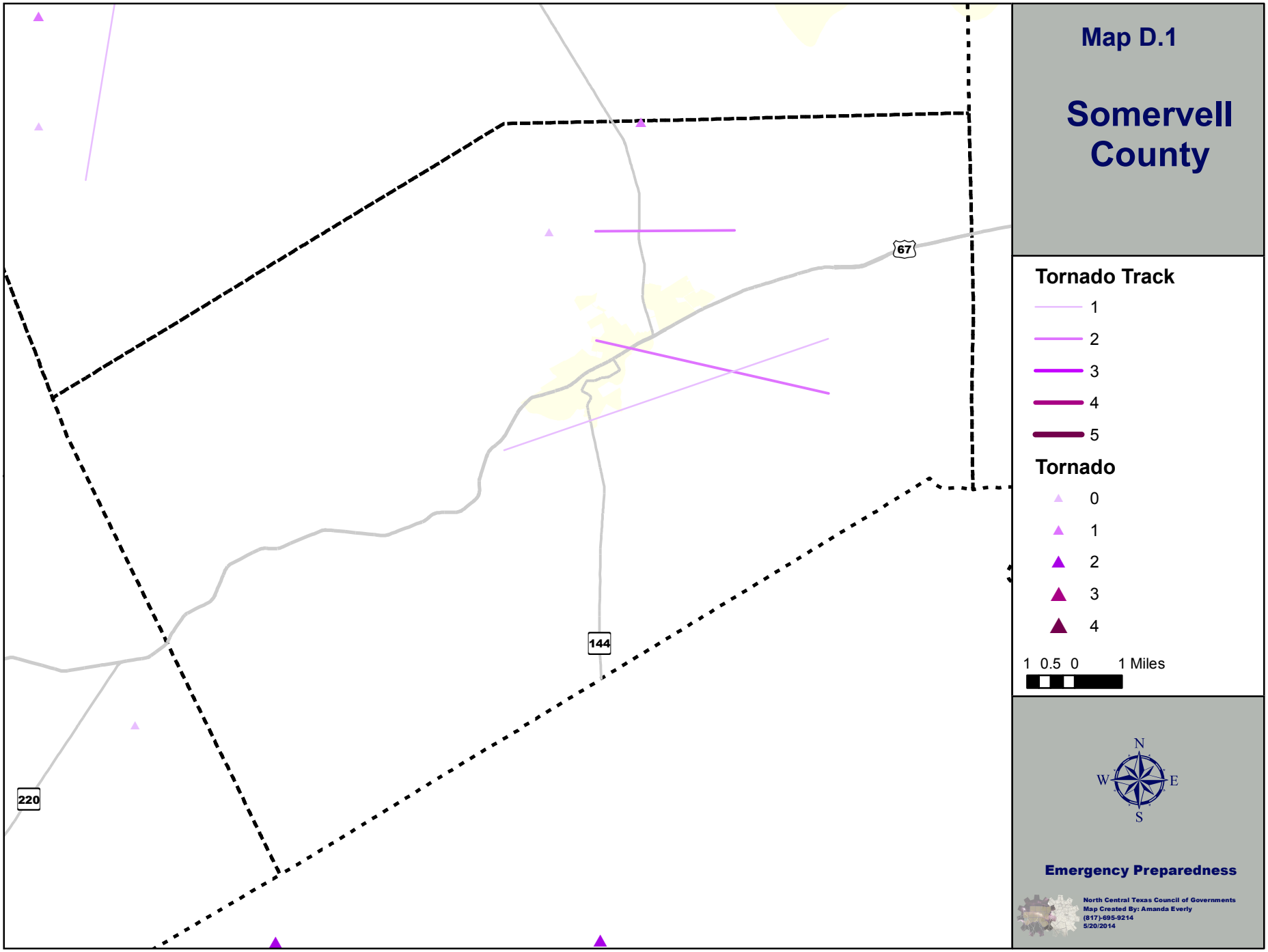

Map D.1

Somervell County

Tornado Track

1
2
3
4
5

Tornado

0
1
2
3
4

1 0.5 0 1 Miles

N
W E
S

Emergency Preparedness

North Central Texas Council of Governments
Map Created By: Amanda Everly
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5/20/2014

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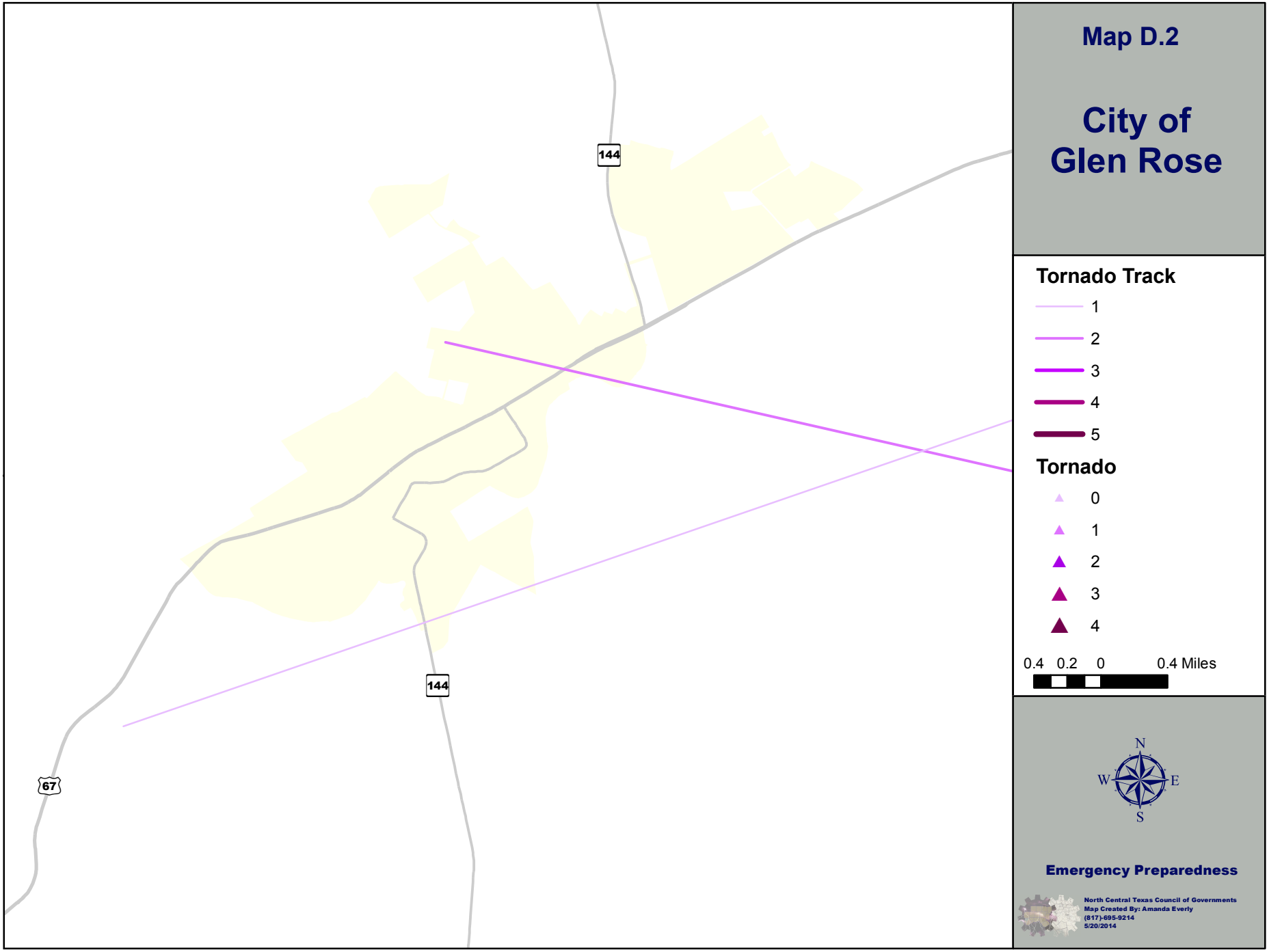

Map D.2

City of Glen Rose

Tornado Track

1
2
3
4
5

Tornado

0
1
2
3
4

0.4 0.2 0 0.4 Miles

N
W E
S

Emergency Preparedness

North Central Texas Council of Governments
Map Created By: Amanda Everly
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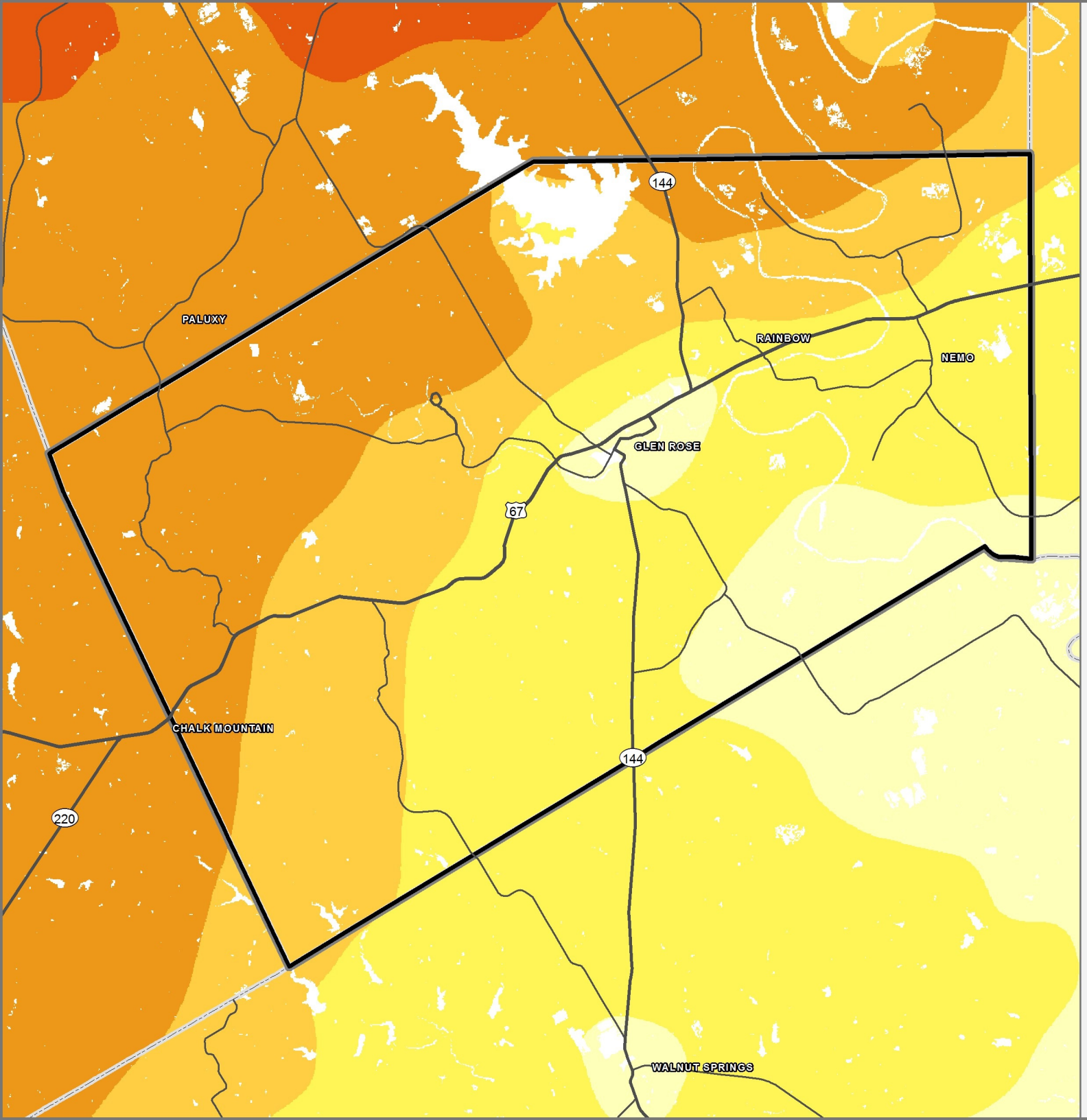

Map E.1
Somervell County

Wildfire Threat

- Non-Burnable
- 1 (Low)
- 2
- 3 (Moderate)
- 4
- 5 (High)
- 6
- 7 (Very High)

0 1 2 3 4 Miles

N

Date: 8/11/2014

Texas A&M Forest Service

Texas Wildfire Risk Assessment
http://www.texaswildfirerisk.com

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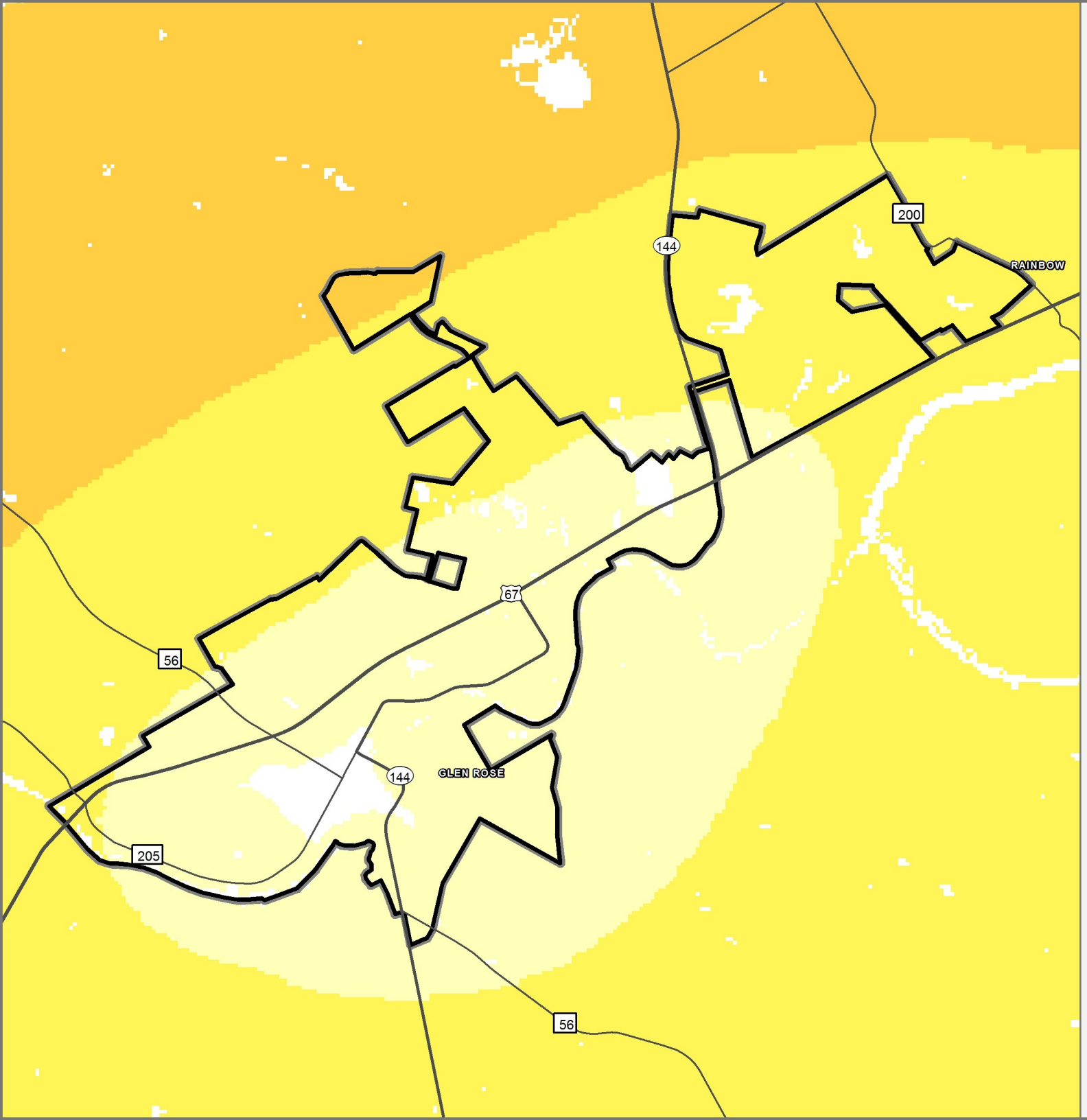

Map E.2
City of Glen Rose

Wildfire Threat

- Non-Burnable
- 1 (Low)
- 2
- 3 (Moderate)
- 4
- 5 (High)
- 6
- 7 (Very High)

0 0.2 0.4 0.6 0.8 Miles

N

Date: 8/11/2014

TEXAS A&M FOREST SERVICE

Texas Wildfire Risk Assessment
http://www.texaswildfirerisk.com

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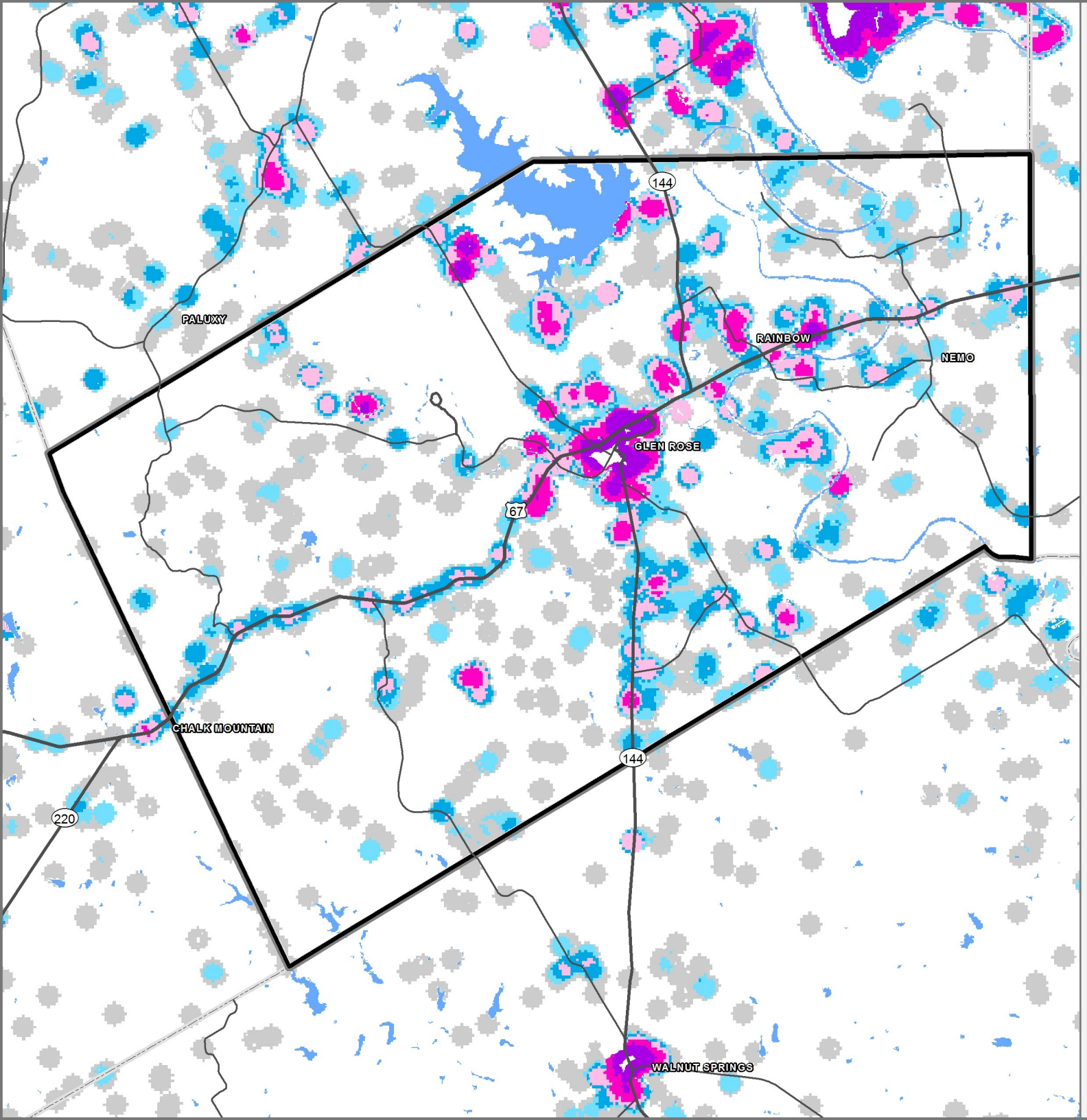

