

The McLennan County Hazard Mitigation Plan



Waco-McLennan County Office of Emergency

Management

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EXECUTIVE SUMMARY

Purpose and Process of Development

This mitigation plan is a five-year blueprint for the future, aimed at making communities in McLennan County disaster resistant by reducing or eliminating the long-term risk from a full range of disasters. It meets the requirements of the Disaster Mitigation Act of 2000 (P.L. 106-390); Section 44 of the Code of Federal Regulations, Part 201.6 & Part 206; and the Texas Division of Emergency Management standards. An open public process was established to provide multiple opportunities for all sectors in McLennan County to become involved in the planning process and make input during its drafting stage.

Hazards Facing McLennan County

Mitigation is defined as the effort to reduce the loss of life and property by lessening the impact of disasters. This McLennan County Hazard Mitigation Plan (“plan”) is aimed at reducing or eliminating the long-term risk of loss of life and property damage from a full range of disasters.

The plan identifies and assesses the potential impact of eight natural hazards that threaten McLennan County and the participating cities of Bellmead, Beverly Hills, Crawford, Gholson, Hallsburg, Hewitt, Lacy-Lakeview, Leroy, Lorena, Mart, McGregor, Robinson, Ross, Waco, West and Woodway. For the purposes of this plan, “the county” refers to all of the participating jurisdictions, which are stated above.

The hazards include floods, droughts, wildfires, tornadoes, thunderstorms/ lightning, winter storms, hail, and dam failure.

Hazards were identified based on a review of historical records, national data sources, existing plans and reports, and discussions with local, regional, and national experts. Each hazard was profiled based on its severity of impact, frequency of occurrence, seasonal patterns, warning time, cascading potential and existing warning systems.

An inventory of populations, buildings, critical and special facilities, and commercial facilities at potential risk was conducted. The probability of occurrence and potential dollar losses from each hazard were estimated using the Federal Emergency Management Agency’s Hazards U.S. Multi-Hazards Model (HAZUS-MH). The hazards were then ranked based on potential damages in terms of lives lost, dollars lost, and other relevant community factors.

Mitigation Goals

Mitigation goals are general guidelines that articulate a desired end state. The goals of this plan are to:

- Protect the lives and property of residents within McLennan County;
- Seek funding in order to implement developed mitigation actions; and

- Be “disaster ready” by implementing those mitigation actions when possible.

The plan is intended to serve as a basis for future funding that may become available from State or Federal grants and technical assistance programs. It will enable the County to take advantage of rapidly developing mitigation grant opportunities as they arise.

Mitigation Actions

Mitigation Actions are the proposed projects or ideas that a jurisdiction may implement in order to lessen or eliminate the impact or severity of disasters on that jurisdiction. Multiple mitigation actions are presented for each participating jurisdiction to reduce the loss of life and property within their community.

Each action is presented in the plan along with a description of the action, costs, benefits, responsible organization for overseeing implementation, estimated completion date, and potential funding sources. The mitigation actions are based upon their effect on the overall risk to life and property, ease of implementation, political and community support, and funding.

McLennan County and the participating jurisdictions will seek to obtain the necessary funding to implement the mitigation actions set forth when possible. However, in this era of increased demands and constrained resources at all levels of government, the lack of resources, especially from external sources, may hamper the ability of the jurisdictions to implement some mitigation actions identified in the plan or to implement them within the timeframe specified.

Plan Maintenance

This section discusses how the plan will be implemented, evaluated and improved over time by the participating jurisdictions and how the public will continue to be involved in the hazard mitigation planning process throughout the next five years. It is important to note that the priorities have not changed since 2013 with the priority to look at all the hazards and threats and work in the best possible way to mitigate them based on the mitigation goals. They include Increase public understanding, support and demand for hazard mitigation, Protect public health and safety, Protect existing and new properties Build and support local capacity and commitment to continuously become less vulnerable to hazards, and Promote growth in a sustainable manner

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SECTION ONE: THE PLANNING PROCESS

Preparation of the Plan

The McLennan County Hazard Mitigation Plan (“mitigation plan” or “plan”) was developed in accordance with the provisions of the Disaster Mitigation Act of 2000 (Public Law 106-390), the Pre-Disaster Mitigation Grant Program, 44 Code of Federal Regulations Part 201.6 and 206, and the planning standards adopted by the Federal Emergency Management Agency (FEMA) and the Texas Division of Emergency Management (TDEM).

The 2013 edition of mitigation plan was created for McLennan County by the McLennan County Office of Emergency Management, along with their contractor, Lerner Consulting. This was funded by the Federal Emergency Management Agency (FEMA) under a mitigation planning grant awarded to McLennan County on August 23, 2010.

The participants in this plan were initially part of a larger mitigation plan created in 2006 by the Heart of Texas Council of Governments (HOTCOG), along with their contractor, H2O Partners. Whereas the 2006 version contained multiple counties within the HOTCOG region, this new mitigation plan covers only McLennan County and participating jurisdictions of Bellmead, Beverly Hills,

Crawford, Gholson, Hallsburg, Hewitt, Lacy-Lakeview, Leroy, Lorena, Mart, McGregor, Robinson, Ross, Waco, West and Woodway.

The 2018 plan is an updated version of the 2013 plan. The update was led by McLennan County and had help from all of the jurisdictional participants listed in the previous paragraph. For the purposes of this plan, “the county” refers to all of the participating jurisdictions listed on page three. The assistant EMC of Waco-McLennan County began working on the updates in the fall of 2017. In October 2017, a public meeting was held in order to have input from the public. The last updates were done with the help of the hazard mitigation team by having them assist with the analysis of the hazards as well as producing mitigation action items for the plan. Each member of the team received an email about the hazard mitigation action items with the opportunity to make changes to the mitigation action items.

The plan identifies and assesses the potential impact of eight (8) natural hazards that threaten human life and property. The hazards include floods, droughts, wildfires, tornadoes, thunderstorms/lightning, winter storms, hail, and dam failure. Hazards including extreme heat and land subsidence were not included because they do not meet the threat hazard assessment.

Ultimately, this plan is designed to help build a sustainable community that, when confronted by natural disasters, will sustain fewer losses and will be able to recover more quickly from them. It is also intended to:

- minimize disruption to the region following a disaster;

- streamline the disaster recovery process by having in place pre-identified actions that can be taken to reduce or eliminate future damage;
- provide the basis for the Small Business Administration to make low interest, fixed rate loans to small businesses for the purpose of implementing mitigation measures to protect their commercial real property (buildings) or leasehold improvements or contents from disaster related damage.
- capitalize on Federal funding that may become available after the disaster strikes; and
- ensure that the region maintains its eligibility to the full range of future Federal disaster relief. After November 1, 2004, eligibility to certain forms of Federal mitigation funding to cities and counties is dependent upon having a FEMA-approved Hazard Mitigation Plan in place.

The plan is intended to serve as a basis for future funding that may become available from State or Federal grants and technical assistance programs. It will enable McLennan County and the participating jurisdictions to take advantage of rapidly developing mitigation grant opportunities as they arise.

Potential funding sources for implementation are identified for each proposed action. These include general revenues, state and federal grants. The County and participating jurisdictions will seek to obtain the necessary funding to implement the mitigation actions set forth when possible. However, in this period of increased demands and constrained resources at all levels of government, the lack of resources, especially from external sources, may hamper the ability of the jurisdictions to implement some mitigation actions identified in the plan or to implement them within the timeframe specified.

Jurisdictional Participation

The overall jurisdictions participating in this Plan include McLennan County and the cities of Bellmead, Beverly Hills, Crawford, Gholson, Hallsburg, Hewitt, Lacy-Lakeview, Leroy, Lorena, Mart, McGregor, Robinson, Ross, Waco, West and Woodway. For the purposes of this plan, “the county” refers to all of the participating jurisdictions listed above.

The jurisdictions all participated equally during the update process. Each jurisdiction has a member on the Hazard Mitigation Team. Appendix A lists the members in greater detail. Each jurisdiction contributed during the update process by:

-
- Reviewed, analyzed and provided data to each section of the plan, as

necessary.

- Provided a detailed risk assessment for their jurisdiction.
- Provided new mitigation actions to lessen vulnerability to hazards.
- Devised a way to keep the plan maintained from 2018-2023
- McLennan County and the participating jurisdictions will maintain, update and evaluate the plan during the next 5 years.

Assessing Risks

Eight natural hazards that have affected and may again affect McLennan County and participating jurisdictions were examined by the HMT based on a review of historical records, national data sources, existing plans and reports, and discussions with local, regional, state, federal, and national experts.

Hazard profiles were prepared and updated to show their severity of impact, frequency of occurrence, seasonal patterns, warning time, cascading potential, and applicable warning systems.

The characteristics and potential consequences of each hazard were assessed to determine how much of the area could be affected and the potential effects on local assets.

An inventory was taken of populations, buildings, infrastructure and facilities classified as “critical” or “special”, or housing hazardous materials. Appendix B contains a full list of critical facilities for the participating jurisdictions.

Potential dollar losses from each hazard were estimated using the Federal Emergency Management Agency’s Hazards U.S. Multi-Hazards Model (HAZUS-MH). The techniques were applied to examine the impact of various hazards on the built environment, including on the general building stock (e.g., residential, commercial, industrial), critical facilities, lifelines, and infrastructure.

Two distinct assessment methodologies were used. The HAZUS-MH risk-assessment methodology modeled distinct hazard and inventory parameters (e.g., wind speed and building types) to determine potential damages and losses in the built environment. The second methodology used a statistical approach to model risk by analyzing a hazard’s frequency of occurrence and estimated effects based on recorded damage data. Both methodologies use a common, systematic framework developed to provide a factual basis for determining what actions will mitigate risks. The assessments also were used to set priorities for mitigation based on potential dollar losses, loss of lives, and other factors. The hazards in Sections 4 through 11 of this Plan appear generally in priority order, based on risk to the County as a whole, with the greatest hazards appearing first.