Map F.1
Somervell County

Wildland Urban Interface

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

0 1 2 3 4 Miles

N

Date: 8/11/2014

Texas A&M Forest Service

Texas Wildfire Risk Assessment
http://www.texaswildfirerisk.com

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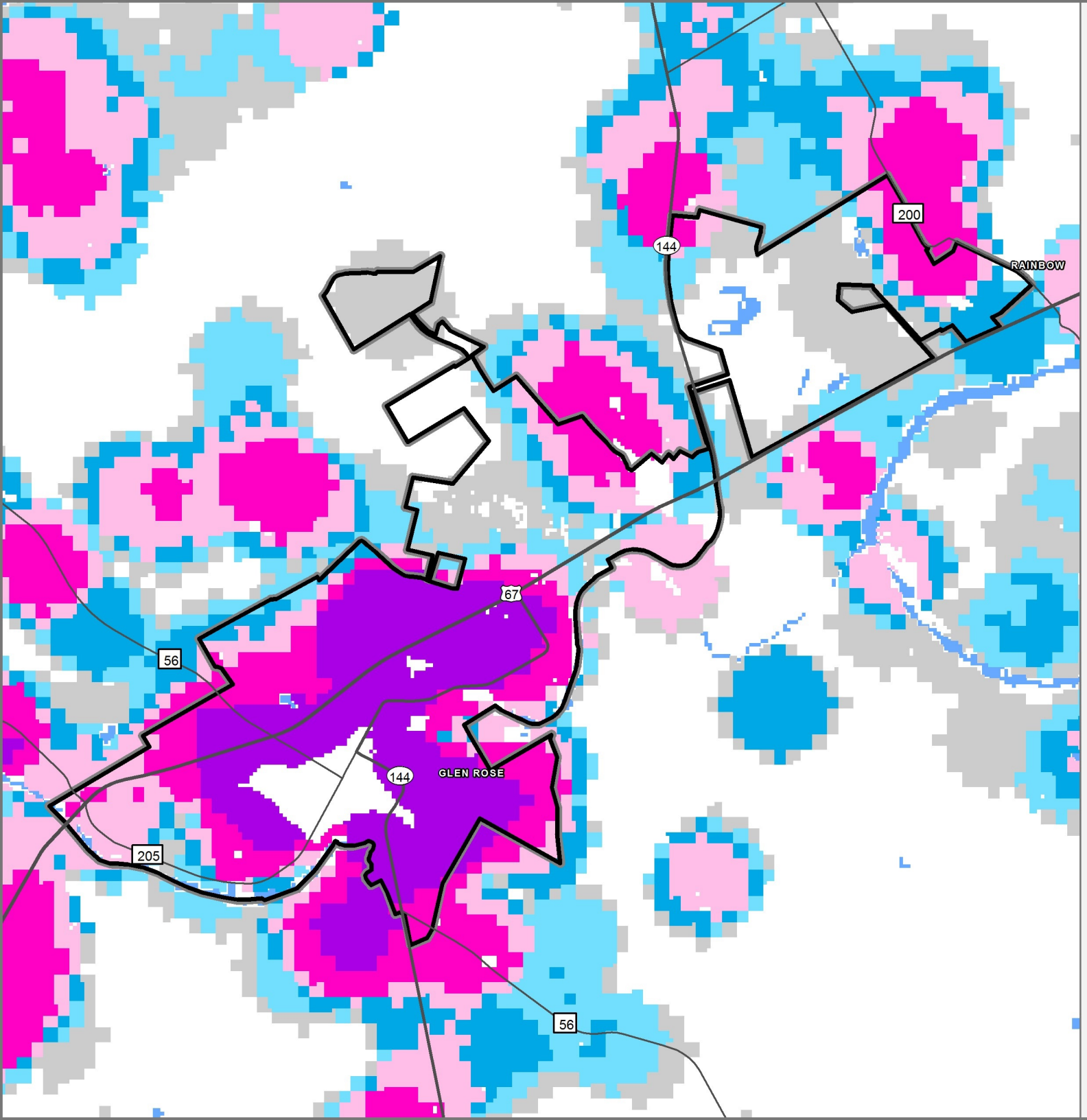

Map F.2
City of Glen Rose

Wildland Urban Interface

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

0 0.2 0.4 0.6 0.8 Miles

N

Date: 8/11/2014

Texas A&M Forest Service

Texas Wildfire Risk Assessment
http://www.texaswildfirerisk.com

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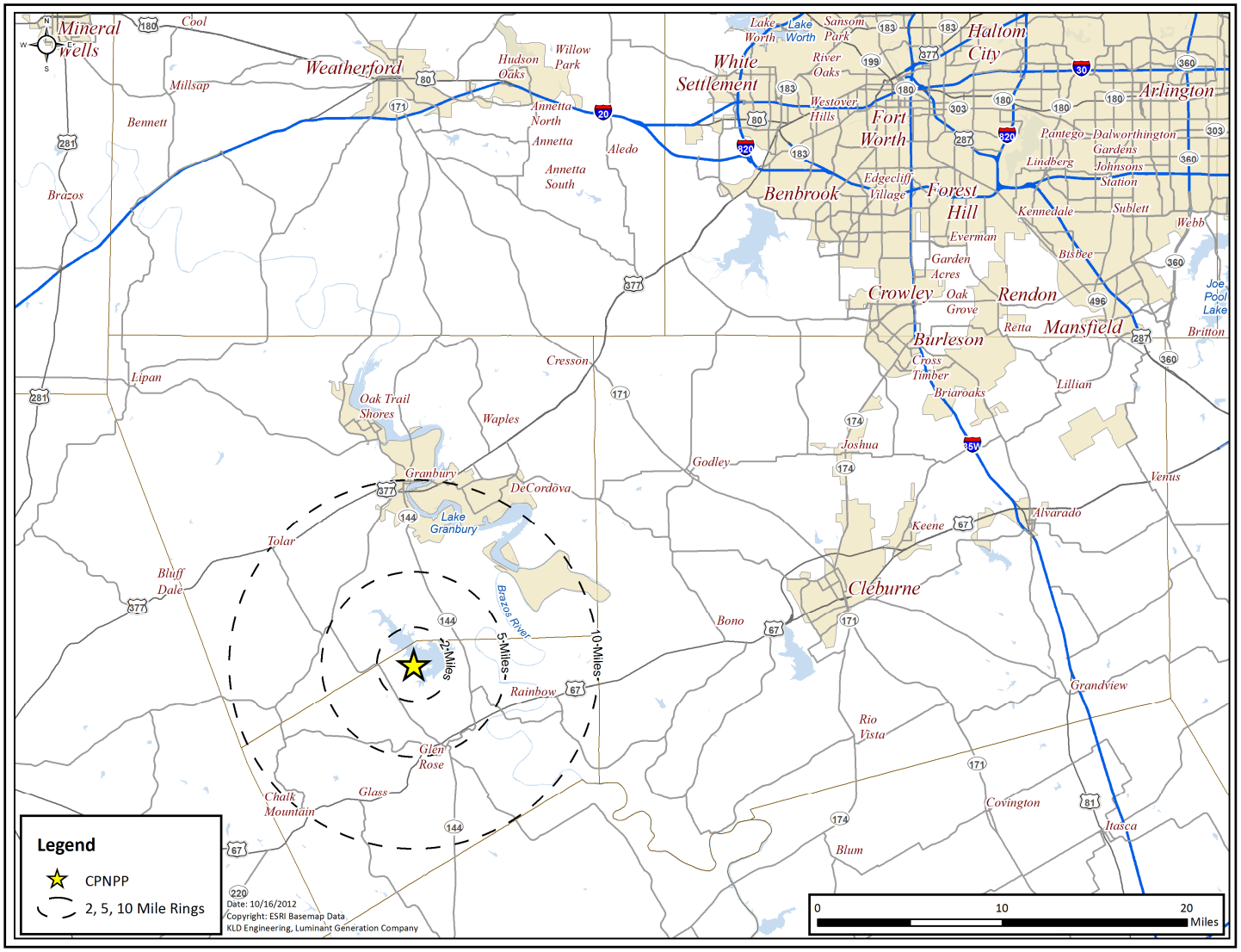

Map G.1

Comanche Peak Nuclear Power Plant
Evacuation Time Estimate

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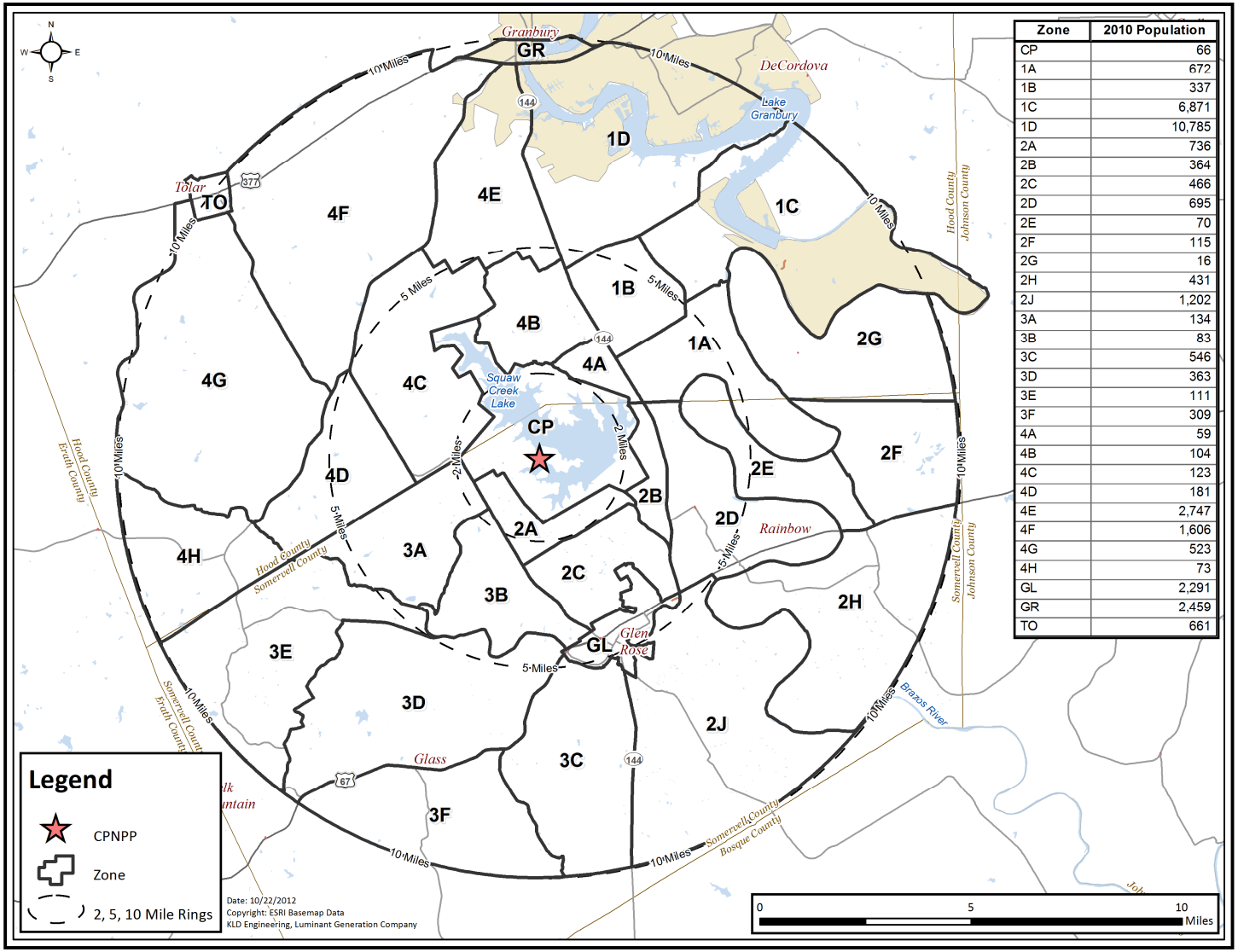

Zone	2010 Population
CP	66
1A	672
1B	337
1C	6,871
1D	10,785
2A	736
2B	364
2C	466
2D	695
2E	70
2F	115
2G	16
2H	431
2J	1,202
3A	134
3B	83
3C	546
3D	363
3E	111
3F	309
4A	59
4B	104
4C	123
4D	181
4E	2,747
4F	1,606
4G	523
4H	73
GL	2,291
GR	2,459
TO	661

Map G.2

Comanche Peak Nuclear Power Plant
Evacuation Time Estimate

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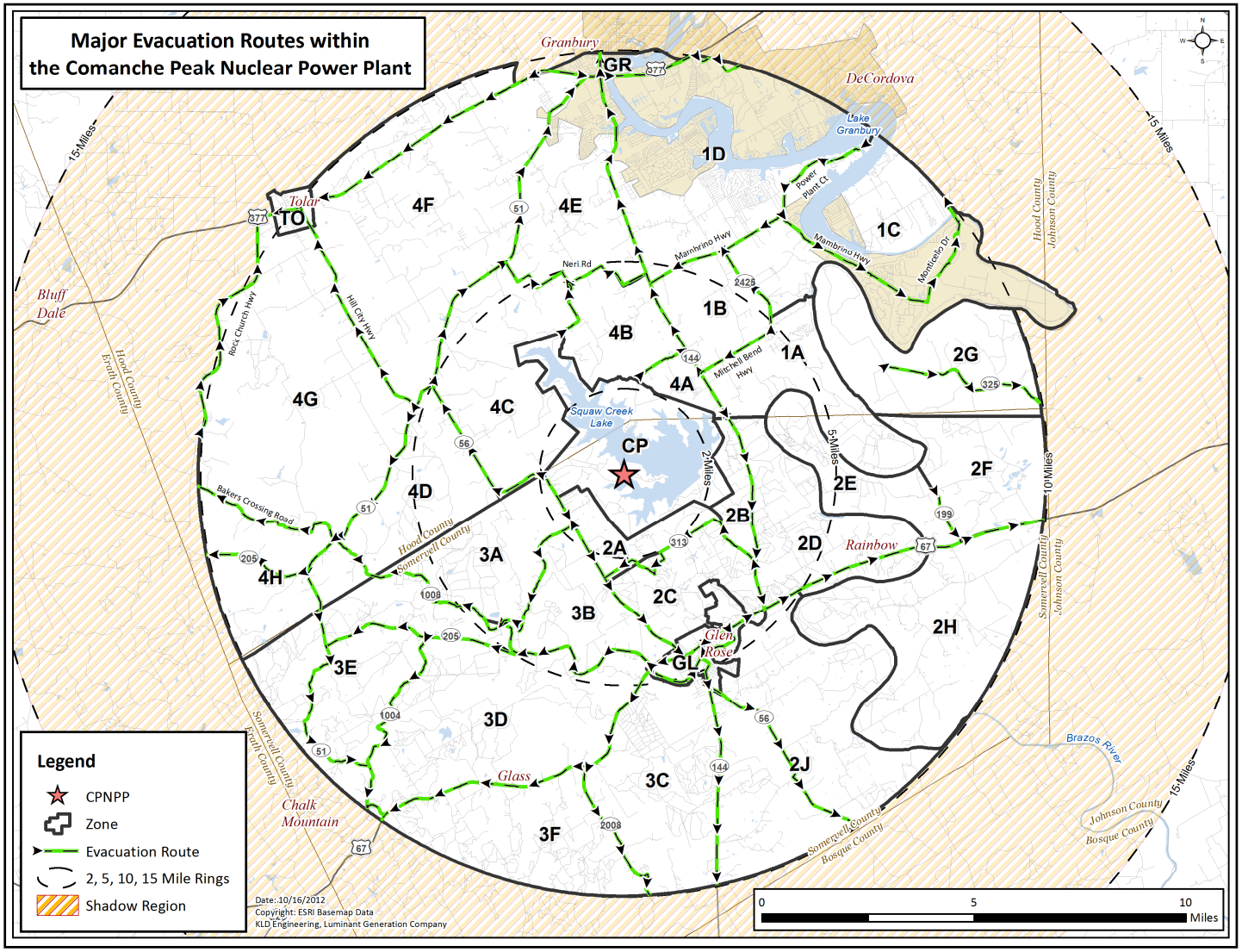

Map G.3

Comanche Peak Nuclear Power Plant Evacuation Routes

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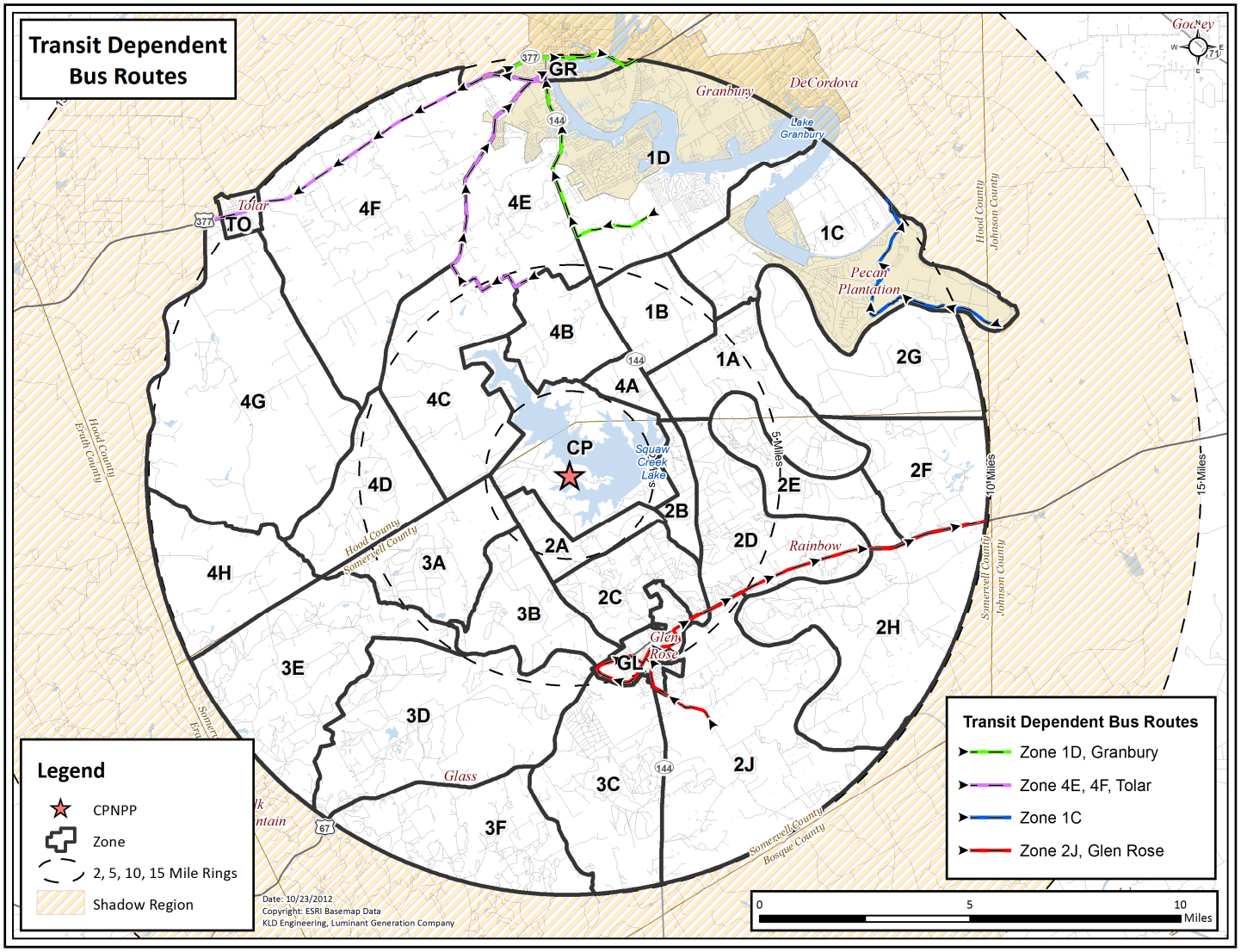