Developing Mitigation Actions

Members of the Hazard Mitigation Team looked at the status of mitigation actions from the 2013 plan in order to plan for the mitigation actions of the 2018 plan.

There was a county EMC meeting held on March 13, 2018 which led to a discussion of the plan and mitigation actions items. Each representative also received an email to check on the status of projects from the 2013 plan. Actions that were not completed in 2013 were carried over to the 2018 plan because the team felt the projects were still of value. Each member used a structured process was used to develop, prioritize and include the mitigation actions for this plan. It included the following steps:

- Hazard mitigation team members conducted a benefit cost review of each proposed mitigation action. The HMT achieved this by considering the overall benefits that would result from the mitigation actions versus the cost of those projects. For those actions in which the benefits could be quantified, an economic evaluation was one factor that helped team member's select one mitigation action from among many competing ones. Cost-effectiveness of actions was considered as each team member developed their final list of mitigation actions. Economic considerations were part of the community's analysis of the comprehensive range of specific mitigation actions and projects being considered.
- Hazard mitigation team members then selected mitigation actions and prioritized them. The prioritization method was based on the following criteria: 1) benefits in terms of effect on overall risk to life and property, including the effects on both new and existing buildings and infrastructure; 2) ease of implementation; 3) political and community support; and 4) cost and funding availability. The overall priority is reflected in each action in Section 14.
- In formulating mitigation actions, team members examined potential mitigation actions that address existing and new buildings and infrastructure. Each team member considered mitigation actions addressing new buildings and infrastructure although not all mitigation actions considered were ultimately included in their plans due to limited capabilities, prohibitive costs, low benefit/cost ratio or other concerns.
- Team members developed action plans identifying proposed actions, estimated costs and benefits, the responsible organization(s), implementation schedule, related objective(s) to which the actions relate, priority, and potential funding sources.

Public Participation

General public input has been solicited during the drafting stage and upon development of the draft plan. Public input will be sought a third time prior to adoption of the plan by the local jurisdictions.

A public meeting was held to give the public an opportunity to learn about the hazards they face and ways to protect themselves and their families and to provide an opportunity for public input into the plan. The public meeting also provided an opportunity for the public to make input into the planning process during the drafting stage. The public meeting was held in Waco on October 10, 2017 to solicit public input and participation. Unfortunately, there was very little public participation. Appendix E contains some of the documentation relating to the public meeting.

The public will also be provided an opportunity to comment on the draft plan prior to plan adoption by each Governing Body. The public will be notified that each Governing Body is considering the plan and will be given the location where the public can inspect the plan and submit comments. During each Governing Body meeting, a formal opportunity to comment on the plan will be provided in advance of Governing Body action passing resolutions adopting the plan.

Stakeholder Participation

Stakeholder participation is a key part of developing this plan. The table below lists stakeholder type, and which jurisdiction they represent. Stakeholders were invited by a variety of ways through emails, press releases, letters, notices, agendas at council meetings, interviews on tv, and Facebook posts. At the stakeholder meetings or in the stakeholder letters, the topics for discussion included the hazards that impact the planning area, and the mitigation action items. Their feedback has been incorporated into the plan by being noted in the table as well as impacting the mitigation action items. In some cases, stakeholder did not show up to the stakeholder meeting but the public did. Their information has been recorded in the stakeholder table.

Industry/ Organization	Jurisdiction Represented	Natural Hazard/ Mitigation Feedback Provided?	Feedback
Public	Hallsburg	No	
Public	Hallsburg	No	
Public	Leroy	No	
Public	Leroy	No	
Public	Ross	No	

Public	Ross	No	
Education- Baylor University	Waco	Yes	Reemphasized need for education- all education projects were carried over to the 2018 plan as noted in the mitigation action items section.
Fire Department	Waco	No	
Fire Department	Waco	No	
Public Works	Waco	No	
Facilities	Waco	No	
Solid Waste	Waco	Yes	Asked about grants and brought up concerns with stormwater and flooding. City of Waco added a project on stormwater on page 291
Hospital	Waco	No	
Hospital	Waco	No	
Stormwater	Waco/ McLennan County	Yes	Asked about grants and brought up concerns with stormwater and flooding. City of Waco added a project on stormwater on page 291
McLennan Engineer	McLennan County	Yes	Suggested flood crossing barriers as a potential project. McLennan County added this project on page 155
McLennan Engineer	McLennan County	Yes	<p>Asked more about the grants and concern with flooding and potential to add more flood projects</p> <p>At the meeting, the grant process was discussed and explained all of the flood projects for the County which are included in the projects section. Explained how we can add more projects later on by amending the plan.</p>

Mayor	Gholson	No	
Mayor Pro-Tem	Gholson	No	
City Attorney	Gholson	No	
Brazos River Authority	Gholson	No	
City Secretary	Gholson	No	
Council Member	Gholson	No	
Council Member	Gholson	No	
Private Industry	Bellmead	No	
EMC	Woodway	Yes	They asked about new hail project which was added to the plan. .
City Building Official	Woodway	No	
City Engineer	Woodway	Yes	Question about status of 2013 projects Updated project information including year and cost. Updated the information of the project including costs and year.
Education	Lacy Lakeview	No	
Education	Lorena	No	
Mayor	Lorena	No	
Mayor	Crawford	No	
Mayor	McGregor	Yes	Question about status of 2013 projects Updated project information including year and cost.
EMC	Mart	Yes	Question about status of 2013 projects. Updated project information including year and cost for projects carried over from 2013 plan.
City Manager	Mart	Yes	Question about status of 2013 projects Updated project information including year and cost.

Public	Robinson	No	
Public	Robinson	No	
Public	Robinson	No	

Partnerships in Planning

In developing the plan, the County Office of Emergency Management was assisted by several federal and state agency documents, including flood plain maps from the Federal Emergency Management Agency (FEMA), staff input and guidance from the Texas Division of Emergency Management (TDEM), information relating the Repetitive Loss (RL) structures from the Texas Water Development Board (TWDB), historically occurrences of natural hazards provided by the National Oceanic and Atmospheric Administration (NOAA), and wild fire maps provided by the Texas Forest Service (TFS).

A variety of existing local studies, plans, reports and technical information were reviewed as part of the planning process. In particular, the McLennan County local floodplain ordinance was reviewed to determine if floodplain management could be strengthened in an effort to mitigate floods. Requiring the addition of freeboard for building permits in the floodplain is one way to increase safety. The Hazard Mitigation Team (HMT) also used any local drainage studies that a community might have as well as their local Flood Insurance Rate Maps (FIRM). The HMT also reviewed the City of Waco's building codes to determine if stronger ordinances would help strengthen new buildings from some hazards, such as tornadoes. Section 13 and the hazard-specific sections of the plan summarize the findings from the studies, plans, reports and technical information.

SECTION TWO: McLENNAN COUNTY AT A GLANCE

Geography

McLennan County, located primarily in northern Central Texas, has a total area of 1,060 square miles, of which 1,042 square miles is land and 18 square miles is water. The City of Waco is the county seat and is the largest jurisdiction within the county. The physical features of McLennan County include mostly blackland prairie and loam, sandy soils with rolling hills in the west. Watersheds drain into the Bosque and Brazos Rivers and into Lake Waco, which is situated on the Bosque River. The county was created by the Texas Legislature in 1850 and is named for Neil McLennan Sr., who moved his family there in 1845 to a site on the Bosque River near present-day Waco.

Figure 2-1: Map of McLennan County

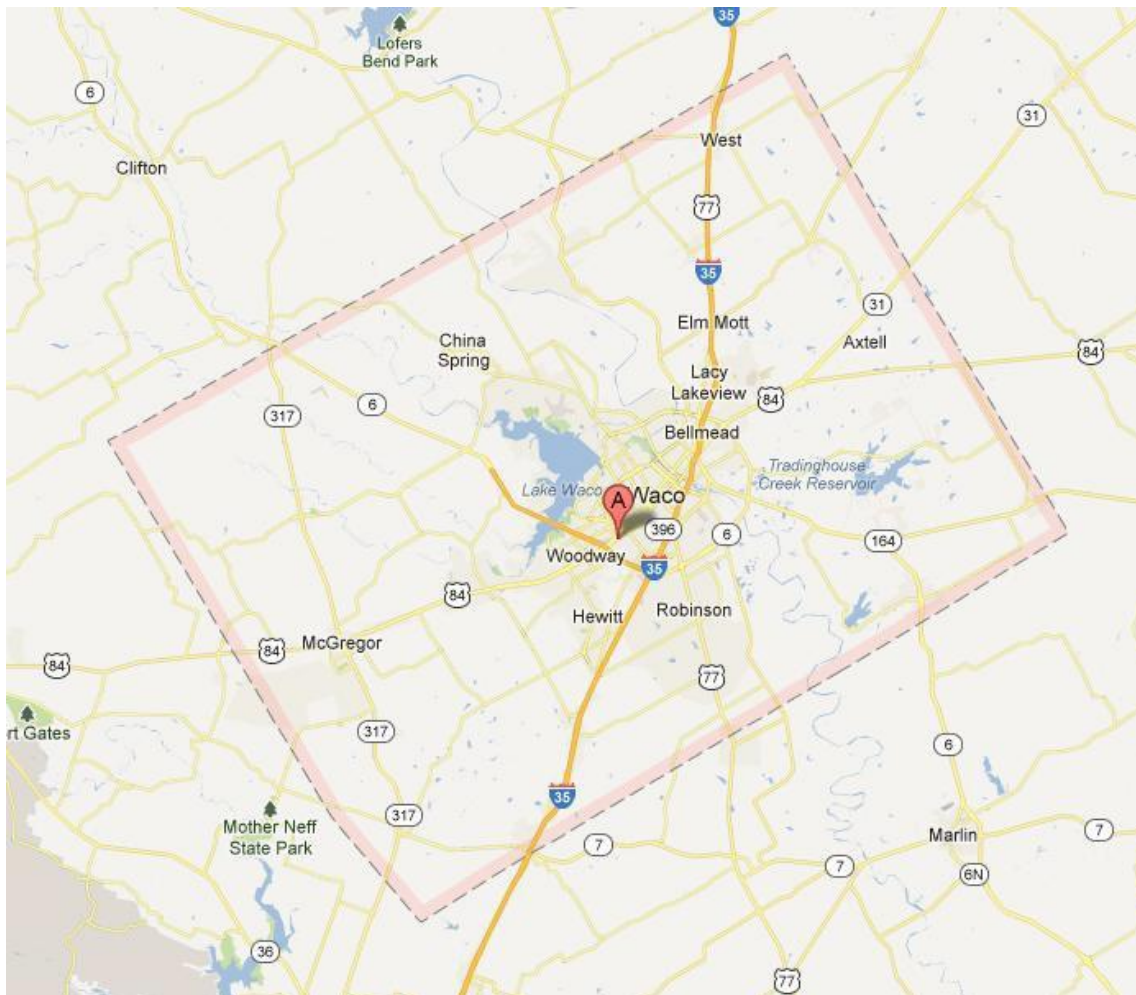


Figure 2-2: Location of McLennan County in Texas



Population

The population of McLennan County in 2017 is estimated to be over 250,000 people. The estimated largest cities in McLennan County are the cities of Waco, with over 134,000 people, and Hewitt with over 14,000.

Higher Education

Table 2-1: 2017 McLennan County Higher Education Institutions Enrollment Numbers

Institution	Location	Enrollment Fall 2017	Number of Faculty
Baylor University	Waco	Over 17,000	Over 900
Texas State Technical College	Waco	Over 4,000	100
McLennan Community College	Waco	Over 8,000	200

Land Use

McLennan County has over 2,000 farms comprising over 490,000 acres. The primary crops are corn, wheat, hay, grain, sorghum and soybeans. Livestock

plays an important role in the McLennan County economy, with poultry, beef cattle and dairy cattle leading the way.

The major minerals in the county include sand and gravel, limestone, oil and gas.

History

Indigenous Indian tribes such as the Tonkawas, Wichitas and Wacos lived in the area until Anglo-American settlers arrived in the 1840's.

The Indians were placed in Brazos reservations in 1854.

McLennan County created from Milam County in 1850 and is named for early local settler Neil McLennan Senior.

Development Trends

The building of new structures will continue throughout McLennan County, with a primary focus on the Waco Metropolitan Statistical Area (MSA) which includes all of McLennan. The primary impetus for development is, of course, population growth. The Texas State Data Center projects an estimated population of 285,285 by 2040. Residential development will pose more of a challenge for the county, particularly in the next few years and for the city of Waco which accounts for about 53 percent of the MSA's population. In addition, McLennan County adjoins the rapidly growing Killeen-Temple MSA. This will put pressure on using land in high hazard areas.

Local governments are also working to develop the economic potential of the area and bring high quality jobs to the Waco MSA. They are working hard to develop commercial research opportunities.

Although all of the communities in McLennan County are projected to grow in population, the city of Waco is the only metropolitan area in the area and therefore may face the most severe development challenges, and thus pressure to build in areas that are hazard-prone. Several of the smaller towns and communities will, however, deal with similar problems of maintaining the quality of life during periods of growth and paying for new schools, roads, and other types of infrastructure.

As part of the five-year plan update in 2018, depending upon resource availability, a review will be undertaken of development trends in each jurisdiction and vulnerability. Also as part of the five-year plan update, depending upon resource availability, a review will be undertaken for each hazard of the type and

number of existing and future buildings, infrastructure and critical facilities within each hazard area, and an estimate will be undertaken of the vulnerability of critical facilities and infrastructure in terms of potential dollar losses from each hazard. Also depending upon resource availability, land uses and development trends will also be re-examined, including the types of development occurring, location, expected intensity, and pace by land use for each jurisdiction. This will help complete and improve future vulnerability assessment efforts.

The county and the surrounding cities are growing at a fast rate leading to an increase in the potential for development of hazard prone areas specifically flooding prone areas based on the development trends. This will be the case for the entire planning area specifically given all the increasing development trends throughout the state of Texas. Floodplain codes and development will become vital in deterring the development in flood prone areas along with other codes. This will be on a case by case basis based on each jurisdictions choice. The important focus is to keep focusing on mitigating the threats and focusing on increasing the education of the whole community.

Communities Designated for Special Consideration

The state of Texas requires that hazard mitigation plans identify any Small and Impoverished Communities in the planning area. These communities may receive special consideration in some federal and state grant programs.

According to the established criteria, Small and Impoverished Communities 1) have a population less than 3,000 and are not a remote area within the corporate boundaries of a larger city and 2) are economically disadvantaged, with residents having an average per capita annual income not exceeding 80 percent of the national per capita income and a local unemployment rate that exceeds by one percentage point or more the most recently reported national unemployment rate.

At this time, there are no small and impoverished communities within McLennan County.

SECTION THREE: HAZARDS IN McLENNAN COUNTY

A risk assessment evaluated the probability of occurrence of a hazard event and the potential associated losses in McLennan County and all participating jurisdictions. The resulting loss estimates are a starting point from which to evaluate mitigation measures if a real hazard event occurs. The loss estimates also are intended to support mitigation decision-making. It is important to note, however, that loss estimates calculated during the risk assessment used available data and methodologies and are approximate. The estimates should be used to understand relative risks from hazards and potential losses and are not intended to predict precise results. Uncertainties are inherent in any loss-estimation methodology and arise, in part, from incomplete scientific knowledge about natural hazards and their effects on the built environment. Uncertainties also result from approximations and simplifications (such as incomplete or outdated inventory, demographic, or economic parameter data) that are necessarily used during a comprehensive analysis. These data can result in a range of uncertainty in loss estimates, perhaps at a factor of two or more. In addition, a variety of previous studies and reports were reviewed for additional risk data.

Two distinct hazard risk-assessment methodologies were applied during the risk assessment: the Federal Emergency Management Agency's Hazards U.S. Multi-Hazards Model (HAZUS-MH), which is loss-estimation software, and a statistical risk-assessment methodology. Each provided estimates of potential effects using a common, systematic framework for evaluation.

The HAZUS-MH risk-assessment methodology is parametric; in that distinct hazard and inventory parameters (wind speed and building types) are modeled to determine the effects (damages and losses) on the built environment. Its statistical approach and mathematical modeling of risk is based on recorded or historic damage information, and predicts a hazard's frequency of occurrence and estimated effects. The HAZUS-MH software was used to estimate losses from wind (hurricane and tornado) and flood hazards.

The statistical risk-assessment methodology was applied to analyze hazards outside the capability of the HAZUS-MH software. A brief description of each approach follows.

HAZUS-MH

HAZUS-MH is FEMA's standardized loss estimation software program built upon an integrated Geographic Information System (GIS) platform. This risk assessment applied HAZUS-MH to produce regional profiles and estimate losses for four hazards. Accordingly, various modules and beta version of the HAZUS-MH software were used in combination to estimate losses from earthquake, wind, and flood hazards.

Statistical Risk Assessment Methodology

Risks associated with other natural hazards were analyzed using a statistical assessment methodology developed and used specifically for this project. Its approach is based on the same principles as HAZUS-MH but does not rely on readily available automated software. Historical data for each hazard are used and statistics are evaluated using manual calculations. The general steps used in the statistical risk-assessment methodology are summarized below:

- Compile data from national and local sources
- Conduct statistical analysis of data to relate historical patterns within data to existing hazard models (minimum, maximum, average, and standard deviation)
- Categorize hazard parameters for each hazard to be modeled
- Develop model parameters based on analysis of data, existing hazard models, and risk engineering judgment

The economic loss results are presented in this plan using two interrelated risk indicators:

- The Annualized Loss (AL), which is the estimated long-term value of losses to the general building stock in any single year in a specified geographic area (i.e., county)
- The Annualized Loss Ratio (ALR), which expresses estimated annualized loss as a fraction of the building inventory replacement value

The estimated Annualized Loss (AL) addresses the two key components of risk: the probability of the hazard occurring in the study area and the consequences of the hazard, largely a function of building construction type and quality, and of the intensity of the hazard event. By annualizing estimated losses, the AL factors in historic patterns of frequent smaller events with infrequent but larger events to provide a balanced presentation of the risk.

The Annualized Loss Ratio (ALR) represents the AL as a fraction of the replacement value of the local building inventory. This ratio is calculated using the following formula: $ALR = \text{Annualized Losses} / \text{Total Exposure at Risk}$

The annualized loss ratio gauges the relationship between average annualized loss and building replacement value. This ratio can be used as a measure of relative risk between areas and, since it is normalized by replacement value, it can be directly compared across different geographic units such as metropolitan areas, jurisdictions or counties.

People and Property at Risk in McLennan County

Hazard identification consists of defining the study area in terms of scale and coverage and collecting and compiling a list of prevalent hazards in the study area to help narrow the focus of the analysis.

Table 3-1 below shows the study area and a numeric breakdown of the population and total estimated dollar exposure by key occupancy that was the basis of the risk assessment presented in this report. A detailed list of critical facilities can be found in Appendix B.

Table 3-1: Population and Building Distribution by Key Occupancy in McLennan County

Jurisdiction	Estimated Population (2017)	Residential Buildings		Commercial Buildings		Critical Facilities
		Number	Average Value (\$)	Number	Average Value (\$)	
McLennan	251,000	80,000	\$178,000	5000	\$646,700	60

Hazards of Concern in McLennan County

Based on input such as historical data, public perception, and technical requirements, the following hazards (listed alphabetically) were considered for analysis:

- Dam failure
- Drought
- Flooding
- Hail
- Thunderstorms/ Lightning
- Tornadoes
- Wildfires
- Winter Storms

Historical Disaster Declarations

Of the 3,700 major disaster declarations in the 50 states, the District of Columbia, and nine U.S. territories between 1972 and 2017, the state of Texas claims 255. Presidential disaster declarations and Small Business Administration declarations for McLennan County are identified in Table 3-3.