Comanche Peak Nuclear Power
Plant transit Dependent Bus Routes

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3.3 Extent

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

Drought

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

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

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

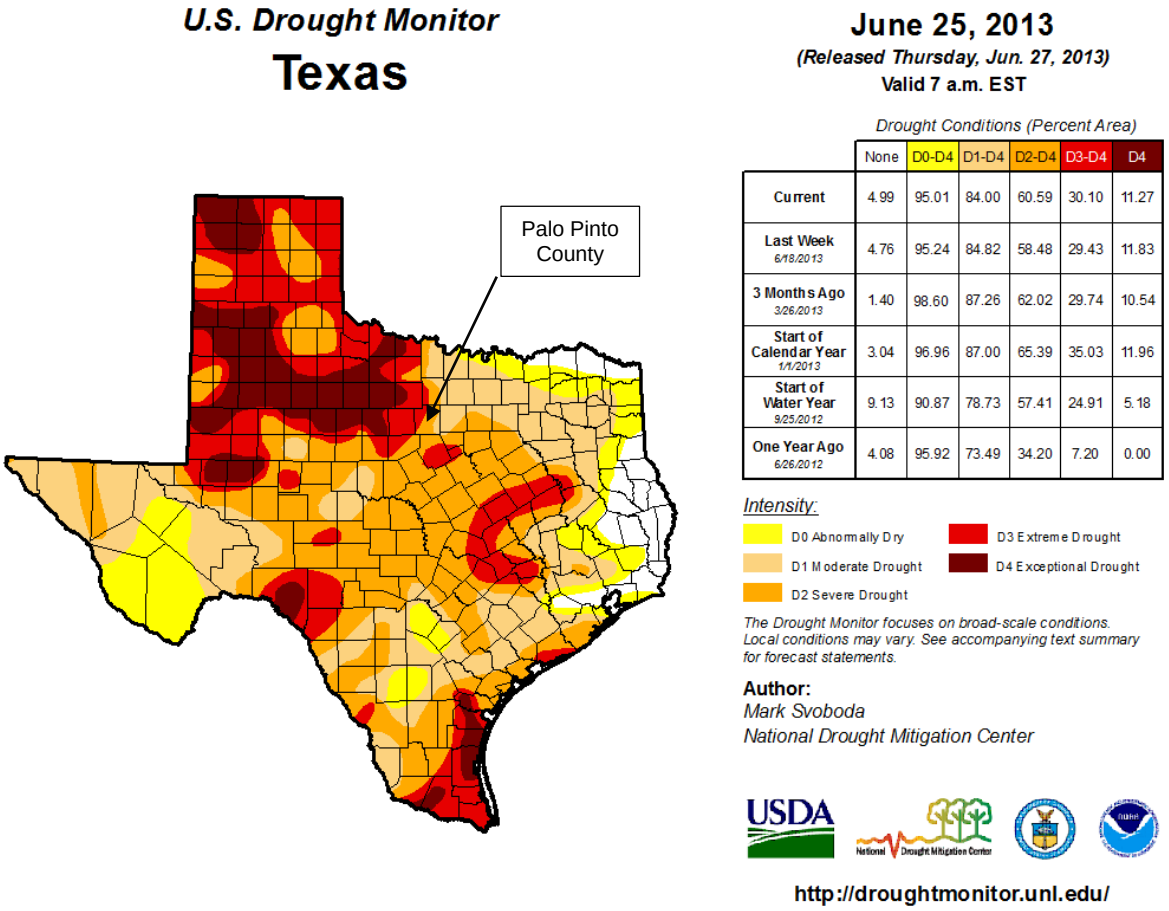
Figure 3.1 PSDI Classifications

PDSI Classifications for Dry and Wet Periods	
4.00 or more	Extremely wet
3.00 to 3.99	Very wet
2.00 to 2.99	Moderately wet
1.00 to 1.99	Slightly wet
0.50 to 0.99	Incipient wet spell
0.49 to -0.49	Near normal
-0.50 to -0.99	Incipient dry spell
-1.00 to -1.99	Mild drought
-2.00 to -2.99	Moderate drought
-3.00 to -3.99	Severe drought
-4.00 or less	Extreme drought

Source: http://drought.unl.edu/whatis/indices.htm

Drought conditions occur in this community. The PDSI Classification allows community planners to anticipate the effects of drought and plan preparedness and mitigation activities for future events as they will likely occur. The last event of widespread drought in Somervell County was on 6/1/2013.

Figure 3.2 Drought Monitor



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

Somervell County and participating jurisdictions have experienced 38 drought events, ranging from Abnormally Dry (D1) to Exceptional Drought (D4), during the time period analyzed for this plan (01/01/2002-06/30/2013). It can be expected that future drought events will be of similar magnitude.

Earthquake: Mercalli & Richter Scales Comparison

Figure 3.3 Earthquake: Mercalli & Richter Scales Comparison

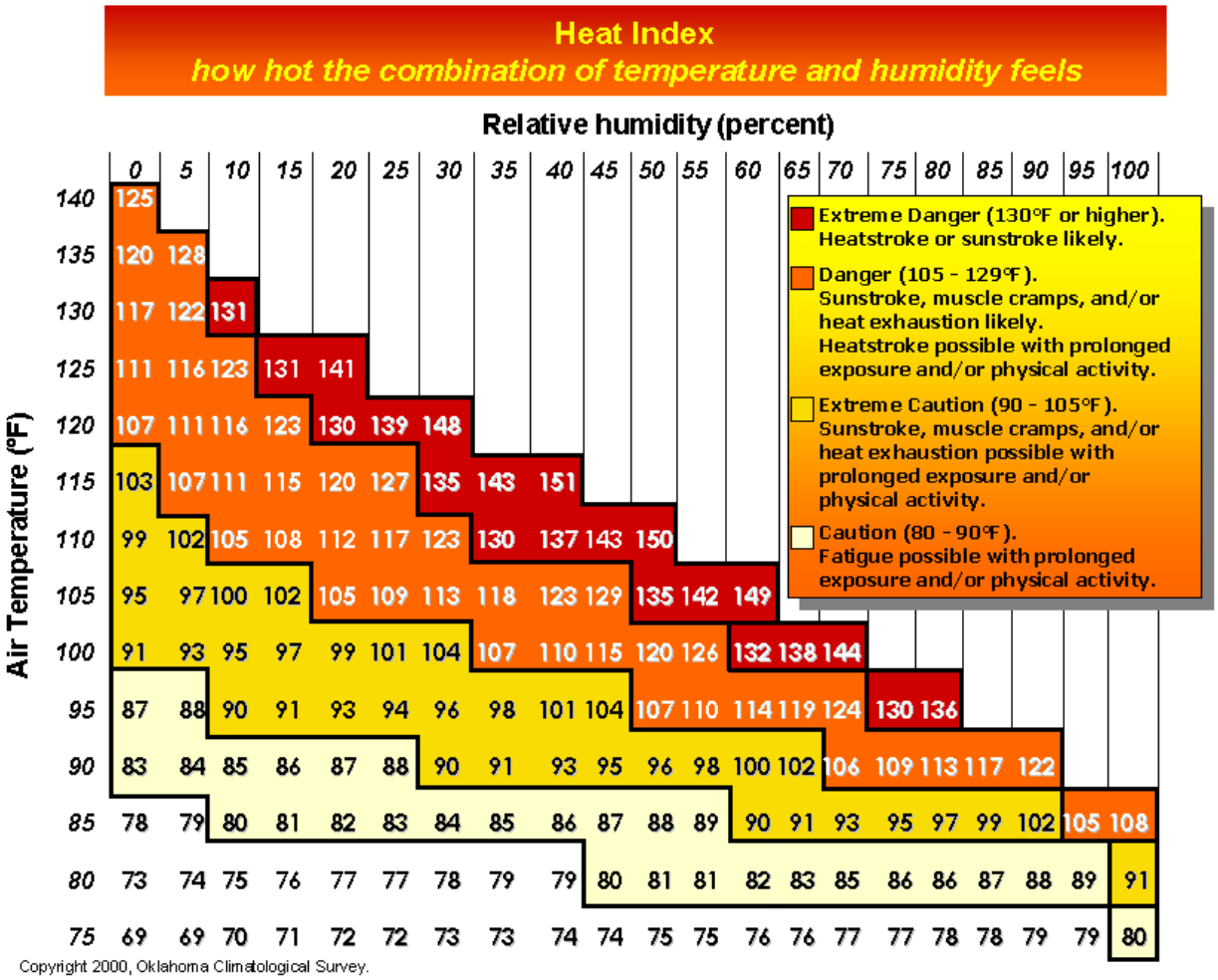
Mercalli Scale	Richter Scale	
I.	0 – 1.9	Not felt. Marginal and long period effects of large earthquakes.
II.	2.0 -2.9	Felt by persons at rest, on upper floors, or favorably placed.
III.	3.0 – 3.9	Felt indoors. Hanging objects swing. Vibration like passing of light trucks. Duration estimated. May not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

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

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

The Mercalli and Richter Scales allow planners to assess the impact earthquakes have. There have been no recorded earthquakes in Somervell County. Somervell County and participating jurisdictions did not experienced any earthquakes during the time period analyzed for this plan (01/01/2002-06/30/2014). There is the potential for future earthquake events.

Figure 3.4 Heat Index



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

The Heat Index chart displays the relative danger in regards to air temperature and relative humidity. Extreme heat is a hazard this community faces on an annual basis during the summer season. A combination of high temperatures and high humidity prompt heat advisories. This chart allows communities to assess the population's danger in regards to heat index. According to the National Climatic Data Center, the last extreme heat event in Somervell County occurred on 8/1/2011. Somervell County and participating jurisdictions experienced one excessive heat event during a prolonged period of heat during the summer of 2011, August 1-5 saw daily highs ranging from 106-111.The whole North Texas Region experienced over a month of 100-degree plus temperatures during this time. It can be expected that any future heat or excessive heat incidents will be similar in magnitude.

Flood Zones

Figure 3.5 Flood Zone Classification

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

Source: 34T*http://www.fema.gov/floodplain-management/flood-zones*34T

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

The planning communities are participants in the National Flood Insurance Program and actively take measures to plan land use. The communities are subject to flash flooding hazards such as the event on 7/8/2007 that occurred in the City of Glen Rose. According to the National Climatic Data Center, the flash flood event lasted one and a half hours and resulted in $400,000 worth of property damage.

Somervell County and participating jurisdictions experienced six flood and flash flood events during the time period analyzed for this plan. Most of the flood and flash flood events were a result of excessive rainfall over a short amount of time. These events resulted mainly in over-the-road flooding and minor to moderate property damage, with one event resulting in two deaths. It can be expected that any future flood or flash flood events will be similar in magnitude.

Combined NOAA/TORRO Hailstorm Intensity Scales

Figure 3.6 Combined NOAA/TORRO Hailstorm Intensity Scales

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

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

The Hailstorm Intensity Scale is representative of the damage from hail storms this community has experienced in the past and will likely experience in the future. The Hailstorm Intensity Scale allows planners to gauge past damage and mitigate for future expected damage. For example, according to the National Climatic Data Center, a hail event in the unincorporated county on 4/25/2011 caused $3,000 in property damage.

Somervell County and participating jurisdictions experienced 12 hail events ranging from magnitude H2 (.75 inch diameters) to magnitude H5 (1.75 inch diameters), during the time period analyzed for this plan (01/01/2002—6/30/2013). It can be expected that any future hail events will be similar in magnitude.

Beaufort Wind Scale

Figure 3.7 Beaufort Wind Scale

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

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

The Beaufort Wind Scale is representative of the damage from high winds this community may endure. The Beaufort Wind Scale allows planners in the community to assess historical data and mitigate for future high wind events. For example, according to the National Climatic Data Center, on 5/6/2009, the City of Glen Rose experienced $5,000 worth of property damage.

Somervell County and participating jurisdictions experienced 18 high wind events ranging from 35 knots to 65 knots (40.3 to 74.8 mph), during the time period analyzed for this plan (01/01/2002—6/30/2013). It can be expected that any future high wind events will be similar in magnitude.

Lightning

Figure 3.9 Lightning Activity Level Grid

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

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

The Lightning Activity Level grid provides a way to gauge the average number of strikes that may accompany a given type of storm. The average number of strikes is given since the density of lightning strikes varies from storm to storm. According to the National Climatic Data Center, there has been one lightning event reported in Somervell County since 2002. This lightning event caused $100,000 in property damage.

Somervell County and participating jurisdictions experienced one lightning event that caused a total of $100,000 in damage, during the time period analyzed for this plan (01/01/2002—6/30/2013). It can be expected that any future lightning events will be similar in magnitude.

Fujita Scale

Figure 3.9 Fujita Scale

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

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

On February 1, 2007, the Fujita scale was decommissioned in favor of the more accurate Enhanced Fujita Scale, which replaced it. None of the tornadoes recorded on or before January 30, 2007 will be re-categorized. Therefore maintaining the Fujita scale will be necessary when referring to previous events.

Enhanced Fujita Scale

Figure 3.10 Enhanced Fujita Scale

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

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

The Enhanced Fujita Scale is representative of the damage from tornadoes this community has faced in the past and will no doubt face in the future. The Enhanced Fujita Scale allows planners to prepare and mitigate future potential damage by assessing the historical nature of tornados in the planning community. For example, according to the National Climatic Data Center on 4/10/2008, an EF1 tornado occurred in the City of Glen Rose and caused $200,000 worth of property damage.

Somervell County and participating jurisdictions experienced two tornado events ranging from EF0 to EF1, during the time period analyzed for this plan (01/01/2002—6/30/2013). It can be expected that any future tornado events will be similar in magnitude.

Keetch-Byram Drought Index

Figure 3.11 Keetch-Byram Drought Index

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

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

The index scale ranges from 0 to 800 and represents moisture deficiency in hundredths of an inch. By looking at indicators of moisture deficiency in the soil in this chart, communities are able to assess when they are at a heightened danger for a wildfire. According to the National Climatic Data Center there has been 1 wildfire event in Somervell County since 2002. On 3/11/2011, a wildfire caused $2,000.

Fire Danger

Figure 3.12 Fire Danger

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

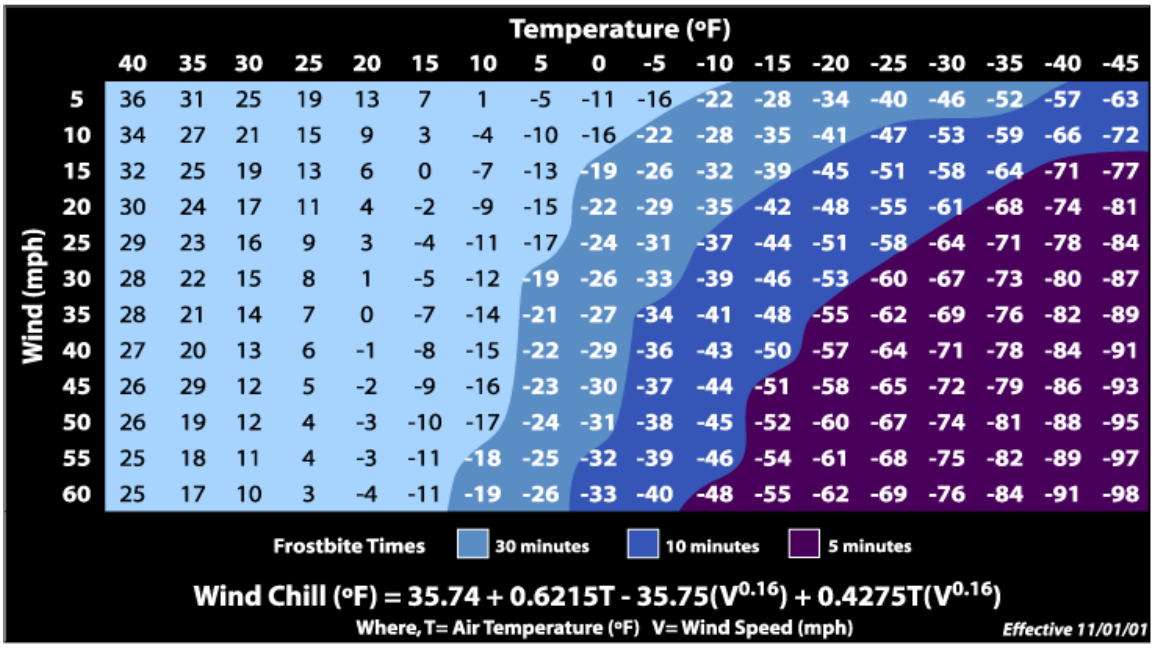
Source: http://www.wfas.net/index.php/fire-danger-rating-fire-potential--danger-32/class-rating-fire-potential-danger-51?task=view

Somervell County and participating jurisdictions experienced one wildfire event, that burned around 500 acres, during the time period analyzed for this plan (01/01/2002—6/30/2013). It can be expected that any future wildland fire events will be similar in magnitude.

Wind Chill

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° day would feel just as cold as a calm day with 0° temperatures. The index was created in 1870, and on November 1, 2001, the National Weather Service released a more scientifically accurate equation, which we use today. Here is a chart for calculating wind chill. (Please note that it is not applicable in calm winds or when the temperature is over 50°.)

Figure 3.13 NOAA Wind Chill Chart



Wind (mph)	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	29	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Source: National Weather Service and NOAA

The Wind Chill Chart displays the frostbite times in regards to temperature and wind.

Ice Accumulation

Figure 3.14 Ice Accumulation Index

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

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

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

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

This chart allows the communities to prepare for a winter storm or an ice event. These events are infrequent but can cause damage. The primary areas of concern are on bridges and roadways. For example, according to the National Climatic Data Center, on 2/1/2011, an ice storm caused $40,000 in property damage across Somervell County.

Somervell County and participating jurisdictions experienced 11 winter storm events ranging from heavy snow to ice, during the time period analyzed for this plan (01/01/2002—6/30/2013). The winter storm events ranged from 3-5 inches of snow fall, 1-3 inches of sleet, and up to an inch of ice accumulation. It can be expected that any future events will be similar in magnitude.

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

Figure 3.15 Figure Extent Charts

	High	Medium	Low
Dam Failure	• Greater than 50% of city structures are in the inundation zone. • Greater than 50% of the city's critical infrastructure in the identified inundation zone	• 20%-50% of city structures are in the inundation zone. • 20%-50% of the city's critical infrastructure in the inundation zone	• Less than 20% of city structures are in the inundation zone. • Less than 20% of the city's critical infrastructure in the inundation zone
Drought	• PDSI 3.00- 4.00 or less • Severe to extreme drought conditions	• PDSI 1.00- 2.99 • Mild to moderate drought conditions	• PDSI 4.00 or more - 0.99 • Extremely wet to incipient dry spells
Earthquake	• Mercalli Scale: VIII-XII • Richter Scale: 6.2->8.1 • Driving will be difficult, increase in damage to infrastructures and objects can be thrown	• Mercalli Scale: VI-VII • Richter Scale: 4.9-6.1 • All will feel the event, walking will be difficult, glassware will break, irrigation ditches damaged	• Mercalli Scale: I-V • Richter Scale: 0-4.8 • Range of feeling the event is cannot be felt to being felt outdoors.
Extreme Heat	• Heat Index >130F • Heatstroke or sunstroke likely	• Heat Index 105F-129F • Sunstroke, muscle cramps, and/pr heat exhaustion likely. Heatstroke possible with prolonged exposure and/or physical activity.	• Heat Index 80F-105F • Fatigue possible with prolonged exposure and/or physical activity, Sunstroke, muscle cramps, and/or heat exhaustion possible with prolonged exposure and/or physical activity.
Flooding	• 100yr Flood Zone, Zone A • The extent of severity in the 100yr Flood Zone will be dependent on the structures and livestock located in the identified area.	• 500yr Flood Zone, Zone B • The extent of severity in the 500yr Flood Zone will be dependent on the structures and livestock located in the identified area.	• Outside of100yr and 500yr Flood Zones, Zone C, F, X • Potential for flooding due to local drainage problems
Hail	• H7-H10, 2.4"->4" • There will be severe damage. Including roof and structural damage and risk of serious injuries to fatalities.	• H5-H6, 1.6"-2.4" • There will be a range of severe damage from well-constructed houses being destroyed to houses being swept away.	• H0-H4, 0"-1.6" • There will be a variance of destruction to vegetation and slight damage to glass.
High Winds	• Force: 8-12 • Knots: 28-64+ • Whole trees moving to considerable structure damage	• Force: 4-6 • Knots: 11-27 • Dust, leaves, and loose paper lifted. Small to Large branches moving.	• Force: 0-3 • Knots: <1-10 • Calm, leaves rustle, light flags extended
Lightning	• LAL 5--Towering cumulus and thunderstorms are numerous, covering more than three-tenths of the sky. Rain is moderate/ heavy, lightning is frequent and intense. • LAL 6--Dry thunderstorms, conditions similar to LAL 3	• LAL 3-- Towering cumulus covering ≤2/10 of the sky. Two to three thunderstorms must occur. Light/ moderate rain, infrequent lightning • LAL 4--Towering cumulus covers 2/10 – 3/10 of the sky. More than three	• LAL 1-- No thunderstorms. • LAL 2-- Cumulus clouds, only a few towering cumulus. A single thunderstorm must be confirmed. The clouds produce virga and occasional

	High	Medium	Low
		thunderstorms must occur. Moderate rain, lightning is frequent.	light rain. Infrequent lightning.
Tornado	• EF3-EF5 • There will be a range of severe damage from well-constructed houses being destroyed to houses being swept away	• EF1-EF2 • There will be a range of moderate to considerate damage. Roofs will be severely stripped, manufactured homes overturned, and cars lifted off of the ground	• EF0 • There will be light damage. Roofs will be peeled off, gutters damaged, and branches broken •
Wildland Fire	• KBDI 600-800 • Associated with severe drought. Intense, deep-burning fires with significant downwind spotting.	• KBDI 200-400 • Ranges from lower litter and duff layers are drying and beginning to contribute to fire intensity to them causing the fire to burn actively.	• KBDI 0-200 Soil moisture and large class fuel moistures are high and do not contribute much to fire intensity.
Winter Storms	• Temperatures 15F- -45F • Wind Chill 7F- -98F • At wind chill of -19F frostbite will occur in 30 minutes increasing in severity to occurrence in 5 minutes.	• Temperatures 30F- 20F • Wind Chill 25F- -4F • Bridges and roadways are at risk to ice.	• Temperatures 40F-35F • Wind Chill 36F-17F • Vulnerable populations and agriculture at risk to lower temperatures and wind chill.

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

Table 3.1 Extent Scales

	Unincorporated	Glen Rose
Dam Failure	Low	Low
Drought	High	High
Earthquake	Low	Low
Extreme Heat	Medium	Medium
Flooding	High	High
Hail	Medium	Medium
High Winds	Medium	Medium
Lightning	Medium	Medium
Tornado	High	High
Wildland Fire	High	High
Winter Storms	Medium	Medium

3.4 Priority Risk Index

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

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

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

The higher the PRI value, the greater the hazards risk. These values were obtained by assigning varying degrees of risk to four categories for each hazard: Probability, Life Impact, Property Impact, and Spatial Extent. Each category has been assigned an Index Value (0 to 3) and a Weighing Factor (0 – 100%). These values may be adjusted during future plan updates. In order to evaluate the risk of each hazard, the assigned PRI Value for each category is multiplied by the weighing factor. Then, the PRI for each hazard is calculated by adding the product obtained in each category. According to the weighing scheme applied for Somervell County, the highest possible PRI value is 4.0. The PRI calculations are presented in *Tables 3.2 through 3.3*. A table breaking down the value of each category is below.

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

Table 3.2 Priority Risk Index for Unincorporated Somervell County

Hazard	Category/Degree of Risk				
	Probability Index Value	Life Impact Index Value	Property Impact Index Value	Spatial Extent Index Value	
Dam Failure	0	2	2	2	1.4
Drought	2	1	1	2	1.4
Earthquake	0	0	0	0	0
Extreme Heat	3	1	1	3	1.8
Flooding	3	1	1	2	1.7
Hail	2	1	0	1	1.05
High Winds	2	0	0	1	0.7
Lightning	2	0	1	1	0.95
Nuclear PP	0	2	3	3	1.75
Tornado	2	1	0	1	1.05
Wildfire	2	1	1	1	1.3
Winter Storms	2	1	0	2	1.15

Table 3.3 Priority Risk Index for the City of Glen Rose

Hazard	Category/Degree of Risk				
	Probability Index Value	Life Impact Index Value	Property Impact Index Value	Spatial Extent Index Value	
Dam Failure	0	2	2	2	1.4
Drought	2	1	1	2	1.4
Earthquake	0	0	0	0	0
Extreme Heat	3	1	1	3	1.8
Flooding	3	1	1	2	1.7
Hail	2	1	0	1	1.05
High Winds	2	0	0	1	0.7
Lightning	2	0	1	1	0.95
Nuclear PP	0	2	3	3	1.75
Tornado	2	1	0	1	1.05
Wildfire	2	1	1	1	1.3
Winter Storms	2	1	0	2	1.15

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

Table 3.4 Unincorporated Somervell County

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

Table 3.5 Glen Rose

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

Vulnerability Assessment

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

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3.5 Identification of Assets

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

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

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

Population

According to the U.S. Census 2010 block data provided by NCTCOG, the total population of Somervell County in 2010 was people, with 3,078 households. The count breakdown by municipal jurisdiction is provided in *Table 3.6.*

Table 3.6 Somervell County Population Counts

Jurisdiction	Population			Households		
	Population	% of County Total	Population Density (Sq. Mile)	Household	% of County Total	Household Density (Sq. Mile)
*Somervell County***	8,490	-		3,078	-	
Glen Rose	2,444	28.76%		878	28.52%	

Source: 2010 Census Data

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

Table 3.7 summarizes population counts and population chance (absolute and percent predications for Somervell County).

Table 3.7 Population Predictions

County	Population 2010 Census	Population 2012 Estimate	Population 2013 Estimate	Absolute Change 2012-2013	Percent (%) Change 2012-2013
Somervell County	8,490	8,577	8,690	113	1.3

Source: 2010 Census Data

Property

There are an estimated 5,696 parcels in Somervell County, with an estimated $517,717,632 in total assessed value of, *Table 3.8* lists the total number and percentage of parcels by jurisdiction.

Table 3.8 Parcel Counts and Improvements Value

Jurisdiction	Number of Parcels	% of County Total	Total Assessed Value of Improvements (Buildings)[1]
*Somervell County**	3,932	69.03%	$309,611,085
Glen Rose	1,764	30.97%	$208,106,547
Total	**5,696**	**100%**	**$517,717,632**

Source: County Data and Regional Hazard Assessment Tool
**Somervell County unincorporated areas*

Emergency Facilities

There are 3 identified emergency facilities in Somervell County, including 1 fire station, 1 police station, and 1 hospital. *Table 3.9* presents the distribution of emergency facilities by jurisdiction. Geographic coordinates were used to determine the location of each facility.

Table 3.9 Emergency Facilities

Jurisdiction	Fire Stations	Police Stations	Hospitals
*Somervell County**	0	1	0
Glen Rose	1	0	1
TOTAL	**1**	**1**	**1**

Source: County Data and Regional Hazard Assessment Tool
** Somervell County unincorporated areas*

Critical Facilities

There are 7 critical facilities, which are considered non-emergency in Somervell County. The critical facilities include 4 schools and 3 historical property sites (*Table 3.10*). Geographic coordinates (i.e., latitude and longitude) were used to determine the location of each facility.

Table 3.10 Critical Facilities

Jurisdiction	Schools	Historical Property
*Somervell County**	0	0
Glen Rose	4	3
Total	**4**	**3**

Source: Local jurisdictions
** Somervell County unincorporated areas*

Critical Infrastructure

There are 291 identified critical infrastructure facilities in Somervell County, including 0 airports, 0 natural gas facilities, 1 water treatment facility, 1 wastewater treatment facility, 2 high risk dams, and 5 railway/highway bridges (*Table 3.11*).

Table 3.11 Critical Infrastructure

Jurisdiction	Airports	Natural Gas Facilities	Wastewater Treatment Facilities	Potable Water Treatment Facilities	Dams	Railway/ Highway Bridges	Nuclear Power Plant
*Somervell County**	0	0	0	1	2	4	1
Glen Rose	0	0	1	0	0	1	0
Total	**0**	**0**	**1**	**1**	**2**	**5**	**1**

Source: Local jurisdictions
** Somervell County unincorporated areas*

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3.6 Methodology

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

Of the 12 hazards evaluated for Somervell County, four were analyzed using a Geographic Information System-based analysis, five using a statistical risk assessment methodology, and the remaining two hazards using a qualitative analysis. Qualitative analysis, limited to three of the hazards due to insufficient information, the inability to define specific areas of risk, and/or inexistence of historical records. Additional information regarding these events is unattainable at the present time, but will be an objective in the five-year planning cycle update. *Table 3.12* summarizes the methodology used for each hazard.

Table 3.12 Analysis used for Vulnerability Assessment

Hazard	Geographic Information System-based Analysis	Statistical Analysis	Qualitative Analysis
Dam Failure			√
Drought	√		
Earthquake			√
Extreme Heat		√	
Flood	√		
Hailstorm	√		
High Wind		√	
Lightning		√	
Nuclear Power Plant			
Tornado		√	
Wildfire	√		
Winter Storm		√	

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3.7 Summary of Vulnerably Assessment

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

Summary Table 1

Drought	
Population	According to National Climatic Data Center (NCDC) no injuries or fatalities have been recorded for drought events. There are no personal losses expected from drought events.
Improved Property	According to National Climatic Data Center (NCDC), a loss of $260.86 per year can be expected in property loss due to damage from drought. Available historical data indicates that the expected losses from drought correspond to crop losses in the amount of $20,347.83 per year, mostly experienced in water shortages and crop losses on agricultural lands.
Emergency Facilities	Because of the nature of this hazard, there are no losses or direct impacts expected on emergency facilities due to drought events.
Critical Facilities	Because of the nature of this hazard, there are no losses or direct impacts expected on critical facilities due to drought events.
Critical Infrastructure	Because of the nature of this hazard, there are no losses or direct impacts expected on critical infrastructure due to drought events.

Summary Table 2

Extreme Heat	
Population	Based on historical data, extreme heat can be expected to produce an average of zero fatalities and injuries per year. All the population of Somervell County is exposed to this hazard.
Improved Property	Based on historical data and the negligible impact of extreme heat to developed areas, the improved property in Somervell County is not exposed to this hazard.
Emergency Facilities	Based on historical data and the negligible impact of extreme heat to buildings, the existing and future emergency facilities in Somervell County are not exposed to this hazard.
Critical Facilities	Based on historical data and the negligible impact of extreme heat to buildings, the existing and future critical facilities in Somervell County are not exposed to this hazard.
Critical Infrastructure	Because of the nature of this hazard, there are no losses or direct impacts expected on critical infrastructure due to drought events.

Summary Table 3

Flooding	
Population	Flooding produces an expected annualized count of zero fatalities and injuries per year.
Improved Property	Due to a data deficiency, Flooding's threat to improved property cannot be demonstrated at this time.
Emergency Facilities	Due to a data deficiency, Flooding's threat to emergency facilities cannot be demonstrated at this time.
Critical Facilities	Due to a data deficiency, Flooding's threat to critical facilities cannot be demonstrated at this time.
Critical Infrastructure	Due to a data deficiency, Flooding's threat to critical infrastructure cannot be demonstrated at this time.

Summary Table 4

Hail	
Population	According to National Climatic Data Center (NCDC), no recorded injuries or fatalities have been recorded for hailstorm events. There are no personal losses expected from hailstorm events.
Improved Property	According to National Climatic Data Center (NCDC), a loss of $869.56 per year can be expected in property loss due to hailstorm damage, and all improved property is exposed to this hazard. Although some crops are susceptible to hail hazards, available historical data for Somervell County indicates that there are no expected crop losses from this event.
Emergency Facilities	Because of the unpredictability of the geographical location of hailstorms, all emergency facilities in Somervell County are exposed to this hazard.
Critical Facilities	Because of the unpredictability of the geographical location of hailstorms, all critical facilities in Somervell County are exposed to this hazard.
Critical Infrastructure	Because of the unpredictability of the geographical location of hailstorms, all critical infrastructures in Somervell County are exposed to this hazard.

Summary Table 5

High Wind	
Population	Based on historical data, high wind events can be expected to produce an average of zero injuries and fatalities per year. All the population of Somervell County is exposed to this hazard.
Improved Property	Based on historical data, an average loss of $7,965 per year in property losses are expected from high wind events in Somervell County. Zero crop losses are expected from this hazard in Somervell County.
Emergency Facilities	Because of the expected geographical widespread nature of high winds, all existing and future emergency facilities in Somervell County are exposed to this hazard.
Critical Facilities	Because of the expected geographical widespread nature of high winds, all existing and future emergency facilities in Somervell County are exposed to this hazard.
Critical Infrastructure	Because of the expected geographical widespread nature of high winds, all existing and future critical infrastructures in Somervell County are exposed to this hazard.

Summary Table 6

Lightning	
Population	Based on historical data, lightning events can be expected to cause no deaths or injuries in Somervell County. All the population of Somervell County is exposed to this hazard.
Improved Property	Based on historical data, an average loss of $0 per year in property losses are expected from lightning events in Somervell County. $0 crop losses are expected from this hazard in Somervell County.
Emergency Facilities	Because of the expected geographical widespread nature of lightning, all existing and future emergency facilities in Somervell County are exposed to this hazard.
Critical Facilities	Because of the expected geographical widespread nature of lightning, all existing and future critical facilities in Somervell County are exposed to this hazard.
Critical Infrastructure	Because of the expected geographical widespread nature of lightning, all existing and future critical infrastructures in Somervell County are exposed to this hazard.

Summary Table 7

Tornado	
Population	Based on historical data, tornado events can be expected to cause an average of zero injuries and fatalities per year in Somervell County. All the population of Somervell County is exposed to this hazard.
Improved Property	Based on historical data, an average loss of $17,391.30 per year in property losses are expected to result from tornado events in Somervell County. No crop losses are expected from this hazard in Somervell County.
Emergency Facilities	Because of the impossibility to predict the geographical area of impact for tornadoes, all existing and future emergency facilities in Somervell County are exposed to this hazard.
Critical Facilities	Because of the impossibility to predict the geographical area of impact for tornados, all existing and future critical facilities in Somervell County are exposed to this hazard.
Critical Infrastructure	Because of the impossibility to predict the geographical area of impact for tornados, all existing and future critical infrastructures in Somervell County are exposed to this hazard.

Summary Table 8

Wildfire	
Population	Based on geographical data, approximately 90.72% of Somervell County is vulnerable to wildfires, with the unincorporated areas contributing with the majority of the exposed population.
Improved Property	Based on geographical data, no annualized loss can be expected in property loss due to wildfires. However, Somervell County can expect a loss of $173.91 in crop damage per year.
Emergency Facilities	Based on geographic information and assuming that the facilities located within the WUI polygons is exposed to impact from wildfire, there is 1 fire station, 1 hospital, and 1 police station at risk from wildfire events.
Critical Facilities	Based on geographic information and assuming that the facilities located within the WUI polygons is exposed to impacts from wildfire, there are 4 schools at risk from wildfire events.
Critical Infrastructure	Based on geographic information and assuming that the infrastructure located within the WUI polygons is exposed to impacts from fire, there are no bridges, no airports, 9 dams, and 2 water facilities at risk from wildfire events.

Summary Table 9

Winter Storm	
Population	Based on historical data, winter storm events can be expected to cause an average of zero injuries and fatalities per year in Somervell County. All the population of Somervell County is exposed to this hazard.
Improved Property	Based on historical data, an average loss of $9,596.21 per year in property losses are expected to result from winter storm events in Somervell County. No crop losses are expected from this hazard in Somervell County.
Emergency Facilities	Because of the expected geographical widespread nature of winter storms, all existing and future emergency facilities in Somervell County are exposed to this hazard.
Critical Facilities	Because of the expected geographical widespread nature of winter storms, all existing and future critical facilities in Somervell County are exposed to this hazard.
Critical Infrastructure	Because of the expected geographical widespread nature of winter storms, all existing and future critical infrastructures in Somervell County are exposed to this hazard.

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3.8 Geographic Information System Based Analysis

For the Geographic Information System-based assessment, digital data was collected from local, state, and national sources. ESRI® ArcMap™ 10.0 was used to assess risk utilizing digital data, which included local tax records for individual parcels and geo-referenced point locations for buildings and critical facilities.