Table 3-3: Disaster Declarations in McLennan County

County	Year	Disaster Number	Primary Incident Type	Presidential Declaration	SBA Declaration
McLennan	1974	FDA 454 DR	Flood	Yes	Yes
McLennan	1979	1642	Flood	No	Yes
McLennan	1989	828 DR	Flood	Yes	Yes

McLennan	1990	863 DR	Flood	Yes	Yes
McLennan	1991	930 DR	Flood	Yes	Yes
McLennan	1998	2217 FSA	Fire	Yes	No
McLennan	1998	2219 FSA	Fire	Yes	No
McLennan	1998	2223 FSA	Fire	Yes	No
McLennan	1998	2244 FSA	Fire	Yes	No
McLennan	2003	State	Tornado	No	Yes
McLennan	2005	1606 DR	Hurricane	Yes	Yes
McLennan	2006	1624 DR	Fire	Yes	Yes
McLennan	2006	State	Tornado	No	Yes
McLennan	2007	1709 DR	Flood	Yes	Yes
McLennan	2008	1791 DR	Hurricane	Yes	Yes
McLennan	2013	3363 EM	Explosion	No	No
McLennan	2015	4223 DR	Flood	No	No

Economic and Social Losses

Risk (vulnerability) assessments are presented, whenever possible, in terms of annualized losses. The annualized data are useful for three reasons:

- Contribution of potential losses from all future disasters is accounted for with this approach.
- Results in this form from different hazards are readily comparable and, hence, easier to rank.
- For purposes of evaluating mitigation alternatives, use of annualized losses is the most objective approach.

Annualized losses for hazards where the parametric approach is used are computed in a three-step process:

- Compute / estimate losses for a number of scenario events with different return periods (e.g., 10-year, 100-year, 200-year, 500-year)

- Approximate the probability versus loss curve through curve fitting
- Calculate the area under the fitted curve to obtain annualized losses.

Computations of loss predictions from the other hazards that used a statistical approach are based primarily on observed historical losses.

Economic Impact

The economic loss results are presented using two interrelated risk indicators:

- The annualized loss (AL), which is the estimated long-term value of losses to the general building stock in any single year in a specified geographic area (i.e., county), and
- The annualized loss ratio (ALR), which expresses estimated annualized losses as a fraction of the building inventory replacement value.

The estimated AL addresses the two key components of risk: the probability of a hazard event occurring in the study area and the consequences of the hazard, largely a function of building construction type and quality and of the intensity of the hazard event. By annualizing estimated losses, the AL factors in historic patterns of frequent smaller events with infrequent but larger events to provide a balanced presentation of the risk.

Using the previously described methodology, statistical results were obtained for some of the different hazards profiled earlier. Estimated annualized losses for tornado, hail, winter storm, thunderstorm/lightning, and wild fire are summarized in Table 3-4, while Table 3-5 shows the annualized loss ratio for flood. It should be noted that dollar loss estimates are not available for all hazards listed in tables 3-4 and 3-5.

Annualized losses and annualized loss ratios represent two different statistical ranking methods. The estimates should be used to understand relative risks from hazards and potential losses and are not intended to predict precise results.

Table 3-4: Summary of the Annualized Loss Estimates (\$1,000)

County	Tornado	Hail	Winter Storm	Thunder-storm	Wild Fire
McLennan	62	478	1,450	113	2,809

Table 3-5: Annualized Loss Ratios (ALR)
(estimated annualized losses as a fraction of the building inventory replacement value)

County	Flood
McLennan	0.01000%

Impact on Critical and Essential Facilities

Hazard mitigation plans often focus on critical facilities vulnerable to hazards simply because it is usually most cost-effective to mitigate the assets that are the most important to the community. These could be facilities critical to emergency operations, or ones that house important government functions or vulnerable populations, or ones simply deemed important to the community for their economic or cultural value. Consequently, these facilities are considered high-priority when evaluating structures for the purpose of increasing their disaster resistance.

Critical and essential facilities include:

- Facilities critical to normal and emergency response operations in the area (fire stations, police stations, and the Emergency Operations Center, or EOC),
- Infrastructure and facilities critical to community survivability or continuity of community services (transportation facilities; post offices; radio station and other communication facilities; electrical transmission and distribution; water and wastewater treatment plants),
- Facilities needed to assist vulnerable populations during and after a disaster (schools, hospitals, residential care facilities), and
- Facilities in which key government functions take place (Sheriff's office, County courthouse, Town halls).

In general, for most of the hazards addressed in this study, the potential for significant damage exists primarily at critical facilities located in flood-prone areas. Critical facilities that happen to be in the tornado path or nearby energy pipelines where incidents could occur also may sustain considerable damage.

Hazard Ranking

Based on absolute economic losses and probability of occurrence, the hazards in McLennan County and participating jurisdictions are listed in priority below:

- Flood
- Thunderstorm/Lightning
- Drought
- Wildfire
- Tornado
- Winter Storm
- Hail
- Dam Failure

Hazard ranking depends on the probability of occurrence of a disaster within a period of time and the expected economic losses. At different return periods, the hazard loss rankings are different. For example, a fire is likely to occur fairly frequently with relatively small losses as compared to a flooding event that occurs less frequently but can cause much greater damage.

The annualized loss is the expected losses from all possible future events (considering all magnitude and frequencies), averaged over an annual basis.

Table 3-6 ranks hazard risks for McLennan County at a ten-year return period.

Table 3-6: Hazard Risk Ranking in McLennan County, Ten Year Return Period

1	Flood	5	Tornado
2	Thunderstorm/lightning	6	Winter Storm
3	Drought	7	Hail
4	Wild Fire	8	Dam Failure

Unique Hazards

This plan is a multi-jurisdictional mitigation plan developed to address common risks faced by all the participating jurisdictions in McLennan County. However, members of the Hazard Mitigation Team also conducted an assessment of risks and identified any unique hazards for their jurisdiction that varied from those hazards affecting McLennan County as a whole. Table 3-7 provides an overall summary of the participating jurisdictions vulnerability to each hazard. The table also reflects any unique hazards for each jurisdiction's risks where they vary from the risks facing the entire planning area.

For all participating jurisdictions, each hazard was given a rating of 'substantial', 'major', 'minor' or 'limited' based on a description of that particular jurisdiction's vulnerability to the hazard. These ratings were developed based on the best acceptable data. Definitions of the classifications are as follows:

- **“Substantial”** severity of impact may result in multiple deaths, complete shutdown of facilities for 30 or more days, or more than 50% of property destroyed or with major damage.
- **“Major”** severity of impact may result in injuries or illnesses that result in permanent disability, complete shutdown of critical facilities for at least 2 weeks, or more than 25% of property destroyed or with major damage.
- **“Minor”** severity of impact may result in injuries or illnesses that do not result in permanent disability, a complete shutdown of critical facilities for more than 1 week, or more than 10% of property destroyed or with major damage.
- **“Limited”** severity of impact may result in injuries or illnesses that are treatable with first aid, minor quality of life lost, shutdown of critical facilities and services for 24 hours or less, or less than 10% of property destroyed or with major damage.

The ratings have been abbreviated in order to fit into Table 3-7 (below and next page). The ratings have been shortened to:

- S = Substantial
- MA = Major
- MI = Minor
- L = Limited

Table 3-7: Overall Summary Descriptions of Jurisdictions' Vulnerability to Hazards in McLennan County

Jurisdiction	Dam Failure	Drought	Flooding	Hail	Thunderstorm/ lightning	Tornado	Wild Fire	Winter Storm
McLennan County	L	S	MA	MI	MI	S	MI	MI
Bellmead	MI	MI	MI	L	L	MI	L	L
Beverly Hills	MI	MI	MI	L	L	L	L	L
Crawford	L	MI	MI	L	L	L	L	L
Gholson	L	MI	MI	L	L	MI	L	MI
Hallsburg	L	MI	L	L	L	MI	L	L
Hewitt	L	MI	MI	L	L	L	L	L
Lacy-Lakeview	L	MI	MI	L	L	L	L	MI
Leroy	L	MI	MI	L	L	L	L	L

Jurisdiction	Dam Failure	Drought	Flooding	Hail	Thunderstorm/ Lightning	Tornado	Wild Fire	Winter Storm
Lorena	L	MI	MI	L	L	MI	L	L
Mart	L	L	L	L	L	L	L	L
McGregor	L	MI	MI	L	L	L	L	MI
Robinson	L	MI	MI	L	L	L	L	L
Ross	L	MI	MI	L	L	L	L	MI
Waco	S	MA	MA	MI	MI	MA	L	MA
West	L	L	L	L	L	L	L	L
Woodway	L	MI	MI	L	L	MI	L	L

Historical Frequency

Sections 4 through 11 of this plan contain reviews of the historical frequency of occurrence and/or loss and damage estimates, by hazard, in McLennan County and participating jurisdictions.

Table 3.8 shows the expected frequency of occurrence in these sections and will be defined as follows:

- **Highly Likely** means that the event is possible in the next 3 years.
- **Likely** means that the event is possible in the next 5 years.
- **Unlikely** means that the event is possible in the next 10 years.
- **Highly Unlikely** means that the event is possible in the next 20 years.