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

For some of the hazards, the Geographic Information System analysis was supplemented with a statistical analysis conducted on the historical data obtained from National Climatic Data Center and the Texas Forest Service for wildfires. The data included both casualty and property losses from hazard events that occurred in Somervell County from 1/1/2002 through 6/30/2014. Annualized personal and property losses were calculated by dividing the total losses by the number of years for which data was available (i.e. 11.5 years).

Drought

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

Since crop losses are expected to be the most vulnerable assets for this hazard, agricultural land acreage was acquired from the USGS land cover classification data to estimate the relative area of Somervell County that would be affected by this event. *Table 3.13* below provides the distribution of agricultural land for each jurisdiction in Somervell County. Somervell County has a total of 84,527 acres of agricultural lands, which represents approximately 64.42% of Somervell County territory, with the majority located in the unincorporated areas.

Table 3.13 Agricultural Land in Somervell County

Jurisdiction	Total Acres	Agricultural Land Acres	Percentage (%) of Total Acres
*Somervell County**	127,462	83,306	65.36%
Glen Rose	3,758	1,221	32.49%
Total	**131,220**	**84,527**	**64.42%**

Sources: U.S. Geological Survey, and local jurisdictions
—: No Recorded Information
**Somervell County unincorporated areas*

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

Table 3.14 presents Somervell County's recorded historical losses due to drought events as provided in the hazard events database obtained from the National Climatic Data Center. Property and personal losses in each expected in each jurisdiction are presented in *Table 3.14*.

Table 3.14 Historical Annualized Losses Due to Drought between 1/1/2002 – 6/30/2013

Jurisdiction	Date	Fatalities	Injuries	Property Damage	Annualized Expected Property Losses	Crop Damage Including	Annualized Expected Crop Loss	Annualized Expected Crop Loss per Acre
Somervell County Territory	7/1/2005	0	0	$0	$0	$0	$0	$0
	8/1/2005	0	0	$0	$0	$0	$0	$0
	9/1/2005	0	0	$0	$0	$0	$0	$0
	10/1/2005	0	0	$0	$0	$0	$0	$0
	11/1/2005	0	0	$0	$0	$0	$0	$0
	12/1/2005	0	0	$0	$0	$0	$0	$0
	1/1/2006	0	0	$0	$0	$0	$0	$0
	2/1/2006	0	0	$0	$0	$0	$0	$0
	3/1/2006	0	0	$0	$0	$0	$0	$0
	4/1/2006	0	0	$0	$0	$0	$0	$0
	5/1/2006	0	0	$0	$0	$0	$0	$0
	6/6/2006	0	0	$0	$0	$0	$0	$0
	7/1/2006	0	0	$0	$0	$0	$0	$0
	8/1/2006	0	0	$0	$0	$0	$0	$0
	9/1/2006	0	0	$0	$0	$0	$0	$0
	3/25/2011	0	0	$0	$0	$5,000	$434.78	$0.003
	4/1/2011	0	0	$0	$0	$20,000	$2,173.91	$0.017
	5/1/2011	0	0	$0	$0	$8,000	$2,869.57	$0.022
	6/1/2011	0	0	$0	$0	$23,000	$4,869.57	$0.037
	7/1/2011	0	0	$0	$0	$30,000	$7,478.26	$0.057
	8/1/2011	0	0	$0	$0	$50,000	$11,826.09	$0.090
	9/1/2011	0	0	$0	$0	$30,000	$14,434.78	$0.110
	10/1/2011	0	0	$0	$0	$20,000	$16,173.91	$0.123
	11/1/2011	0	0	$0	$0	$10,000	$17,043.48	$0.130

Jurisdiction	Date	Fatalities	Injuries	Property Damage	Annualized Expected Property Losses	Crop Damage Including	Annualized Expected Crop Loss	Annualized Expected Crop Loss per Acre
Somervell County Territory	12/1/2011	0	0	$0	$0	$5,000	$17,478.26	$0.133
	1/1/2012	0	0	$0	$0	$4,000	$17,826.09	$0.136
	9/25/2012	0	0	$0	$0	$2,000	$18,000.0	$0.137
	10/1/2012	0	0	$0	$0	$5,000	$18,434.78	$0.140
	11/1/2012	0	0	$0	$0	$5,000	$18,869.57	$0.144
	12/1/2012	0	0	$0	$0	$2,000	$19,043.48	$0.145
	1/1/2013	0	0	$0	$0	$6,000	$19,565.22	$0.149
	2/1/2013	0	0	$0	$0	$1,000	$19,652.17	$0.150
	3/1/2013	0	0	$3,000	$260.86	$0	$19,652.17	$0.150
	4/1/2013	0	0	$0	$260.86	$2,000	$19,826.09	$0.151
	5/1/2013	0	0	$0	$260.86	$3,000	$20,086.96	$0.153
	6/1/2013	0	0	$0	$260.86	$3,000	$20,347.83	$0.155
Total	**35 Events**	**0**	**0**	**$3,000**	**$260.86**	**$234,000**	**$20,347.83**	**$0.155**

Source: National Climatic Data Center
—: No Recorded Information

As described on Section 3.6, calculations of annualized losses due to drought events were conducted using historical data obtained from the National Climatic Data Center (*Table 3.14*). The annualized loss value can be interpreted as the impact expected from drought in terms of annualized human losses and human injuries, and annualized property losses. As observed in *Table 3.14*, Somervell County can expect approximately an annual $260.86 in property losses, and $20,347.83 of crop losses each year as a result of drought, with no injuries or deaths expected from this event.

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

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

- **Population**: According to National Climatic Data Center (NCDC) no recorded injuries or fatalities have been recorded for drought events. There are no personal losses expected from

drought events. All the population of Somervell County is exposed to this hazard, but there are no personal losses expected from drought events.

- **Improved Property**: According to National Climatic Data Center (NCDC), a loss of $260.86 per year can be expected in property loss due to damage from drought. Available historical data indicates that the expected losses from drought correspond to crop losses in the amount of $89,826.09 per year, mostly experienced in water shortages and crop losses on agricultural lands.
- **Emergency Facilities**: Because of the nature of this hazard, there are no losses or direct impacts expected on emergency facilities due to drought events.
- **Critical Facilities**: Because of the nature of this hazard, there are no losses or direct impacts expected on critical facilities due to drought events.
- **Critical Infrastructure**: Because of the nature of this hazard, there are no losses or direct impacts expected on critical infrastructure due to drought events.

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

Flood

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

Table 3.15 presents Somervell County's recorded historical losses due to flooding as provided in the hazard events database obtained by National Climatic Data Center.

Table 3.15 Historical Annualized Losses Due to Flood Events 1/1/2002 – 6/30/2013

Jurisdiction	Fatalities	Number of Events	Annualized Expected Fatalities	Injuries	Property Damage	Annualized Expected Property Losses	Crop Damage ($)
*Somervell County**	0	1	0	0	$0	$0	$0
Glen Rose	2	5	.1739	0	$440,000	38,260.86	$0
Total	**2**	**6**	**.1739**	**0**	**$440,000**	**$38,260.86**	**$0**

Source: National Climatic Data Center
** Somervell County unincorporated areas*
—: No Recorded Information

As described in Section 3.6, calculations of annualized losses due to flooding events were conducted using historical data obtained from National Climatic Data Center (*Table 3.15*). The annualized loss value can be interpreted as the impact expected from flooding in terms of annualized human losses and human injuries, and annualized property losses. As observed in *Table 3.15*, Somervell County can expect a total property loss of $38,260.86 each year as a result of flooding, with .1739 fatalities, no injuries, and no crop losses.

In order to assess flood risk and vulnerability of the identified assets, a Geographic Information System-based analysis was conducted to estimate exposure to flood events using Federal Emergency Management Agency's digital 100-year floodplain in combination with Somervell Central Appraisal District property records and the geo-referenced assets provided by Regional Hazard Assessment Tool. The 100-year floodplain data layer for this analysis is a subset of FAFDS Nationwide Floodmap Database as of May 2007.

By overlaying the geo-referenced assets and the floodplain layers using Geographic Information System, the number of emergency facilities, critical facilities, and critical infrastructure located within the 100-year floodplain was calculated. Although, having a facility located within the floodplain does not necessarily imply that would be impacted by the 100-year storm event (e.g., the building could be flood-proofed, or

the buildings may be constructed above the 100-year elevation), it provides with a good approximation of potential impacts from flooding.

Table 3.15 Critical Infrastructure Located in 100-year Federal Emergency Management Agency Floodplain

Jurisdiction	Critical Infrastructure											
	Railway/Highway Bridges		Dams		Water Treatment Facilities		Waste Water Treatment Facilities		Natural Gas		Airports	
	Total	Percentage (%)	Total	Percentage (%)	Total	Percentage (%)	Total	Percentage (%)	Total	Percentage (%)	Total	Percentage (%)
*Somervell County**	-	-	-	-	-	-	-	-	-	-	-	-
Total	-	-	-	-	-	-	-	-	-	-	-	-

Source: Regional Hazard Assessment Tool, and local jurisdictions
** Somervell County unincorporated areas*
—: No Recorded Information

Due to a data deficiency, Flooding's threat to critical infrastructure cannot be demonstrated at this time.

Vulnerability to flooding can also be measured by assessing the number of people and buildings exposed to flood events. *Table 3.16* shows Population and Improved Property at risk from flooding events.

Table 3.16 shows Residential Parcels and Improved Property at risk from flooding events.

The determination of residential parcel vulnerability was calculated by adding the total residential parcel counts from 2013 that had at least some portion located within the 100-year floodplain. The determination of commercial and utility property value at-risk (exposure) was calculated adding the total assessed building values for only those parcels that were confirmed to have at least one building located within the 100-year floodplain.

Table 3.16 Residential Parcels and Buildings potentially located within the 100-year floodplain

Jurisdiction	Residential Parcels located in the 100-year Floodplain	Percentage of Total Residential Parcels located in the 100-year Floodplain	Commercial and Utility parcels in the 100-year Floodplain	Percentage of Commercial and Utility Parcels in the 100-year Floodplain
*Somervell County**	-	-	-	-
Glen Rose	-	-	-	-
Total	**-**	**-**	**-**	**-**

Source: Regional Hazard Assessment Tool, and local jurisdictions
** Somervell County unincorporated areas*
—: No Recorded Information

Due to a data deficiency, Flooding's threat to residential property cannot be demonstrated at this time.

Since Somervell County is composed of large areas used for cropland, an analysis was conducted to determine the vulnerability of the land to flooding relative to the type of land cover (*Table 3.17*). The calculations were made using Geographic Information System. The USGS land cover shapefile was clipped with the 100-year floodplain to calculate the area (acreage) of each land cover type potentially affected by flooding. Reservoirs, streams, and channels were excluded from the calculations.

Table 3.17 Land Cover Types and Acreage located within the 100-year Floodplain

Land Cover Type	Total Areas For Somervell County (Acres)	Total Area Affected By 100-year Flood (Acres)	Percentage of Area Affected By 100-year Flood (%)
Commercial	2,584	-	-
Utilities	2,794	-	-
Residential	79,626	-	-
Farmland/Undeveloped	84,245	-	-
Total	**169,249**	**-**	**-**

Source: USGS
—: No Recorded Information

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

- **Population**: Based on historical data, flooding produces an expected annualized zero injuries and fatalities per year.
- **Improved Property**: Due to a data deficiency, Flooding's threat to improved property cannot be demonstrated at this time.
- **Emergency Facilities**: Due to a data deficiency, Flooding's threat to emergency facilities cannot be demonstrated at this time.
- **Critical Facilities**: Due to a data deficiency, Flooding's threat to critical facilities cannot be demonstrated at this time.
- **Critical Infrastructure**: Due to a data deficiency, Flooding's threat to critical infrastructure cannot be demonstrated at this time.

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

Repetitive Loss

As per Requirement 201.6(c)(2)(ii) "The risk assessments in all plans approved after 2008 must also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged by floods." Repetitive Loss Property information provides local jurisdictions with the properties that had submitted insurance claims due to flooding damage to buildings and its contents. The information provided by Federal Emergency Management Agency included 9 repetitive loss properties in Somervell County as of 7/9/2014 (*Table 3.18*).

Address information available for 9 repetitive loss properties recorded allowed those properties to be geo-referenced using ESRI® ArcMap™ 10.0. The probability of future repetitive losses on those properties was estimated using Geographic Information System by overlying the geo-referenced properties with the 100-year floodplain layer. *Table 3.18* summarizes with the number of properties located within the 100-year floodplain as obtained using this approach.

Table 3.18 Repetitive Loss Properties located within the 100-year Floodplain

Jurisdiction	Total Number of Repetitive Loss Properties	Properties within 100-year Floodplain			Total Number of Repetitive Loss Properties Within 100-year Floodplain	Percent of Repetitive Loss Properties Within 100-year Floodplain
		Single Family	Other Residential	Non Residential		
Somervell County*	8	8	-	-	7	87.5
Glen Rose	1	-	-	1	1	100
Total	**9**	**8**	**-**	**1**	**8**	**88.9**

Source: Federal Emergency Management Agency
**Somervell County unincorporated areas*
—: No Recorded Information

As noted in *Table 3.18* most of the repetitive loss properties are located in Unincorporated Somervell County, with all of those properties located within the 100-year floodplain. Unincorporated areas of Somervell County present records of eight properties, all located within the floodplain area. The City of Glen Rose had 1 recorded repetitive loss property each, located within the floodplain. As expected, in general the majority of the properties are located within the 100-year floodplain, which can be interpreted as having a greater probability of future losses resulting from flood events. In compliance with Requirement 201.6(c)(2)(ii),*Table 3.15* provides the type (residential, commercial, institutional, etc.) and numbers of repetitive loss properties located in the identified flood hazard zones within Somervell County.

Table 3.19 shows the repetitive loss property statistics for the 9 properties recorded in Somervell County classified by jurisdiction. The numbers provided can be used to estimate the vulnerability to repetitive loss properties in terms of dollar losses.

Table 3.19 Repetitive Loss Property Statistics

Jurisdiction	Single Family				Other Residential				Non Residential				Total			
	Years	Properties	Number of Losses	Payments	Years	Properties	Number of Losses	Payments	Years	Properties	Number of Losses	Payments	Years	Properties	Number of Losses	Payments
Somervell County *	1981-2007	8	26	413,812.10	-	-	-	-	-	-	-	-	1981-2007	8	26	413,812.10
Glen Rose	-	-	-	-	-	-	-	-	2006-2007	1	2	14,031.29	2006-2007	1	2	14,031.29
Total	**1981-2007**	**8**	**26**	**413,812.10**	**-**	**-**	**-**	**-**	**2006-2007**	**1**	**2**	**14,031.29**	**1981-2007**	**9**	**28**	**427,843.39**

Source: Federal Emergency Management Agency
** Somervell County unincorporated areas*
—: No Recorded Information

The dollar amounts in the tables represent the payments made for insurance claims due to flood damage to buildings and contents. As can be observed in *Table 3.16,* and consistent with having the greatest number of repetitive loss properties, Unincorporated Somervell County has the greatest value dollar of claims, with mostly residential properties damaged. It is followed by the unincorporated areas of Somervell County, with approximately the same number of residential and non-residential claims.

Although, both repetitive loss information (*Tables 3.18 and 3.19*) and the historical annualized losses expected from flooding (*Table 3.15*) represent actual historical information, the data cannot be compared or correlated to each other. The repetitive loss information presents insurance claims on properties and buildings, whereas the historical annualized losses represent property losses in the community due to flood events.

Hail

Table 3.20 Historical Annualized Losses Due to Hail Events between 01/01/2002-6/30/2013

Jurisdiction	Number of Events	Years	Magnitude	Fatalities	Injuries	Property Damage	Annualized Expected Property Losses	Crop Damage
*Somervell County**	2	2002-2013	1.50in – 1.75in	0	0	$3,000	$260.86	$0
Glen Rose	10	2002-2013	.50in – 1.75in	0	0	$7,000	$608.69	$0
Total	**12**	**2002 - 2013**	**.50in – 1.75in**	**0**	**0**	**$10,000**	**$869.56**	**$0**

Source: National Climatic Data Center
**Somervell County unincorporated areas*
—: No Recorded Information

As described in Section 3.6, calculations of annualized losses due to hail events were conducted using historical data obtained from the National Climatic Data Center (*Table 3.20*). The annualized loss value can be interpreted as the impact expected from hail in terms of annualized human losses and human injuries, and annualized property losses. As observed in *Table 3.20*, Somervell County can expect a total property loss of $869.56 each year as a result of hail, with no injuries, deaths, or crop losses expected from this event.

The geographical occurrence of hailstorm events cannot be predicted; therefore, the area of potential impacts corresponds to all of Somervell County's territory. All improved property, emergency and critical facilities, and critical structures are exposed to this hazard. As described above, roofs and structures are more vulnerable to this hazard. Therefore, it is expected that building improvements would be most affected.

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

- **Population**: According to National Climatic Data Center (NCDC), zero recorded injuries or fatalities have been recorded for hailstorm events. All the population of Somervell County is exposed to this hazard, but there are no personal losses expected from hailstorm events.
- **Improved Property**: Based on historical data, a loss of $869.56 per year can be expected in property loss due to hailstorm damage. Because of the unpredictability of the geographical location of hailstorms, all improved property in Somervell County is exposed to this hazard. Although some crops are susceptible to hail hazards, available historical data for Somervell County indicates that there are no expected crop losses from this event.
- **Emergency Facilities**: Because of the unpredictability of the geographical location of hailstorms, all emergency facilities in Somervell County are exposed to this hazard.
- **Critical Facilities**: Because of the unpredictability of the geographical location of hailstorms, all critical facilities in Somervell County are exposed to this hazard.
- **Critical Infrastructure**: Because of the unpredictability of the geographical location of hailstorms, all critical infrastructure in Somervell County is exposed to this hazard.

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

Wildfires

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

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

WUI data was obtained from the Texas Forest Service wildfire database. The data provides GIS data for wildfires and households affected. Data from the National Climatic Data Center provided the property and crop damage totals for Somervell County wildfires.

Table 3.21 Wildfire Events

Jurisdiction	Date	Time	Fatalities	Injuries	Property Damage	Crop Damage
Somervell County Territory	3/11/2011	14:00	0	0	$0	$2,000
TOTALS:			0	0	$0	$2,000

Source: National Climatic Data Center

Table 3.21 provides the magnitude, number of fatalities, property and crop damage caused by fires in the county.

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

Wildland fires in Somervell County are highly likely to occur annually and will impact the county as a whole. Based on previous occurrences, the extent of wildland fires will be very high. Fires will start easily and spread at a rapid rate, which can result in extensive county wide property damage. According to the Texas Forest Service Wildfire Summary Report, 94% of Somervell County's population is located in the Wildland Urban Interface. Maps depicting the WUI and wildfire risk can be found in Map Series E and F, respectively.