The ratings have been abbreviated in order to fit into Table 3-8 (next page). The ratings have been shortened to:

- HL = Highly Likely
- L = Likely
- U = Unlikely
- HU = Highly Unlikely

Table 3-8: Overall Probability to Future Hazards in McLennan County

Jurisdiction	Dam Failure	Drought	Flooding	Hail	Thunderstorm/ Lightning	Tornado	Wild Fire	Winter Storm
McLennan County	HU	L	HL	L	HL	L	L	L
Bellmead	HU	L	U	L	L	U	L	U
Beverly Hills	HU	L	U	L	L	U	L	U
Crawford	HU	L	U	L	L	U	L	U
Gholson	HU	L	U	L	L	U	L	U
Hallsburg	HU	L	U	L	L	U	L	U
Hewitt	HU	L	U	L	L	U	L	U
Lacy-Lakeview	HU	L	U	L	L	U	L	U
Leroy	HU	L	U	L	L	U	L	U

Jurisdiction	Dam Failure	Drought	Flooding	Hail	Thunderstorm/ Lightning	Tornado	Wild Fire	Winter Storm
Lorena	HU	L	U	L	L	U	L	U
Mart	HU	L	U	L	L	U	L	U
McGregor	HU	L	U	L	L	U	L	U
Robinson	HU	L	U	L	L	U	L	U
Ross	HU	L	U	L	L	U	L	U
Waco	HU	L	L	L	L	U	L	L
West	HU	L	U	L	L	U	L	U
Woodway	HU	L	U	L	L	U	L	U

Conclusions

The hazard-event profiles relevant to McLennan County reveal historic hazard trends and provide a reference point for understanding the potential effects of future hazard events. A review of historic data helps to evaluate hazard-event profiles and answer questions, such as; how often may a particular disaster occur, who is most likely to be affected, what area is most likely to be affected and, how bad can it get?

Sections 4 through 11 of this mitigation plan contain reviews, by hazard, of the historical frequency of occurrence in McLennan County and each participating jurisdiction. Each section discusses why the hazard is a threat, profiles the hazard, identifies areas at risk to hazards that have distinct geographic boundaries, identifies the people and property at risk, and summarizes the history of hazard events and potential damages and losses.

The results of this study are useful in at least three ways:

1. Improving our understanding of the risks associated with natural hazards in McLennan County through knowledge of the complexities and dynamics of the risks, enabling measurement and comparison of levels of risk and the myriad factors that influence risk. Understanding these relationships is critical in making balanced and informed decisions about managing the risks.
2. Providing a baseline for developing policy and comparing mitigation alternatives. The data collected and used for this analysis present a current picture of risk in McLennan County. Updating this risk “snapshot” with future data will enable comparison of the changes in risk with time. Baselines of this type can support the objective analysis of policy and program options for risk reduction in McLennan County.
3. Comparing the risks among the natural hazards addressed. The ability to quantify the risks to all these hazards relative to one another helps in a balanced, multi-hazard approach to managing the risk at each level of governing authority. The risk ranking supports comparisons and enables the setting of priorities for dealing with the disparate natural hazards present in McLennan County.

SECTION FOUR: FLOODS

Why Floods Are a Threat

Numerous areas of Texas are susceptible to floods, especially Central Texas, where McLennan County is located. The definition of a “flood” is an, “overflow of water that submerges land which is normally dry”. The State’s vulnerability to flood events is the result of several factors: its miles of Gulf of Mexico coastline; its proximity to the Pacific Ocean off the west coast of Mexico; its geographical location near the Rocky Mountains of Colorado and Arizona and the high-altitude jet stream; and its nearness to the unique West Texas “dry line,” a shifting, invisible atmospheric separation of dry desert air from the moist Gulf air. These factors create a breeding ground for the big storms of spring and fall that spawn tornadoes and suck up Gulf or Pacific moisture that feed the heavy rains that cause flash flooding. All these geographic factors cause Texas to experience extensive, annual storms. Flooding takes many forms in McLennan County.

Flash Flooding

Most flash flooding is caused by slow-moving thunderstorms, by thunderstorms repeatedly moving over the same area, or by heavy rains from hurricanes and tropical storms. Flash floods can occur within a few minutes or after hours of excessive rainfall. Often there is no warning that flash floods are coming.

Flash flooding can pose a deadly danger to residents of McLennan County. A number of roads run through low-lying areas that are prone to sudden and frequent flooding during heavy rains. Motorists often attempt to drive through barricaded or flooded roadways. It takes only 18-to-24-inches of water moving across a roadway to carry away most vehicles. Floating cars easily get swept downstream, making rescues difficult and dangerous.

Riverine Flooding

Riverine flooding is natural and inevitable. It is the over-bank flooding of rivers and streams, typically resulting from large-scale weather systems that generate prolonged rainfall over a wide geographic area. Some river floods occur seasonally when winter or spring rainfalls fill river basins with too much water, too quickly. Torrential rains from decaying hurricanes or tropical systems can also produce river flooding.

Urban Flooding

Urban flooding occurs as land is converted from fields or woodlands to roads, buildings and parking lots and when the natural land loses its ability to absorb rainfall. Urbanization changes the natural hydrologic systems of a basin, increasing runoff two to six times over what would occur on natural terrain. During periods of urban flooding, streets can become swift moving rivers, while highway underpasses and underground parking garages can become death traps as they fill with water.

El Niño Phenomenon

Flooding can occur in cycles. The El Niño phenomenon – the cyclical disruption of the ocean-atmosphere system in the tropical Pacific Ocean – has important consequences around the globe and here in Texas. The presence of El Niño is indicated by unusually warm water in the eastern Pacific Ocean, altering wind and ocean currents. El Niño generally brings cooler winters and wetter than normal conditions to Texas.

Hazard Profile

Flood events can have a major severity of impact for McLennan County. A major flood event that affects the county may result in injuries or illnesses that result in permanent disability, complete shutdown of critical facilities for at least 2 weeks, or more than 25% of property destroyed or with major damage. For the purposes of this plan, “the county” refers to all of the participating jurisdictions. For more information on severity of impact for the other participating jurisdictions, please see Table 3-7 located on pages 22-23.

The frequency of occurrence of flooding in McLennan County is highly likely, with an event possible in the next three years. For more information on the frequency of occurrence for the other participating jurisdictions, please see Table 3-8 located on pages 24-25.

The annual probability of observing a 100-year flood is one-percent. The annual probability of observing a 500-year flood event is 0.2 percent.

Flooding occurs in seasonal patterns. Thunderstorms form when warm, moist air collides with cooler, drier air. Since these masses tend to come together during the transition from summer to winter, most thunderstorms and resulting flooding occur during the spring (April, May and June) and fall (October, November, and December).

Location of Flooding

Flood-hazard areas are determined using statistical analyses of records of river flow, storm tides, and rainfall; information obtained through consultation with communities; floodplain topographic surveys; and hydrological and hydraulic analyses. FEMA's Flood Insurance Rate Maps (FIRMs) identify areas subject to flood hazard. These include Special Flood Hazard Areas, which are defined as areas that will be inundated by a flood event having a one-percent chance of being equaled or exceeded in any given year. The one-percent-annual-chance flood is also referred to as the base flood or 100-year flood.

Moderate flood-hazard areas are also shown on the FIRM, and are the areas between the limits of the base flood and the two-tenths of a percent-annual-chance (or 500-year) flood.

All FIRM's are available for the public to view and print at the FEMA Map Center located at www.msc.fema.gov/. In addition, local flood maps are held in the offices of the local Emergency Management Coordinator for each participating jurisdiction.

Figures 4-1 through 4-19 on the following pages depicts the flood zones where there is potential for damage to property and loss of life in McLennan County and the participating jurisdictions.