Table 3.22 Distribution of WUI Interface Communities in Somervell County

Jurisdiction	Area (Sq. Mile)	WUI-Interface Community				
		Low Density (Sq. Mile)	Medium Density (Sq. Mile)	High Density (Sq. Mile)	Total (Sq. Mile)	Percentage of Total Area (%)
Somervell County	199.16	55.67	11.40	1.49	68.55	34.42%
Glen Rose	5.87	1.07	1.09	1.00	3.15	53.66%
Total	**205.03**	**56.74**	**12.49**	**2.49**	**71.70**	**34.97%**

Source: Texas Forest Service
—: No Recorded Information

Table 3.23 Critical Infrastructure within Wildland/Urban Interface

Jurisdiction	Schools	
	Schools Located Within Low/Medium/High Density Interface Communities	Percentage (%) of Schools within WUI Communities
Somervell County	4	100%
Total	4	100%

Source: Texas Forest Service
—: No Recorded Information

Table 3.24 Critical Facilities within Wildland Urban Interface

Jurisdiction	Bridge		Airports		Dams		Water Facilities	
	Facilities Located Within Interface Communities	Percentage (%) of Facilities s	Facilities Located Within Interface Communities	Percentage (%) of Facilities s	Facilities Located Within Interface Communities	Percentage (%) of Facilities	Facilities Located Within Interface Communities	Percentage (%) of Facilities
*Somervell County**	0	-	0	-	9		2	100%
Total	**0**	**-**	**0**	**-**			**2**	**100%**

Source: Texas Forest Service
—: No Recorded Information

Table 3.25 Emergency Facilities within Wildland Urban Interface

Jurisdiction	Hospitals		Fire Stations		Police Stations	
	Facilities Located Within Low/Medium/High Density Interface Communities	Percentage (%) of Facilities within WUI Communities	Facilities Located Within Low/Medium/High Density Interface	Percentage (%) of Facilities within WUI Communities	Facilities Located Within Low/Medium/High Density Interface Communities	Percentage (%) of Facilities within WUI Communities
Somervell County	1	100%	1	100%	1	100%
Total	**1**	**100%**	**1**	**100%**	**1**	**100%**

Source: Texas Forest Service
—: No Recorded Information

The determination of population vulnerability to wildfires was calculated by overlaying the population data from the 2000 U.S. Census Block shapefile to the Texas Fire Service data. The determination of assessed value at-risk (exposure) to wildfires was calculated by overlaying the improved property shapefile to the WUI polygons, and adding the total assessed building values within each of the low/medium/high density WUI Interface communities (*Table 3.26*).

Table 3.26 Population and Assessed Value of Improvements

Jurisdiction	Population at Risk	Percentage (%) of Population at Risk	Total Assessed Value of Improvements (Buildings & Contents) at Risk	Percentage (%) of Assessed Value of Improvements (Buildings & Contents) at Risk
Somervell County	5,238	94%	-	-
Glen Rose	2,028	83%	-	-
Total	**7,266**	**90.72%**	**-**	**-**

Source: Texas Forest Service
—: No Recorded Information

As observed in *Table 3.26*, approximately 90.72% of Somervell County is vulnerable to wildfires, with the unincorporated areas contributing with the majority of the exposed population.

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

- **Population**: Based on geographical data, approximately 90.72% of Somervell County is vulnerable to wildfires, with the unincorporated areas contributing with the majority of the exposed population.
- **Improved Property**: Based on geographical data, no annualized loss can be expected in property loss due to wildfires. However, Somervell County can expect a loss of $173.91 in crop damage per year.

- **Emergency Facilities**: Based on geographic information and assuming that the facilities located within the WUI polygons are exposed to impact from wildfire, there is 1 fire station, 1 hospital, and 1 police station at risk from wildfire events.
- **Critical Facilities**: Based on geographic information and assuming that the facilities located within the WUI polygons are exposed to impacts from wildfire, there are 4 schools at risk from wildfire events.
- **Critical Infrastructure**: Based on geographic information and assuming that the infrastructure located within the WUI polygons are exposed to impacts from fire, there are no bridges, no airports, 2 dams, and 2 water facilities at risk from wildfire events.

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

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3.9 Statistical Risk Assessment

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

The statistical analysis was conducted using the historical data obtained from National Climatic Data Center. The data included both personal and property losses from hazard events that occurred in Somervell County from 1/1/2002 through 6/30/2013. Annualized personal and property losses were calculated by dividing the total losses by the number of years for which data was available (i.e. 11.5 years).

Extreme Heat

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

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

Table 3.27 presents Somervell County's recorded historical losses due to extreme heat events as provided in the hazard events database obtained from the National Climatic Data Center. The annualized losses due to extreme events were calculated using the methodology described in Section 3.6.

Table 3.27 Extreme Heat Historical Occurrences between 01/01/2002 – 06/30/2013

Jurisdiction	Date	Type	Fatalities	Annualized Expected Fatalities	Injuries	Property Damage	Crop Damage
Somervell County Territory	8/1/2011	Excessive Heat	0	0	0	$0	$0
Total	**1**	**-**	**0**	**0**	**0**	**$0**	**$0**

Source: National Climatic Data Center
**Unincorporated Somervell County*
—: No Recorded Information

The annualized loss value can be interpreted as the impact expected from extreme heat in terms of annualized human losses and human injuries, and annualized property losses. As observed in *Table 3.27*, Somervell County can expect zero fatalities and injuries per year, and no property or crop losses expected from extreme heat.

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

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

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

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

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

High Wind

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

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

Table 3.28 presents Somervell County's recorded historical losses due to high wind events as provided in the hazard events database obtained from the National Climatic Data Center and the Texas Forest Service

Table 3.28 High Wind Historical Occurrences between 01/01/2002 – 06/30/2013

Jurisdiction	Number of Events	Years	Magnitude (Knots)	Fatalities	Injuries	Property Damage (Present Value)	Crop Damage	Annualized Expected Property Losses
*Somervell County**	5	2002-2013	35kts – 52kts	0	0	$31,500	$0	$2,739.13
Glen Rose	13	2002-2013	50kts – 60kts	0	0	$57,000	$0	$4,956.52
Total	**18**	**2002-2013**	**35kts-60kts**	**0**	**0**	**$88,500**	**$0**	**$7,695.65**

Source: National Climatic Data Center
** Unincorporated Somervell County*
—: No Recorded Information

The annualized losses due to high wind events were calculated using the methodology described previously. The annualized loss value can be interpreted as the impact expected from high wind in terms of annualized human losses and human injuries, and annualized property losses. As observed in *Table 3.28*, Somervell County can expect an average of $7,695.65 per year in property losses, with no fatalities, injuries, or crop losses from high wind events.

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

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

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

- **Improved Property**: Based on historical data, an average loss of $7,965 per year in property losses are expected from high wind events in Somervell County. Zero crop losses are expected from this hazard in Somervell County.
- **Emergency Facilities**: Because of the expected geographical widespread nature of high winds, all existing and future emergency facilities in Somervell County are exposed to this hazard.
- **Critical Facilities**: Because of the expected geographical widespread nature of high winds, all existing and future emergency facilities in Somervell County are exposed to this hazard.
- **Critical Infrastructure**: Because of the expected geographical widespread nature of high winds, all existing and future critical infrastructures in Somervell County are exposed to this hazard.

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

Lightning

Because the location of a lightning event cannot be predicted, all existing and future buildings, critical facilities, critical infrastructure, emergency facilities, improved property, and populations are considered to be exposed to this hazard.

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

Table 3.29 presents Somervell County's recorded historical losses due to lightning events as provided in the hazard events database obtained from the National Climatic Data Center.

Table 3.29 Historical Lightning Occurrences between 01/01/2002 – 06/30/2013

Jurisdiction	Number of Events	Years	Fatality	Injuries	Property Damage (Present Value)	Crop Damage (Present Value)	Annualized Expected Property Losses
*Somervell County**	-	-	-	-	-	-	-
Glen Rose	-	-	-	-	-	-	-
Totals	-	-	-	-	-	-	-

Source: National Climatic Data Center
** Somervell County unincorporated areas*
—: No Recorded Information

The annualized losses due to lightning events were calculated using the methodology described in Section 3.6. The annualized loss value can be interpreted as the impact expected from lightning in terms of annualized human losses and human injuries, and annualized property losses. As observed in *Table 3.29*, on average Somervell County can expect no annual property losses, with no deaths, no injuries, and no losses in crop production from lightning events.

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

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

- **Population**: Based on historical data, lightning events can be expected to cause 0 deaths and 0 injuries in Somervell County. All the population of Somervell County is exposed to this hazard.
- **Improved Property**: Based on historical data, an average loss of $0 per year in property losses are expected from lightning events in Somervell County. $0 crop losses are expected from this hazard in Somervell County.
- **Emergency Facilities**: Because of the expected geographical widespread nature of lightning, all existing and future emergency facilities in Somervell County are exposed to this hazard.

- **Critical Facilities**: Because of the expected geographical widespread nature of lightning, all existing and future critical facilities in Somervell County are exposed to this hazard.
- **Critical Infrastructure**: Because of the expected geographical widespread nature of lightning, all existing and future critical infrastructures in Somervell County are exposed to this hazard.

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

Tornado

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

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

Table 3.30 presents Somervell County's recorded historical losses due to tornado events as provided in the hazard events database obtained from the National Climatic Data Center.

Table 3.30 Historical Tornado Occurrences between 01/01/2002 – 06/30/2013

Jurisdiction	Number of Events	Years	Magnitude (Fujita Scale & Enhanced Fujita Scale)	Fatalities	Injuries	Property Damage	Annualized Expected Property Losses	Crop Damage
Somervell County	1	2002-2013	EF0	0	0	$0	$0	$0
Glen Rose	1	2002-2013	EF1	0	0	$200,000	$17,391.30	$0
Total	**2**	**2002-2013**	**EF0-EF1**	**0**	**0**	**$200,000**	**$17,391.30**	**$0**

Source: National Climatic Data Center
**Unincorporated Somervell County*
—: No Recorded Information

The annualized losses due to tornado events were calculated using the methodology described in Section 3.6. The annualized loss value can be interpreted as the impact expected from tornadoes in terms of annualized human losses and human injuries, and annualized property losses. As observed in Table 3.26, Somervell County can expect an average of zero fatalities and injuries per year. All the population of Somervell County is exposed to this hazard. Also, an expected average of $17,391.30 per year in property losses is expected from tornados, with most of the historical events occurring in the unincorporated areas of Somervell County. Finally, there are no expected crop losses as result of tornado events.

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

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

- **Population**: Based on historical data, tornado events can be expected to cause an average of zero injuries and fatalities per year in Somervell County. All the population of Somervell County is exposed to this hazard.
- **Improved Property**: Based on historical data, an average loss of $17,391.30 per year in property losses are expected to result from tornado events in Somervell County. No crop losses are expected from this hazard in Somervell County.
- **Emergency Facilities**: Because of the impossibility to predict the geographical area of impact for tornadoes, all existing and future emergency facilities in Somervell County are exposed to this hazard.
- **Critical Facilities**: Because of the impossibility to predict the geographical area of impact for tornados, all existing and future critical facilities in Somervell County are exposed to this hazard.
- **Critical Infrastructure**: Because of the impossibility to predict the geographical area of impact for tornados, all existing and future critical infrastructures in Somervell County are exposed to this hazard.

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

Winter Storms

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

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

Table 3.31 presents Somervell County's recorded historical losses due to winter storm events as provided in the hazard events database obtained from the National Climatic Data Center.

Table 3.31 Winter Storm Historical Occurrences between 01/01/2002 – 06/30/2013

Jurisdiction	Date	Fatalities	Injuries	Property Damage	Annualized Expected Property Losses	Crop Damage
Somervell County Territory	3/2/2002	0	0	$0	$0	$0
	2/24/2003	0	0	$0	$0	$0
	12/7/2005	0	0	$0	$0	$0
	1/14/2007	0	0	$10,000	$869.56	$0
	12/24/2009	0	0	$40,000	$4,347.82	$0
	2/11/2010	0	0	$20,000	$6,086.95	$0
	2/1/2011	0	0	$40,000	$9,596.21	$0
Total	**7**	**0**	**0**	**$110,000**	**$9,596.21**	$0

Source: National Climatic Data Center
—: No Recorded Information

The annualized losses due to winter storm events were calculated using the methodology described previously. The annualized loss value can be interpreted as the impact expected from winter storm in terms of annualized human losses and human injuries, and annualized property losses. As observed in *Table 3.31*, Somervell County can expect in average an annual $9,596.21 in property losses, with zero injuries, fatalities, and crop losses from winter storm events.

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

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

- **Population**: Based on historical data, winter storm events can be expected to cause an average of zero injuries and fatalities per year in Somervell County. All the population of Somervell County is exposed to this hazard.
- **Improved Property**: Based on historical data, an average loss of $9,596.21 per year in property losses are expected to result from winter storm events in Somervell County. No crop losses are expected from this hazard in Somervell County.
- **Emergency Facilities**: Because of the expected geographical widespread nature of winter storms, all existing and future emergency facilities in Somervell County are exposed to this hazard.
- **Critical Facilities**: Because of the expected geographical widespread nature of winter storms, all existing and future critical facilities in Somervell County are exposed to this hazard.
- **Critical Infrastructure**: Because of the expected geographical widespread nature of winter storms, all existing and future critical infrastructures in Somervell County are exposed to this hazard.

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

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3.10 Qualitative Analysis

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

Dam Failure

The probability of occurrence for dam and/or levee events in Somervell County is likely. However, due to insufficient information regarding this hazard, quantitative predictions are not available at the present time. All five categories, population, improved property, emergency facilities, critical facilities, and critical infrastructure are considered vulnerable to damage caused by dam and/or levee failure. According to the Priority Risk Index analysis presented in section 3.4, any estimated losses associated with this hazard are anticipated to be of low risk across Somervell County.

Based on data from the participating jurisdictions a total of 12 dams are located in Somervell County (*Table 3.32).*

Table 3.32 Dams located in Somervell County and Participating Jurisdictions

Jurisdiction	Number of Dams	Dam Classification		
		High	Significant	Low
*Somervell County**	9	2	1	6
Glen Rose	3	0	1	2
Total	**12**	**2**	**2**	**8**

Source: Cross Timbers Soil and Water Conservation District
**Somervell County unincorporated areas*

The Hazard Mitigation Planning Team provided a list of high hazard dams located in Somervell County.

Table 3.33 High Hazard Dams

Jurisdiction	Dam Name
Somervell County	Squaw Creek Dam
Somervell County	Wheeler Branch Dam

Source: Cross Timbers Soil and Water Conservation District

**Somervell County unincorporated areas*

Earthquake

The probability of occurrence for an earthquake event in Somervell County is extremely low. Due to insufficient information regarding this hazard, quantitative predictions are not available at the present time. All five categories, population, improved property, emergency facilities, critical facilities, and critical infrastructure are considered vulnerable to damage caused by an earthquake. According to the Priority Risk Index analysis presented in Section 3.4, any estimated losses associated with this hazard are anticipated to be of no risk across Somervell County.

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3.11 Summary

Table 3.34 provides a summary of annualized losses for each of the nine hazard events for which the quantitative analysis (Geographic Information System and/or statistical) was conducted. *Table 3.35* summarizes the qualitative analysis conducted on the two hazard events.

Table 3.34 Annualized Losses Expected from Hazards Analyzed using a Quantitative Analysis

Hazard Event	Annualized Expected Fatalities	Annualized Expected Injuries	Annualized Expected Property Losses	Annualized Expected Crop Loss	Annualized Expected Crop Loss per Acre
Drought	0	0	$260.86	$20,347.83	$0.155
Extreme Heat	0	0	$0	$0	-
Flood	.1739	0	$38,260.86	$0	-
Hail	0	0	$869.56	$0	-
High Wind	0	0	$7,695.65	$0	-
Lightning	0	0	$0	$0	-
Tornado	0	0	$17,391.30	$0	-
Nuclear Power Plant	0	0	$0		
Wildfire	0	0	$0	$2,000	$0.015
Winter Storm	0	0	$9,596.21	$0	-

—: No Recorded Information

Table 3.35 Summary of Qualitative Analysis

Hazard Event	Probability of Occurrence According to the Priority Risk Index	Vulnerable Categories				
		Population	Property Damage	Emergency Facilities	Critical Facilities	Critical Infrastructures
Dam Failure	Low Risk	√	√	√	√	√
Earthquake	No Risk	√	√	√	√	√

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Chapter Four: Capability Assessment

(In compliance with 201.6 (C1))

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

At the heart of each county is the Commissioners Court. Each Texas county has four precinct commissioners and a county judge who serve on this court. Although this body conducts the general business of the county and oversees financial matters, the Texas Constitution established a strong system of checks and balances by creating other elective offices in each county. The major elective offices found in most counties include the county judges, county attorneys, county and district clerks, county treasurers, sheriffs, tax assessor-collectors, justices of the peace, and constables. As a part of the checks and balances system, counties have an auditor appointed by the district courts.

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

The capability assessment examines the ability of Somervell County and participating jurisdictions to implement and manage a comprehensive mitigation strategy. The strengths, weaknesses, and resources of these jurisdictions are identified in this assessment as a means to develop an effective Hazard Mitigation Action Plan. The capabilities identified in this assessment are evaluated collectively to develop feasible recommendations, which support the implementation of effective mitigation activities, given existing conditions throughout the County. A summary of each jurisdiction's legal and regulatory capabilities, administrative and technical capabilities, and fiscal capabilities can be found in Tables 4.1, 4.2, and 4.3.

Jurisdiction	Chief Administrative Officer	Ability to Implement Capabilities
Somervell County	County Judge	The commissioner's court, including the county judge, and county commissioners, along with the county clerk, address the budget; pass laws, regulations, and codes; hire staff; approve plans; and determine the direction of the city overall. As the governing body, the commissioner's court has the authority to expand and/or improve mitigation capabilities though hiring additional staff, implementing new taxes, increasing the county budget, and changing policies and programs. Ability to implement and approve mitigation actions and integrate mitigation into existing policies and programs is a function of this group.
City of Glen Rose	City Manager	The city council, including the mayor, mayor pro-tem, and council members, along with the city manager, address the budget; pass laws, regulations, and codes; hire staff; approve plans; and determine the direction of the city overall. As the governing body, the city council has the authority to expand and/or improve mitigation capabilities though hiring additional staff, implementing new taxes, increasing the city budget, adopting new ordinances and regulations, and changing policies and programs. Ability to implement and approve mitigation actions and integrate mitigation into existing policies and programs is a function of this group.

A questionnaire was distributed to the Somervell County Office of Emergency Management and to the Hazard Mitigation Planning Team in order to initiate this assessment. This capability assessment was distributed to the participating jurisdictions to request information pertaining to existing plans, policies, and regulations that contribute to or hinder the ability to implement hazard mitigation activities, including legal and regulatory capabilities, administrative and technical capabilities, and fiscal capabilities. The completed questionnaire was received on May 23, 2014.

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

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

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

Table 4.1 Legal and Regulatory Capability Summary

Legal and Regulatory Capabilities															
Jurisdiction	**Building Code**	**Zoning Ordinance**	**Subdivision Ordinance or regulation**	**Special purpose ordinances (floodplain management, storm water management, hillside or steep slope ordinances wildfire ordinances, hazard setback requirements)**	**Growth management ordinances (also called "smart Growth" or anti-sprawl programs)**	**Site Plan review requirements**	**General or comprehensive plan**	**A capital improvements plan**	**An economic development plan**	**An emergency response plan**	**A post-disaster recovery plan**	**A post-disaster recovery ordinance**	**Real estate disclosure requirements**	**Other**	**% Yes per Jurisdiction**
Somervell County	N	N	Y	Y	N	Y	N	N	Y	Y	Y	N	Y	N	**50%**
Glen Rose	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	N	N	N	**71%**
Average % Yes Capabilities – 61%															
Y- Yes N- No ?- Don't Know															

Table 4.2 Administrative and Technical Capability Summary

Administrative and Technical Capabilities											
Jurisdiction	**Planner(s) or engineer(s) with knowledge of land development and land management**	**Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure**	**Planners or engineer(s) with an understanding of natural and/or human caused hazards**	**Floodplain manager**	**Surveyors**	**Staff with education or expertise to assess the community's vulnerability to hazards**	**Personnel skilled in GIS**	**Scientists familiar with the hazards of the community**	**Emergency manager**	**Grant writers**	**% Yes per Jurisdiction**
Somervell County	N	N	N	Y	Y	Y	Y	N	Y	N	**50%**
Glen Rose	Y	Y	Y	Y	Y	Y	N	N	Y	Y	**80%**
Average % Yes Capabilities – 65%											
Y- Yes N- No ?- Don't Know											

Table 4.3 Fiscal Capability Summary

Fiscal Capabilities											
Jurisdiction	**Community Development Block Grants (CDBG)**	**Capital improvements project funding**	**Authority to levy taxes for specific purposes**	**Fees for water, sewer, gas, or electric service**	**Impact fees for homebuyers or developers for new developments/homes**	**Incur debt through general obligation bonds**	**Incur debt through special tax bonds**	**Incur debt through private activity bonds**	**Withhold spending in hazard-prone areas**	**Other**	**% Yes per Jurisdiction**
Somervell County	N	N	Y	N	N	Y	Y	N	Y	N	**40%**
Glen Rose	Y	Y	Y	Y	N	Y	N	Y	N	N	**60%**
Average % Yes Capabilities – 50%											
Y- Yes N- No ?- Don't Know											

To quantify Somervell County's legal and regulatory capabilities, administrative and technical, and fiscal capabilities, an overall rating system was administered for each category; limited (0-30%), moderate (31-70%), and strong (70-100%). Questionnaire responses indicated that on average, Somervell County and its jurisdictions have 61% of legal and regulatory capabilities, 65% of administrative and technical capabilities of, and 50% fiscal capabilities.

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

Chapter Five: Mitigation Strategy

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

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

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

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

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5.1 Goals

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

Goal 1 Identify and implement hazard mitigation projects to reduce the impact of hazard events and disasters.

Objective 1-A Identify areas where repetitive damages occur during chronic hazard events.
Objective 1-B Incorporate disaster-resistant features in government facilities and infrastructure.
Objective 1-C Expand and coordinate Early Warning Systems currently in use

Goal 2 Protect existing and new properties from the effects of all natural hazards.

Objective 2-A Conduct studies to determine hazard and vulnerability threat assessment for all natural hazards.
Objective 2-B Rehabilitate or retrofit identified high hazard critical infrastructure.
Objective 2-C Enact and enforce regulatory measures that enforce hazard mitigation measures.
Objective 2-D Construct enhancements or additions to current and new facilities which mitigate the effects of natural hazards.
Objective 2-E Maintain NFIP compliance, storm water management, and implement drainage projects.

Goal 3 Develop Public Education Campaigns to educate the public on what actions they can take to mitigate the effects of loss of life or property damage resulting from all natural hazards.

Objective 3-A Educate the public on risks, threats, and vulnerability from all natural hazards.
Objective 3-B Educate the public on actions they can take to prevent or reduce the loss of life or property from all natural hazards.
Objective 3-C Develop and implement a community education campaign to heighten public awareness about chronic flooding and options for insurance coverage to protect their personal properties as well as long term benefits from a buyout program.

Goal 4 Incorporate technology into mitigation program

Objective 4-A Promote and support the CASA Weather Radar System
Objective 4-B Identify and implement technology that can be used in mitigation
Objective 4-C Integrate county-owned technology for use in mitigation

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5.2 Action Items

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

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

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

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

Action Item Complete Listing

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

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Section 5.2.A – Somervell County Action Items

Somervell County Action Item	Purchase NOAA All-Hazard radios and distribute to vulnerable populations
Hazard(s) Addressed	Flooding, High Winds, Tornado, Hail, Extreme Heat, Wildland Fire, Winter Storms, Nuclear Power Plant, Dam Failure, Lightning, Earthquake
Goal/Objective	1-C
Priority	High
Estimated Cost	100,000
Potential Funding Sources	General Funds, HMPG
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	Emergency Management
Implementation Schedule	1 month
Effect on Old Buildings	N/A
Effect on New Buildings	N/A
Cost Effectiveness	Low
Discussion	Radios will be used for disseminating early warnings and public education, protecting life and property from damage.

Somervell County Action Item	Mitigate effects of extreme through installation of covered patios in public parks
Hazard(s) Addressed	Extreme Heat
Goal/Objective	2-D
Priority	Low
Estimated Cost	$5,000
Potential Funding Sources	HMGP
Potential Matching Sources	Local funds, donations, In-kind
Lead Department	Public Works
Implementation Schedule	6 months – 12 months
Effect on Old Buildings	n/a
Effect on New Buildings	n/a
Cost Effectiveness	Low
Discussion	Covered patios in park areas would provide cover/protection, from the sun, for residents that are outside during extreme heat days

Somervell County Action Item	Create temporary public cooling and warming centers to mitigate effects of extreme temperatures.
Hazard(s) Addressed	Extreme Heat, Winter Storm
Goal/Objective	1-B
Priority	Medium
Estimated Cost	TBD
Potential Funding Sources	HMGP
Potential Matching Sources	Local funds, donations, In-kind
Lead Department	Emergency Management
Implementation Schedule	6 months – 12 months
Effect on Old Buildings	Existing buildings would be used as cooling/heating shelters.
Effect on New Buildings	New buildings could be constructed with cooling/heating shelter technology.
Cost Effectiveness	Low
Discussion	Cooling and warming centers would be identified and equipped with appropriate cooling and heating systems. The centers would be open to the public during extreme heat events or severe winter storms.

Somervell County Action Item	Develop and Implement a Comprehensive Public Education Program for the Comanche Peak Nuclear Power Plant
Hazard(s) Addressed	Nuclear Power Plant
Goal/Objective	3-A
Priority	High
Estimated Cost	$15,000
Potential Funding Sources	HMGP, PDM, Other State/Federal Grants
Potential Matching Sources	Local funds, donations, In-kind
Lead Department	Emergency Management
Implementation Schedule	6 months – 12 months
Effect on Old Buildings	n/a
Effect on New Buildings	n/a
Cost Effectiveness	Public education programs return high results for low cost.
Discussion	Educate the public about appropriate response to nuclear risks and disasters.

Somervell County Action Item	Implement Texas Individual Tornado Safe Room Rebate Program.
Hazard(s) Addressed	High Wind, Tornadoes
Goal/Objective	4-C
Priority	High
Estimated Cost	$250,000
Potential Funding Sources	HMGP, PDM, Resident Match, General Fund
Potential Matching Sources	Local funds, donations, In-kind
Lead Department	Emergency Management
Implementation Schedule	12 months – 24 months
Effect on Old Buildings	Some buildings modified for shelter retrofit.
Effect on New Buildings	Storm shelters would be designed into new structures
Cost Effectiveness	Moderate
Discussion	Residential safe room shelters have the potential to decrease personal injuries and death during severe weather, tornado, or high wind events.

Somervell County Action Item	Mitigate low-water crossings identified in this plan through elevating the roadway or installing culverts.
Hazard(s) Addressed	Flooding
Goal/Objective	2-E
Priority	High
Estimated Cost	$250,000
Potential Funding Sources	HMGP, Local Funding
Potential Matching Sources	Local funds, donations, In-kind
Lead Department	County road and bridge supervisor
Implementation Schedule	6 months – 18 months
Effect on Old Buildings	Structures close to construction would be further protected from flooding.
Effect on New Buildings	Culvert construction could modify floodplain, increasing area available for use in new construction.
Cost Effectiveness	Elevating roadways and installing culverts alleviates damage caused by flooding, saving money in repairs.
Discussion	Prevent further roadway damage from running water by elevating roadways out of flood prone areas or installing culverts under the roadway to increase water flow.

Somervell County Action Item	Develop public education campaign to promote “hail resistant” roofing in new construction and roof replacements.
Hazard(s) Addressed	Hail
Goal/Objective	3-A
Priority	Low
Estimated Cost	$2,000
Potential Funding Sources	HMGP
Potential Matching Sources	General Fund, In-kind
Lead Department	Emergency Management
Implementation Schedule	12 Months
Effect on Old Buildings	Potentially can reduce damage caused by hail storms.
Effect on New Buildings	Potentially can reduce damage caused by hail storms.
Cost Effectiveness	Public education provides great results with low cost
Discussion	Public education has proven to be a low cost effective means to achieve changes in public behavior. Encouraging hail resistant roofing can benefit citizens through reduced damage, business through reduced damage to their buildings and reduced claims against insurance companies, and government through reduced request for assistance.

Somervell County Action Item	Educate citizens on drought-tolerant landscape design
Hazard(s) Addressed	Drought, Wildfire
Goal/Objective	3-A
Priority	High
Estimated Cost	TBD
Potential Funding Sources	HMGP, General Fund
Potential Matching Sources	Local funds, donations, In-kind
Lead Department	Emergency Management/ Fire Marshal
Implementation Schedule	12 Months
Effect on Old Buildings	Lower water usage by structures.
Effect on New Buildings	Built in design upon construction
Cost Effectiveness	Low
Discussion	Xeriscaping would prevent unwanted foliage adjacent to homes reducing the need for irrigation and fuel for wildfires

Somervell County Action Item	Implement a program to control all unwanted brush and trees from the dam and spillway areas to prevent erosion of earthen dam.
Hazard(s) Addressed	Dam Failure
Goal/Objective	2-B
Priority	High
Estimated Cost	TBD
Potential Funding Sources	HMGP, General Fund
Potential Matching Sources	Local funds, donations, In-kind
Lead Department	County maintenance supervisor
Implementation Schedule	12 Months
Effect on Old Buildings	N/A
Effect on New Buildings	N/A
Cost Effectiveness	Moderate
Discussion	Removal of brush and trees prevent burrowing animals from destroying the dam by erosion. This one-time project would eliminate a significant source of regular maintenance.

Somervell County Action Item	Identify and complete capital improvements to storm drainage system.
Hazard(s) Addressed	Flooding
Goal/Objective	2-D, 2-E
Priority	High
Estimated Cost	TBD
Potential Funding Sources	General Funds, HMGP
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	City maintenance
Implementation Schedule	As funding is available
Effect on Old Buildings	Less Prone to Flooding
Effect on New Buildings	Less Prone to Flooding
Cost Effectiveness	Low compared to life safety benefits.
Discussion	Somervell County needs to complete improvements to the storm drainage system on a continual basis as growth and population density increase.

Somervell County Action Item	Educate downstream property owners on the benefits of participating in the National Flood Insurance Program.
Hazard(s) Addressed	Dam Failure
Goal/Objective	3-C
Priority	Medium
Estimated Cost	$10,000
Potential Funding Sources	County budget, HMGP
Potential Matching Sources	Local funds, in-kind
Lead Department	Floodplain Manager
Implementation Schedule	Annual program
Effect on Old Buildings	N/A
Effect on New Buildings	N/A
Cost Effectiveness	Cost to implement this program is low compared to the benefits of program.
Discussion	

Somervell County Action Item	Install lightning mitigation devices on critical communications infrastructure and facilities
Hazard(s) Addressed	Lightning
Goal/Objective	1-B
Priority	Low
Estimated Cost	TBD
Potential Funding Sources	County budget, HMGP
Potential Matching Sources	Local funds, in-kind
Lead Department	County Maintenance supervisor
Implementation Schedule	6-12 months
Effect on Old Buildings	Lightning mitigation devices would be installed on existing critical infrastructure.
Effect on New Buildings	Lightning mitigation devices would be installed on new critical infrastructure during construction.
Cost Effectiveness	Moderate
Discussion	Divert lightning strikes from critical infrastructure

Somervell County Action Item	Purchase and install CASA WX Weather Radar
Hazard(s) Addressed	Flooding, Hail, High Winds, Tornado, Winter Storm, Dam Failure,
Goal/Objective	2-E, 4-A
Priority	High
Estimated cost	$2.5 Million
Potential Funding sources	General Fund, Private Donations, User Fees, HMGP, PDM, Public/Private Partnerships
Potential Matching sources	Local funds, donations, in-kind, user fees
Lead Agency / Department Responsible	Emergency Management
Implementation Schedule	< 2 Years
Effect on New Building	None
Effect on Existing Buildings	None
Cost Effectiveness	Low compared to life saving benefits.
Discussion	The Collaborative Adaptive Sensing of the Atmosphere (CASA WX) project is a multi-sector partnership dedicated to engineering revolutionary weather-sensing networks. The main purpose of the CASA WX project is to save lives and minimize injuries due to severe weather. This is accomplished through the enhancement of data by providing lower atmospheric coverage at faster rates. The CASA WX radars provide jurisdictions more accurate weather data and geographically specific weather data culled from the most active levels of the atmosphere. This data could save lives by providing the public more time to react and prepare appropriately as severe weather affects their location. The more accurate data will also provide a better means to analyze severe weather post event which can also help in the assessment of damage after a severe weather event.

Somervell County Action Item	Develop public education campaign to educate citizens on the risks of drought.
Hazard(s) Addressed	Drought
Goal/Objective	3-A
Priority	Low
Estimated Cost	$2,000
Potential Funding Sources	HMGP
Potential Matching Sources	General Fund, In-kind
Lead Department	Emergency Management
Implementation Schedule	12 Months
Effect on Old Buildings	Potentially can reduce damage caused by drought.
Effect on New Buildings	Potentially can reduce damage caused by drought.
Cost Effectiveness	Public education provides great results with low cost
Discussion	Public education has proven to be a low cost effective means to achieve changes in public behavior. Encouraging low water days and careful water usage will help preserve water during times of drought.

Somervell County Action Item	Hire consultant to complete new inundation studies of all high and moderate hazard dams within the county.
Hazard(s) Addressed	Dam Failure, Flood
Goal/Objective	1-A
Priority	High
Estimated Cost	$75,000
Potential Funding Sources	HMPG, Water Shed Authorities, Dam Sponsors
Potential Matching Sources	Local Sponsors, In-Kind
Lead Department	Somervell County Planning and Zoning/ NRCS
Implementation Schedule	12-18 Months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Low
Discussion	Data deficiency identified in Chapter 3. Identify all structures and infrastructures that would be impacted by a potential dam failure.

Somervell County Action Item	Develop an Emergency Plan for Drought
Hazard(s) Addressed	Drought
Goal/Objective	1A
Priority	High
Estimated Cost	15,000
Potential Funding Sources	HMGP, PDM, Local funding
Potential Matching Sources	Local funds, In-kind
Lead Department	Emergency Management
Implementation Schedule	12 months – 24 months
Effect on Old Buildings	n/a
Effect on New Buildings	Include water conservation measures identified in plan: construction considerations, plumbing, fixtures
Cost Effectiveness	Moderate
Discussion	Plan will identify measures to help reduce impacts of drought on people and property to include: replacing existing fixtures with low-flow fixtures and establishing restricted water usage schedules in county buildings, and accessing identified alternate water supplies.

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

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Section 5.2.B – City of Glen Rose Action Items

City of Glen Rose Action Item	Purchase NOAA All-Hazard radios and distribute to vulnerable populations
Hazard(s) Addressed	Flooding, High Winds, Tornado, Hail, Extreme Heat, Wildland Fire, Winter Storms, Nuclear Power Plant, Dam Failure, Lightning
Goal/Objective	1-C
Priority	High
Estimated Cost	5,000 Annually
Potential Funding Sources	General Funds, HMPG
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	Emergency Management
Implementation Schedule	1 month
Effect on Old Buildings	N/A
Effect on New Buildings	N/A
Cost Effectiveness	Low
Discussion	Radios will be used for disseminating early warnings and public education, protecting life and property from damage.

City of Glen Rose Action Item	Mitigate effects of extreme through installation of covered patios in public parks
Hazard(s) Addressed	Extreme Heat
Goal/Objective	2-D
Priority	Low
Estimated Cost	$5,000
Potential Funding Sources	HMGP
Potential Matching Sources	Local funds, donations, In-kind
Lead Department	Public Works
Implementation Schedule	6 months – 12 months
Effect on Old Buildings	n/a
Effect on New Buildings	n/a
Cost Effectiveness	Low
Discussion	Covered patios in park areas would provide cover/protection, from the sun, for residents that are outside during extreme heat days

City of Glen Rose Action Item	Create temporary public cooling and warming centers to mitigate effects of extreme temperatures.
Hazard(s) Addressed	Extreme Heat, Winter Storm
Goal/Objective	1-B
Priority	Medium
Estimated Cost	TBD
Potential Funding Sources	HMGP
Potential Matching Sources	Local funds, donations, In-kind
Lead Department	Emergency Management
Implementation Schedule	6 months – 12 months
Effect on Old Buildings	Existing buildings would be used as cooling/heating shelters.
Effect on New Buildings	New buildings could be constructed with cooling/heating shelter technology.
Cost Effectiveness	Low
Discussion	Cooling and warming centers would be identified and equipped with appropriate cooling and heating systems. The centers would be open to the public during extreme heat events or severe winter storms.

City of Glen Rose Action Item	Develop and Implement a Comprehensive Public Education Program for the Comanche Peak Nuclear Power Plant
Hazard(s) Addressed	Nuclear Power Plant
Goal/Objective	3-A
Priority	High
Estimated Cost	$15,000
Potential Funding Sources	HMGP, PDM, Other State/Federal Grants
Potential Matching Sources	Local funds, donations, In-kind
Lead Department	Emergency Management
Implementation Schedule	6 months – 12 months
Effect on Old Buildings	n/a
Effect on New Buildings	n/a
Cost Effectiveness	Public education programs return high results for low cost.
Discussion	Educate the public about appropriate response to nuclear risks and disasters.

City of Glen Rose Action Item	Implement Texas Individual Tornado Safe Room Rebate Program.
Hazard(s) Addressed	High Wind, Tornadoes
Goal/Objective	4-C
Priority	High
Estimated Cost	$250,000
Potential Funding Sources	HMGP, PDM, Resident Match, General Fund
Potential Matching Sources	Local funds, donations, In-kind
Lead Department	Emergency Management
Implementation Schedule	12 months – 24 months
Effect on Old Buildings	Some buildings modified for shelter retrofit.
Effect on New Buildings	Storm shelters would be designed into new structures
Cost Effectiveness	Moderate
Discussion	Residential safe room shelters have the potential to decrease personal injuries and death during severe weather, tornado, or high wind events.