Figure 4-1: Potential Flooding Locations in McLennan County

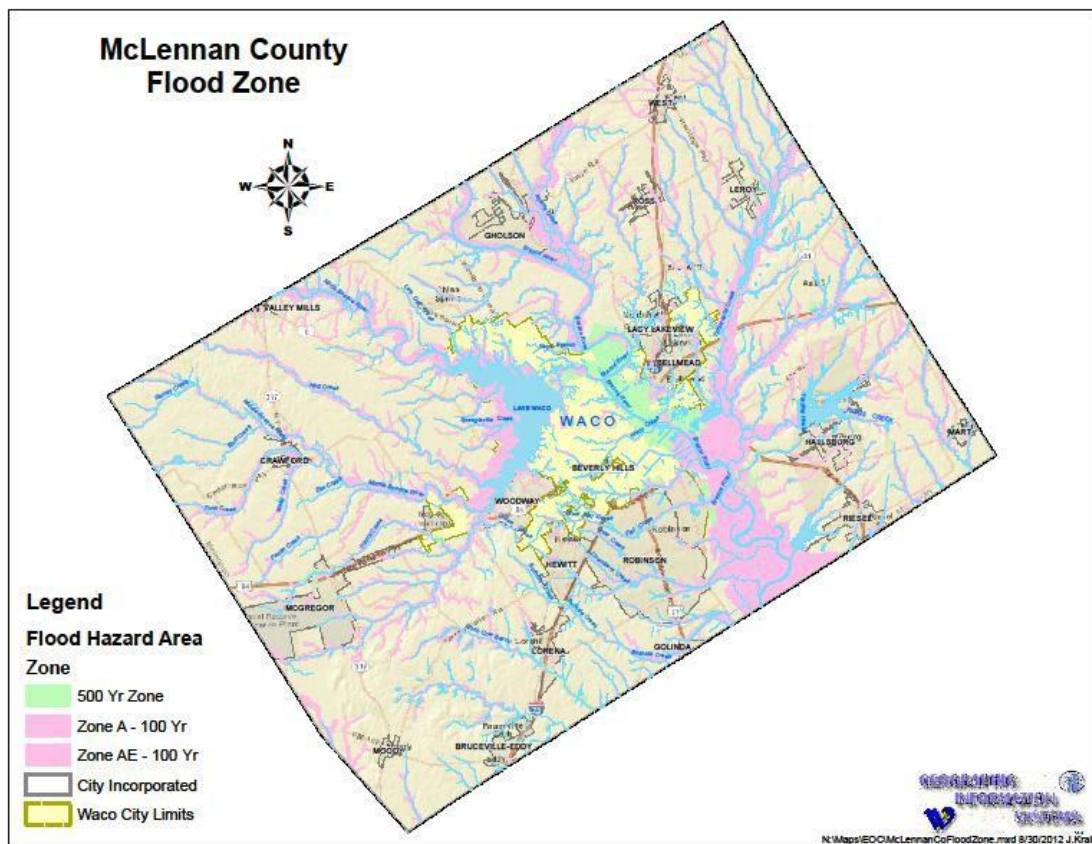


Figure 4-2: Potential Flooding Locations in Bellmead

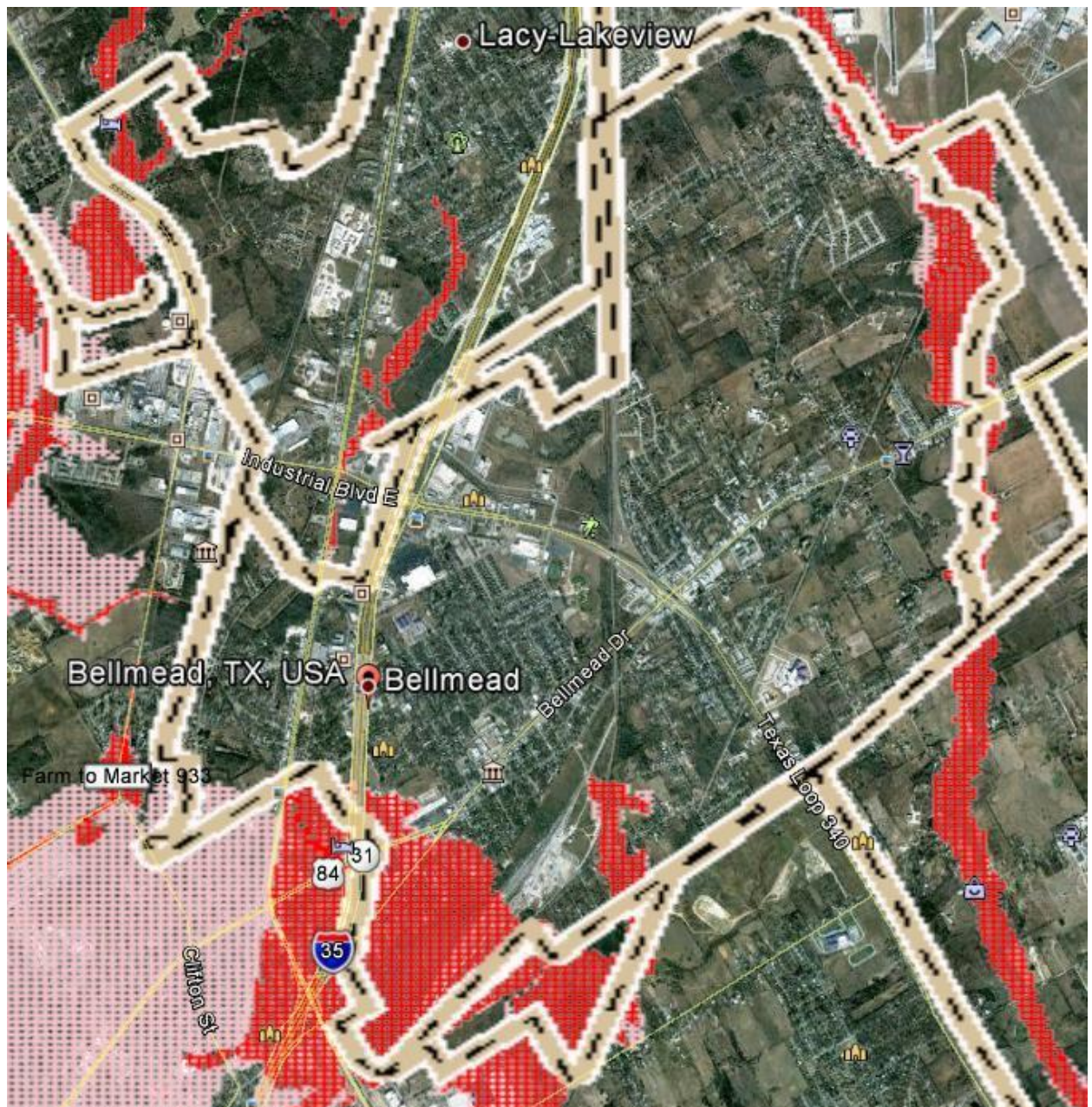


Figure 4-3: Potential Flooding Locations in Beverly Hills

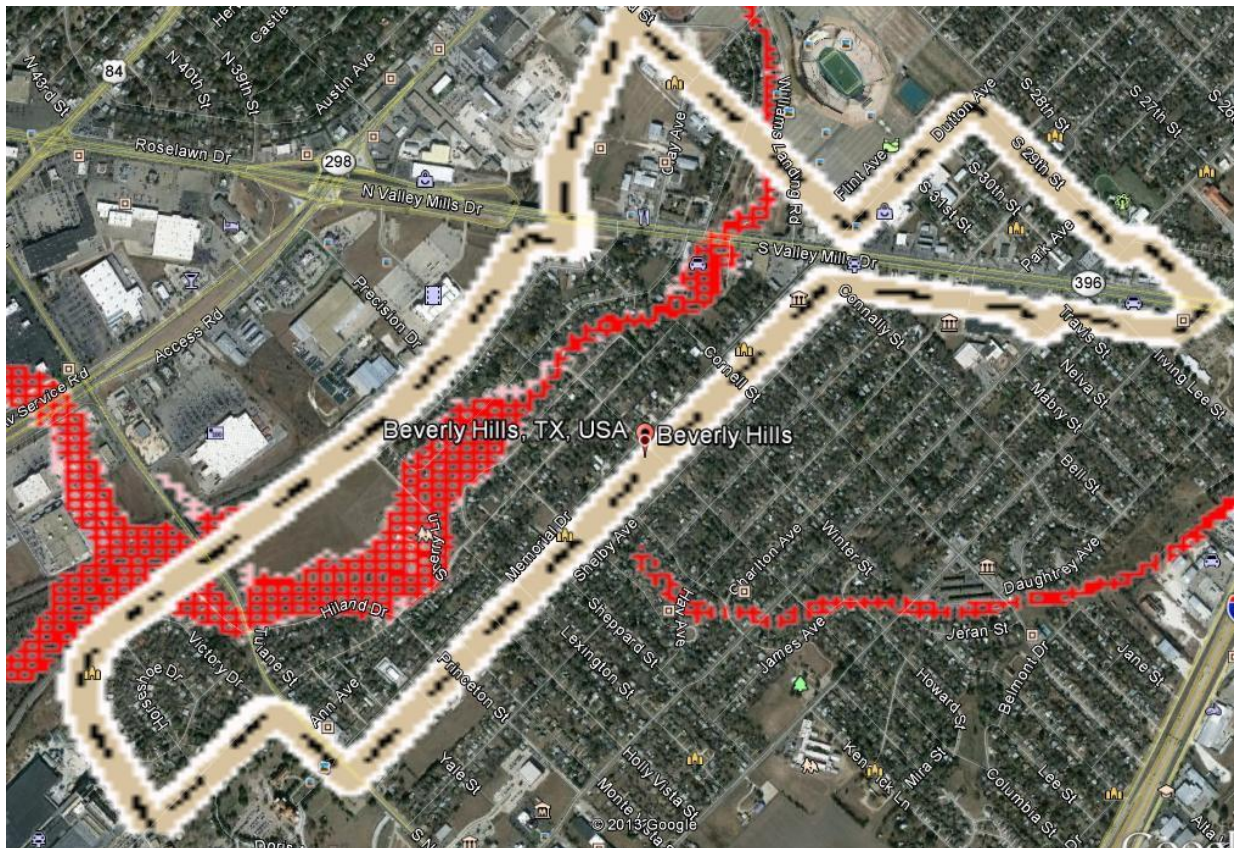