City of Glen Rose Action Item	Mitigate low-water crossings identified in this plan through elevating the roadway or installing culverts.
Hazard(s) Addressed	Flooding
Goal/Objective	2-E
Priority	High
Estimated Cost	$250,000
Potential Funding Sources	HMGP, Local Funding
Potential Matching Sources	Local funds, donations, In-kind
Lead Department	County road and bridge supervisor
Implementation Schedule	6 months – 18 months
Effect on Old Buildings	Structures close to construction would be further protected from flooding.
Effect on New Buildings	Culvert construction could modify floodplain, increasing area available for use in new construction.
Cost Effectiveness	Elevating roadways and installing culverts alleviates damage caused by flooding, saving money in repairs.
Discussion	Prevent further roadway damage from running water by elevating roadways out of flood prone areas or installing culverts under the roadway to increase water flow.

City of Glen Rose Action Item	Develop public education campaign to promote “hail resistant” roofing in new construction and roof replacements.
Hazard(s) Addressed	Hail
Goal/Objective	3-A
Priority	Low
Estimated Cost	$2,000
Potential Funding Sources	HMGP
Potential Matching Sources	General Fund, In-kind
Lead Department	Emergency Management
Implementation Schedule	12 Months
Effect on Old Buildings	Potentially can reduce damage caused by hail storms.
Effect on New Buildings	Potentially can reduce damage caused by hail storms.
Cost Effectiveness	Public education provides great results with low cost
Discussion	Public education has proven to be a low cost effective means to achieve changes in public behavior. Encouraging hail resistant roofing can benefit citizens through reduced damage, business through reduced damage to their buildings and reduced claims against insurance companies, and government through reduced request for assistance.

City of Glen Rose Action Item	Educate citizens on drought-tolerant landscape design
Hazard(s) Addressed	Drought, Wildfire
Goal/Objective	3-A
Priority	High
Estimated Cost	TBD
Potential Funding Sources	HMGP, General Fund
Potential Matching Sources	Local funds, donations, In-kind
Lead Department	Emergency Management/ Fire Marshal
Implementation Schedule	12 Months
Effect on Old Buildings	Lower water usage by structures.
Effect on New Buildings	Built in design upon construction
Cost Effectiveness	Low
Discussion	Xeriscaping would prevent unwanted foliage adjacent to homes reducing the need for irrigation and fuel for wildfires

City of Glen Rose Action Item	Implement a program to control all unwanted brush and trees from the dam and spillway areas to prevent erosion of earthen dam.
Hazard(s) Addressed	Dam Failure
Goal/Objective	2-B
Priority	High
Estimated Cost	TBD
Potential Funding Sources	HMGP, General Fund
Potential Matching Sources	Local funds, donations, In-kind
Lead Department	County maintenance supervisor
Implementation Schedule	12 Months
Effect on Old Buildings	N/A
Effect on New Buildings	N/A
Cost Effectiveness	Moderate
Discussion	Removal of brush and trees prevent burrowing animals from destroying the dam by erosion. This one-time project would eliminate a significant source of regular maintenance.

City of Glen Rose Action Item	Identify and complete capital improvements to storm drainage system.
Hazard(s) Addressed	Flooding
Goal/Objective	2-D, 2-E
Priority	High
Estimated Cost	TBD
Potential Funding Sources	General Funds, HMGP
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	City maintenance
Implementation Schedule	As funding is available
Effect on Old Buildings	Less Prone to Flooding
Effect on New Buildings	Less Prone to Flooding
Cost Effectiveness	Low compared to life safety benefits.
Discussion	Somervell County needs to complete improvements to the storm drainage system on a continual basis as growth and population density increase.

City of Glen Rose Action Item	Educate downstream property owners on the benefits of participating in the National Flood Insurance Program.
Hazard(s) Addressed	Dam Failure
Goal/Objective	3-C
Priority	Medium
Estimated Cost	$10,000
Potential Funding Sources	City budget, HMGP
Potential Matching Sources	Local funds, in-kind
Lead Department	Floodplain Manager
Implementation Schedule	Annual program
Effect on Old Buildings	N/A
Effect on New Buildings	N/A
Cost Effectiveness	Cost to implement this program is low compared to the benefits of program.
Discussion	

City of Glen Rose Action Item	Install lightning mitigation devices on critical communications infrastructure and facilities
Hazard(s) Addressed	Lightning
Goal/Objective	1-B
Priority	Low
Estimated Cost	TBD
Potential Funding Sources	City budget, HMGP
Potential Matching Sources	Local funds, in-kind
Lead Department	County Maintenance supervisor
Implementation Schedule	6-12 months
Effect on Old Buildings	Lightning mitigation devices would be installed on existing critical infrastructure.
Effect on New Buildings	Lightning mitigation devices would be installed on new critical infrastructure during construction.
Cost Effectiveness	Moderate
Discussion	Divert lightning strikes from critical infrastructure

City of Glen Rose Action Item	Purchase and install CASA WX Weather Radar
Hazard(s) Addressed	Flooding, Hail, High Winds, Tornado, Winter Storm, Dam Failure,
Goal/Objective	2-E, 4-A
Priority	High
Estimated cost	$2.5 Million
Potential Funding sources	General Fund, Private Donations, User Fees, HMGP, PDM, Public/Private Partnerships
Potential Matching sources	Local funds, donations, in-kind, user fees
Lead Agency / Department Responsible	Emergency Management
Implementation Schedule	< 2 Years
Effect on New Building	None
Effect on Existing Buildings	None
Cost Effectiveness	Low compared to life saving benefits.
Discussion	The Collaborative Adaptive Sensing of the Atmosphere (CASA WX) project is a multi-sector partnership dedicated to engineering revolutionary weather-sensing networks. The main purpose of the CASA WX project is to save lives and minimize injuries due to severe weather. This is accomplished through the enhancement of data by providing lower atmospheric coverage at faster rates. The CASA WX radars provide jurisdictions more accurate weather data and geographically specific weather data culled from the most active levels of the atmosphere. This data could save lives by providing the public more time to react and prepare appropriately as severe weather affects their location. The more accurate data will also provide a better means to analyze severe weather post event which can also help in the assessment of damage after a severe weather event.

City of Glen Rose Action Item	Develop public education campaign to educate citizens on the risks of drought.
Hazard(s) Addressed	Drought
Goal/Objective	3-A
Priority	Low
Estimated Cost	$2,000
Potential Funding Sources	HMGP
Potential Matching Sources	General Fund, In-kind
Lead Department	Emergency Management
Implementation Schedule	12 Months
Effect on Old Buildings	Potentially can reduce damage caused by drought.
Effect on New Buildings	Potentially can reduce damage caused by drought.
Cost Effectiveness	Public education provides great results with low cost
Discussion	Public education has proven to be a low cost effective means to achieve changes in public behavior. Encouraging low water days and careful water usage will help preserve water during times of drought.

City of Glen Rose Action Item	Hire consultant to complete new inundation studies of all high and moderate hazard dams within the county.
Hazard(s) Addressed	Dam Failure, Flood
Goal/Objective	1-A
Priority	High
Estimated Cost	$75,000
Potential Funding Sources	HMPG, Water Shed Authorities, Dam Sponsors
Potential Matching Sources	Local Sponsors, In-Kind
Lead Department	Planning and Zoning/ NRCS
Implementation Schedule	12-18 Months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Low
Discussion	Data deficiency identified in Chapter 3. Identify all structures and infrastructures that would be impacted by a potential dam failure.

City of Glen Rose Action Item	Develop an Emergency Plan for Drought
Hazard(s) Addressed	Drought
Goal/Objective	1A
Priority	High
Estimated Cost	15,000
Potential Funding Sources	HMGP, PDM, Local funding
Potential Matching Sources	Local funds, In-kind
Lead Department	Emergency Management
Implementation Schedule	12 months – 24 months
Effect on Old Buildings	n/a
Effect on New Buildings	Include water conservation measures identified in plan: construction considerations, plumbing, fixtures
Cost Effectiveness	Moderate
Discussion	Plan will identify measures to help reduce impacts of drought on people and property to include: replacing existing fixtures with low-flow fixtures and establishing restricted water usage ordinances in city limits, and accessing identified alternate water supplies.

5.3 National Flood Insurance Program (NFIP) Compliance

The National Flood Insurance Program (NFIP)

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

Community Participation

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

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

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

Somervell County Jurisdiction Participation Somervell County jurisdictions are participating in the National Flood Insurance Program and have identified their respective areas as vulnerable to flooding. This is incorporated into all current and future planning for dealing with repetitive loss vulnerabilities.

CID	Community Name	County	Initial FHBM Identified	Initial FIRM Identified	Curr Eff Map Date	Reg-Emer Date	Tribal
480574#	GLEN ROSE, CITY OF	SOMERVELL COUNTY	8/23/1974	5/25/1984	4/3/1995	5/25/1984	No
481186#	SOMERVELL COUNTY*	SOMERVELL COUNTY	9/11/1979	8/4/1987	4/3/1995	8/4/1987	No

Source: http://www.fema.gov/cis/TX.html
** - Unincorporated Somervell County*

Jurisdiction Compliance

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

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

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

Jurisdiction Activities

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

Jurisdiction	Community Floodplain Administrator	NFIP Activity	Activity Description	Enforcement
Somervell County	Road and Bridges Supervisor	Completing and maintaining FEMA elevation certificates for pre-FIRM and or post-FIRM buildings	Permits are issued through the Roads and Bridges Department	NFIP compliance is implemented and enforced through a process of floodplain identification using FEMA floodplain maps, permit issuance, building requirements, and compliance inspections pending approval. Failure to comply with County's flood damage prevention order shall result in fines up to $500 per violation plus court costs.
		Floodplain development permits	Elevation certificate and permits required for any new construction in a floodplain.	
		Participate with FEMA in identifying Special Flood Hazard Areas for future FIRM maps	Strictly adhere to the Flood Damage Prevention Court Order.	
		Future Mitigation Projects	Somervell County will continue to monitor for new areas of flooding that have not been previously identified for mitigation.	
City of Glen Rose	City Administrator	Completing and maintaining FEMA elevation	Permits are issued through the Roads and Bridges Department	NFIP compliance is implemented and enforced

		certificates for pre-FIRM and or post-FIRM buildings		through a process of floodplain identification using FEMA floodplain maps, permit issuance, building requirements, and compliance inspections pending approval. Failure to comply with City's flood damage prevention order shall result in fines up to $500 per violation plus court costs.
		Floodplain development permits	Elevation certificate and permits required for any new construction in a floodplain.	
		Participate with FEMA in identifying Special Flood Hazard Areas for future FIRM maps	Strictly adhere to the Flood Damage Prevention Court Order.	
		Future Mitigation Projects	City of Glen Rose will continue to monitor for new areas of flooding that have not been previously identified for mitigation.	

The Community Rating System (CRS)

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

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

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Chapter Six Plan: Maintenance Process

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

6.1 Monitoring, Evaluating and Updating the Plan

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

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

The Somervell County Emergency Management Coordinator will be responsible for ensuring the mitigation action items and implementation are monitored, evaluated, and reviewed biannually by emailing all the participating jurisdictions for updates on their individual action items. The progress of the action items will be tracked electronically as “in progress”, “deferred” or “completed”. This implementation will be included in the Mitigation Strategies for the 5 year update of the plan.

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

Jurisdiction	Personnel	Activity	Schedule
Somervell County	Emergency Management Coordinator	Tracking implementation and action items	Biannually
		Evaluate Plan	Annually
		Update Plan	Once every 5 years
City of Glen Rose	City Administrator	Tracking implementation and action items	Biannually
		Evaluate Plan	Annually
		Update Plan	Once every 5 years

At least once every five (5) years, or more frequently, if such a need is determined by the participating jurisdiction, the multi-jurisdictional plan will undergo a major update. During this process, all sections of

the plan will be updated with current information and analyses and new and/or modified mitigation action plans will be developed. The revised plan will be submitted for state and federal review and approval and presented to the Somervell County Commissioner's Court and the respective incorporated cities', included in the Somervell County plan, City Councils for approval. Likewise, each participating jurisdiction will undergo the same process for reviewing, revising and updating their respective plans and submitting same for state, federal and jurisdiction's respective local governing body approval. The plan will be updated every five years in accordance.

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

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

Local and regional planning committees currently use comprehensive land use planning, capital improvements planning, and building code ordinances to guide development. The mitigation strategy, goals, objectives and actions outlined in this plan will be integrated into these existing mechanisms as applicable. Those mechanisms include the following:

Jurisdiction	Responsible Personnel	Jurisdictional Plans	Integration Schedule	Integration Plan
Somervell County	Emergency Management Coordinator	Capital Improvement Plan	Annually	During meetings to create, adopt, update, or otherwise change any documents that have an effect on vulnerability to natural hazards, Somervell County will consult the most recent version of the Hazard Mitigation Action Plan. Provided there is sufficient political, fiscal, and administrative capability, actions detailed in the HazMAP will be brought before the Commissioners Court to be approved, via vote, for integration into the document wherever applicable.
		Economic Development Plan	Annually	
		Emergency Operations Plan	Every five years	
		Drought Contingency plans	As needed	
City of Glen Rose	City Administrator	Capital Improvement Plan	Annually	During meetings to create, adopt, update, or otherwise change any documents that have an effect on vulnerability to natural hazards, City of Glen Rose will consult the most recent version of the Hazard
		Economic Development Plan	Annually	

Jurisdiction	Responsible Personnel	Jurisdictional Plans	Integration Schedule	Integration Plan
		Emergency Operations Plan	Every five years	Mitigation Action Plan. Provided there is sufficient political, fiscal, and administrative capability, actions detailed in the HazMAP will be brought before the City Council to be approved, via vote, for integration into the document wherever applicable.
		Drought Contingency plans	As needed	

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

6.3 Continued Public Involvement *(In compliance with 201.6(c)(4)(iii))*

As stated in requirement § *201.6(c)(4)(iii)* The plan maintenance process shall include a discussion on how the community will continue public participation in the plan maintenance process.

To address this requirement, ongoing public participation will be encouraged throughout the entire planning and implementation process. A copy of the plan will be provided on the Somervell County website. The planning committee will continue meeting on a weekly basis to ensure the successful implementation of the plan and to discuss any additional issues regarding the emergency management of Somervell County. The annual meetings for monitoring, evaluating, and updating the plan will be open to the public and public notices will encourage community participation.

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Appendix A: Planning and Public Meeting Documentation

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MEETING SIGN-IN SHEET

Meeting:	Somervell County Hazard Mitigation Action Plan	**Meeting Date:**	10/31/2013
Facilitator:	Nicholas F. LaGrassa	**Place/Room:**	

Name	Title	Company	Phone	E-Mail
John R. Curtis	County Commissioner Pct 2	Somervell County	817-559-9367	john_curtis@glenrose.org
Jim Ogden	Emergency Planner CPNPP	Comanche Peak	682-936-9100	ogden2@luminant.com
JIM HOLDER	PUBLIC WORKS MGR. CITY OF GLEN ROSE		254 396 5626	JIM.HOLDER@GLENROSETEXAS.ORG
RAY MOODY	CODE Enf CITY OF Glen Rose		254 897 2272	ray.moody@glenrose texas.ORG
Dwayne Griffin	Somervell Co. EMC	Somervell Co.	254 897-2919	emc@co.somervell.Tx.US
Andrea Wilson	NCTCOG EP Intern		817 695 9139	awilson@nctcog.org
Melanie Levine	Sr. Specialist	NCTCOG	817-695-9138	MLevine@nctcog.org
Mike Ford	County Judge	Somervell County	254 897-2322	cojudge@co.somervell.tx.us
Nicholas LaGrassa	EP Program Asst. Staff	NCTCOG	817 608 2323	nlagrassa@nctcog.org
Dennis Moore	Mayor City of Glen Rose	City Glen Rose	254-897-2272	Dennis.Moore@glenrosetexas.org

MEETING SIGN-IN SHEET

Meeting:	Somervell County HazMAP Meeting	**Meeting Date:**	11/21/2013
Facilitator:	Nicholas F. LaGrassa, NCTCOG	**Place/Room:**	

Name	Title	Company	Phone	E-Mail
Dwayne Griffin	Somervell Co. EMC	Somervell Co.	254 897. 2919	emc@co.somervell.tx.us
WADE Busch	Somervell Sup		254-897-2239	Wadebusch@yahoo.com
John Curtis	Somervell Comm	Somervell Co.	817-559-9367	john_curtis@stanrose.org
Nicholas LaGrassa	EP Program Asst. Staff ~~NCTCOG~~	NCTCOG	817 608 2323	nlagrassa@NCTCOG.org
Andrea Wilson	Intern	NCTCOG	on file	

FILED
CANDACE GARRETT
COUNTY/DISTRICT CLERK
SOMERVELL CO., TEXAS

2014 FEB -7 AM 8:35

DEPUTY

COMMISSIONERS COURT
PUBLIC HEARING
OF SOMERVELL COUNTY

TO WHOM IT MAY CONCERN:

PURSUANT TO THE TEXAS OPEN MEETINGS ACT, NOTICE IS HEREBY GIVEN THAT A PUBLIC HEARING

MEETING OF THE COMMISSIONERS COURT OF SOMERVELL COUNTY, TEXAS WILL BE HELD AT:

9:30 AM 10th day of February 2014

IN THE COMMISSIONERS COURTROOM IN THE SOMERVELL COUNTY COURT HOUSE ANNEX,

107 N.E. VERNON

IN GLEN ROSE, TEXAS AT WHICH MEETING THE FOLLOWING SUBJECTS WILL BE DISCUSSED

AND THE FOLLOWING MATTERS ACTED UPON:

OPEN MEETING

POSTED
DATE 2-7-14
8:35 A.M. _____ P.M.
Candace Garrett
BY _____ DEPUTY

Agenda Requests

1. **County Judge: Public Hearing and presentation of a Hazard Mitigation Program for Somervell County, led by the North Central Texas Council of Governments.**

MEETING SIGN-IN SHEET

Meeting:	Somervell County MitStrat Meeting (Somervell HazMAP)	**Meeting Date:**	3/24/14
Facilitator:	Nicholas F. LaGrassa`	**Place/Room:**	Somervell Courthouse

Name	Title	Company	Phone	E-Mail
Dwayne Griffin	Somervell EMC	Somervell County	254 897.2919	emc@co.somervell.Tx.us
John Curtis	Somervell Comm	Somervell County	817-559-9367	john_curtis@slemrose.org
Andrea C Wilson	NCTCOG	NCTCOG	8176959891	awilson@nctcog.org.

COMMISSIONERS COURT
PUBLIC HEARING
OF SOMERVELL COUNTY

TO WHOM IT MAY CONCERN:

PURSUANT TO THE TEXAS OPEN MEETINGS ACT, NOTICE IS HEREBY GIVEN THAT A PUBLIC HEARING

MEETING OF THE COMMISSIONERS COURT OF SOMERVELL COUNTY, TEXAS WILL BE HELD AT:

9:30 AM 22nd day of September 2014

IN THE COMMISSIONERS COURTROOM IN THE SOMERVELL COUNTY COURT HOUSE ANNEX,

107 N.E. VERNON

IN GLEN ROSE, TEXAS AT WHICH MEETING THE FOLLOWING SUBJECTS WILL BE DISCUSSED

AND THE FOLLOWING MATTERS ACTED UPON:

OPEN MEETING

Agenda Requests

1. **County Judge: Final Public Hearing for HAZMAP being written by North Central Texas Council of Governments.**

Presentation given by Somervell Co. EMC.

All Commissioners and County Judge was present.

Dwayne Griffin
Somervell Co. EMC / Fire Marshal