Figure 4-4: Potential Flooding Locations in Crawford

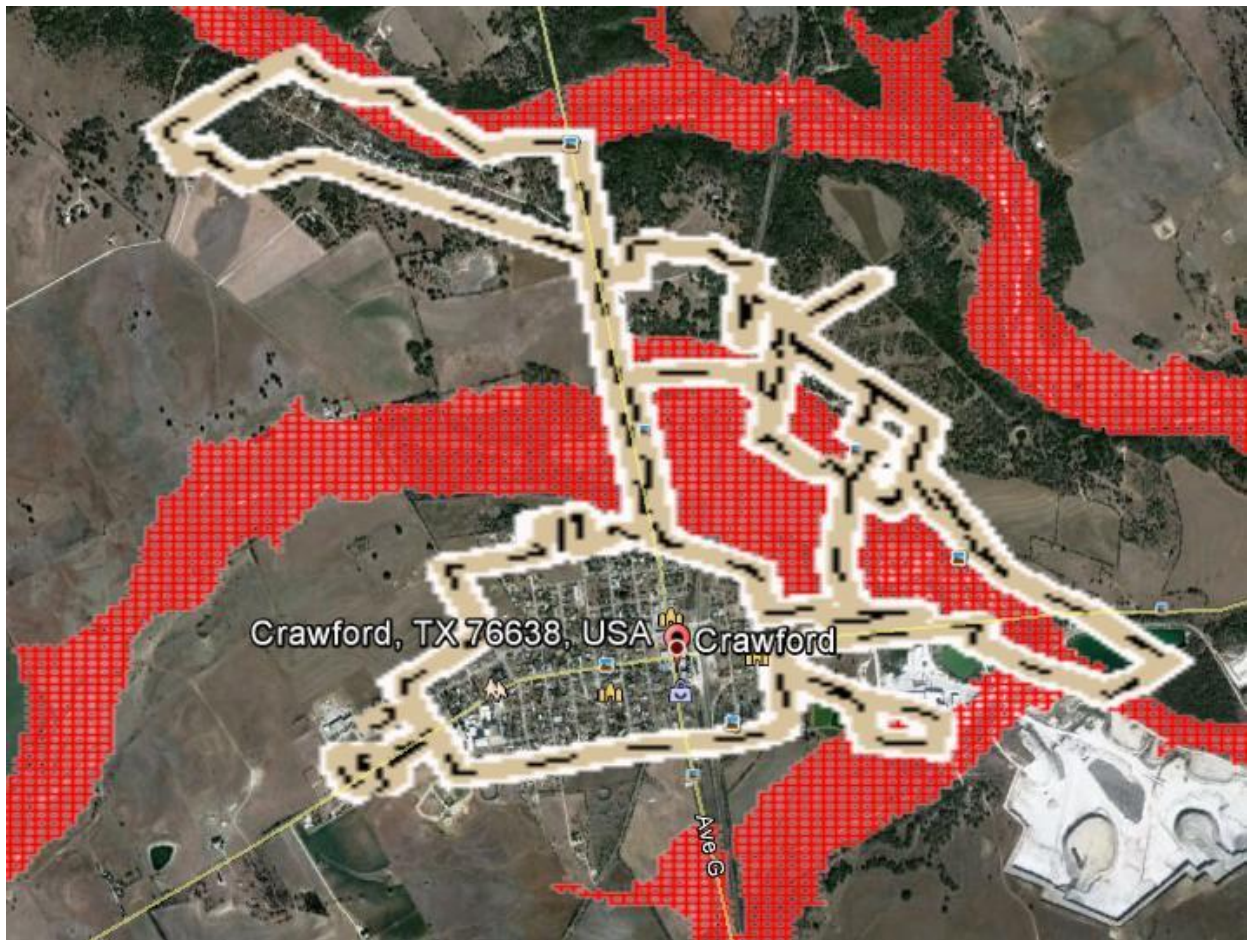


Figure 4-5: Potential Flooding Locations in Gholson

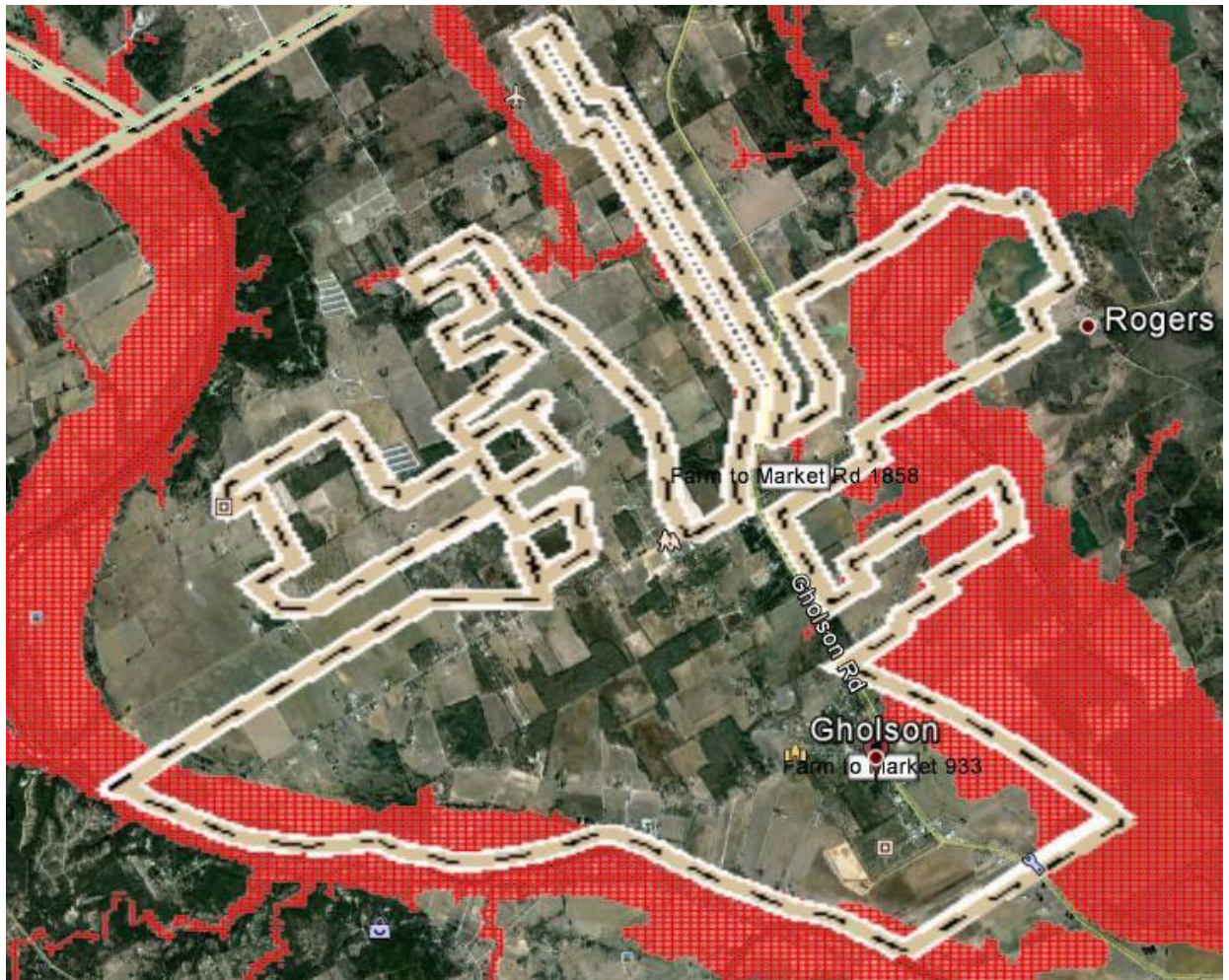


Figure 4-6: Potential Flooding Locations in Hallsburg

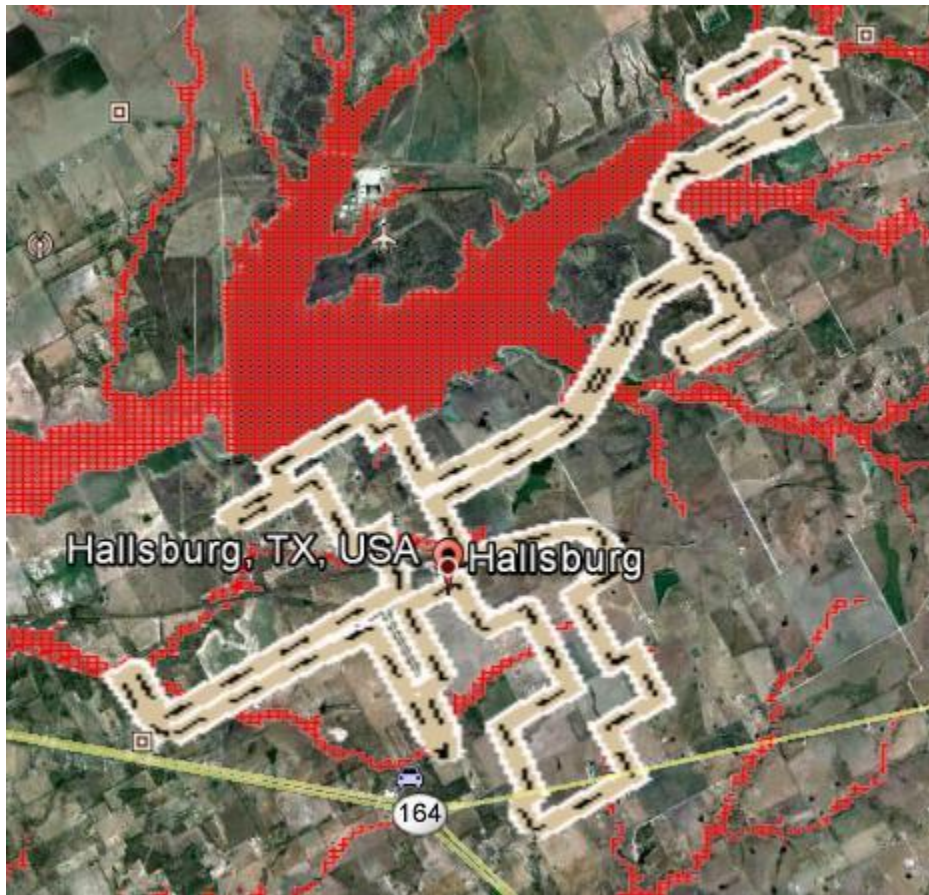


Figure 4-7: Potential Flooding Locations in Hewitt

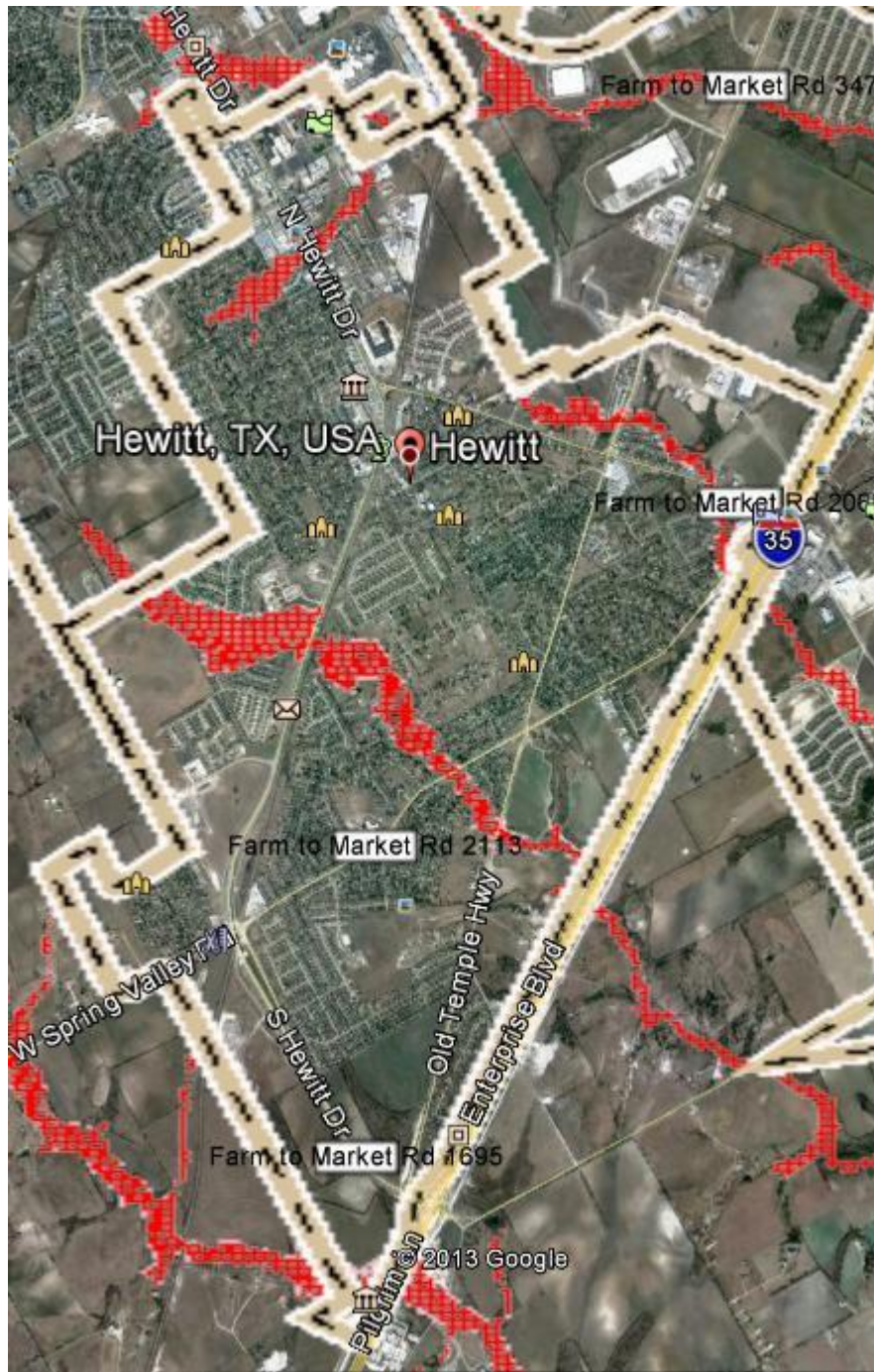


Figure 4-8: Potential Flooding Locations in Lacy-Lakeview

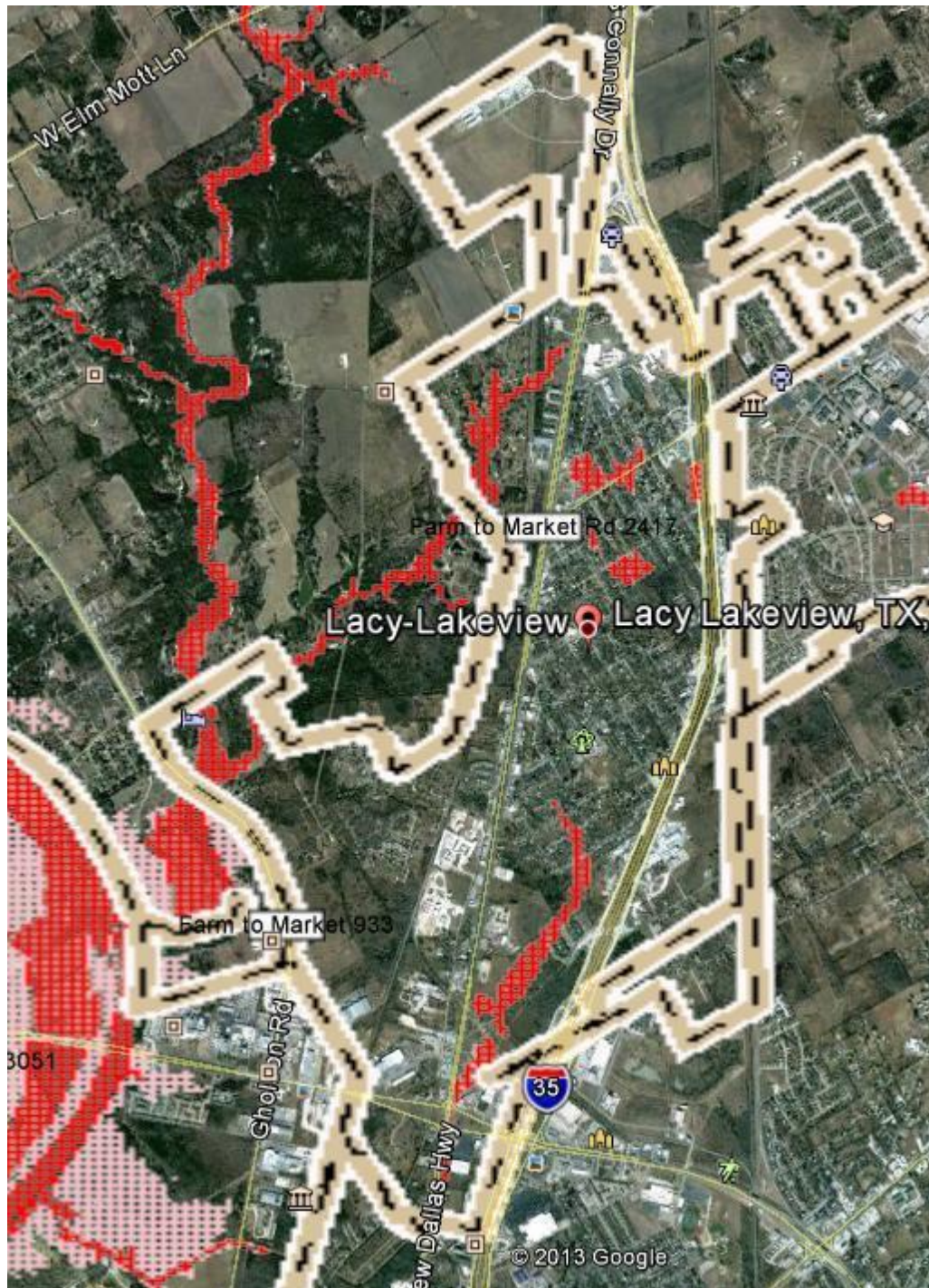


Figure 4-9: Potential Flooding Locations in Leroy

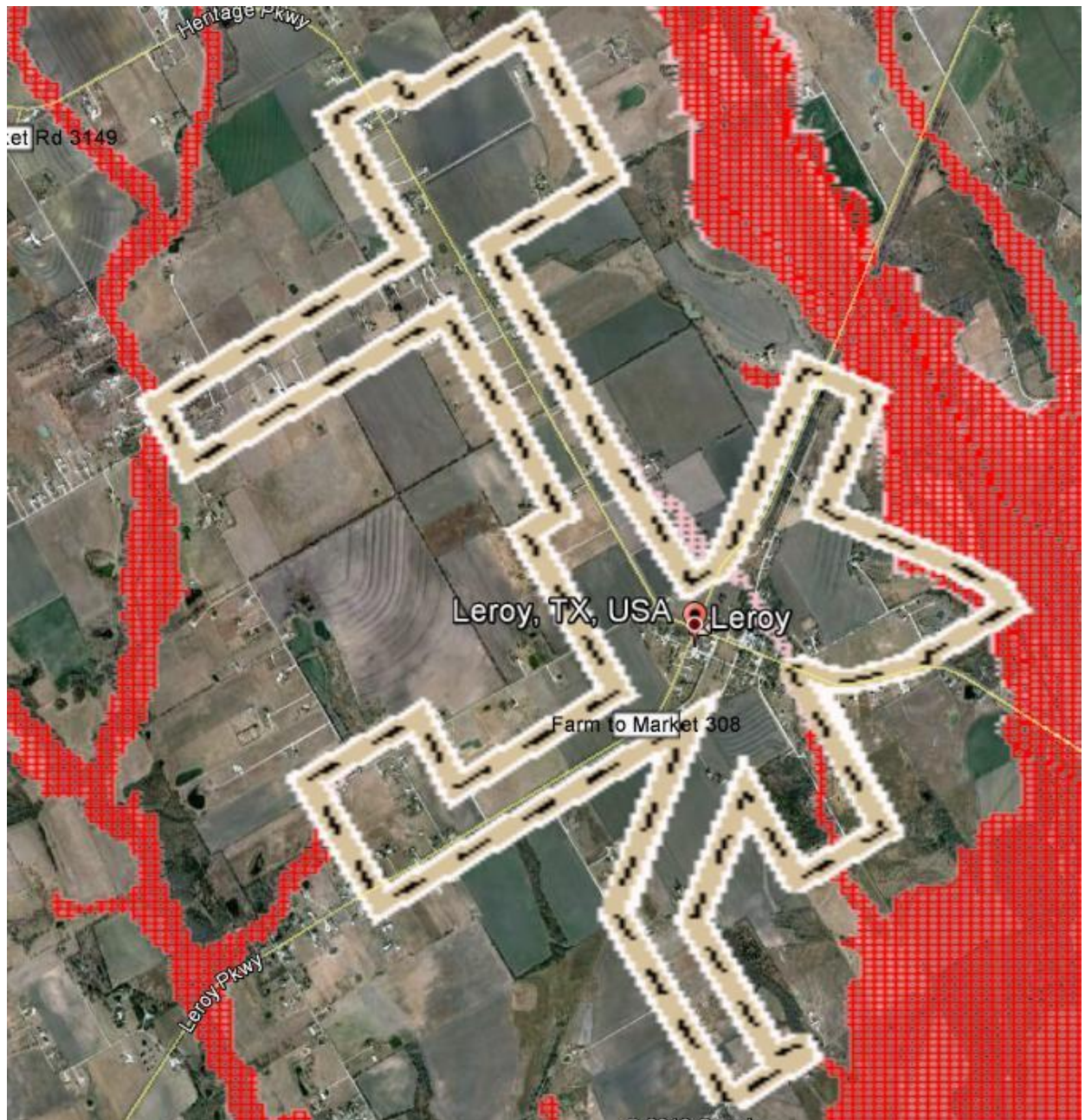


Figure 4-10: Potential Flooding Locations in Lorena

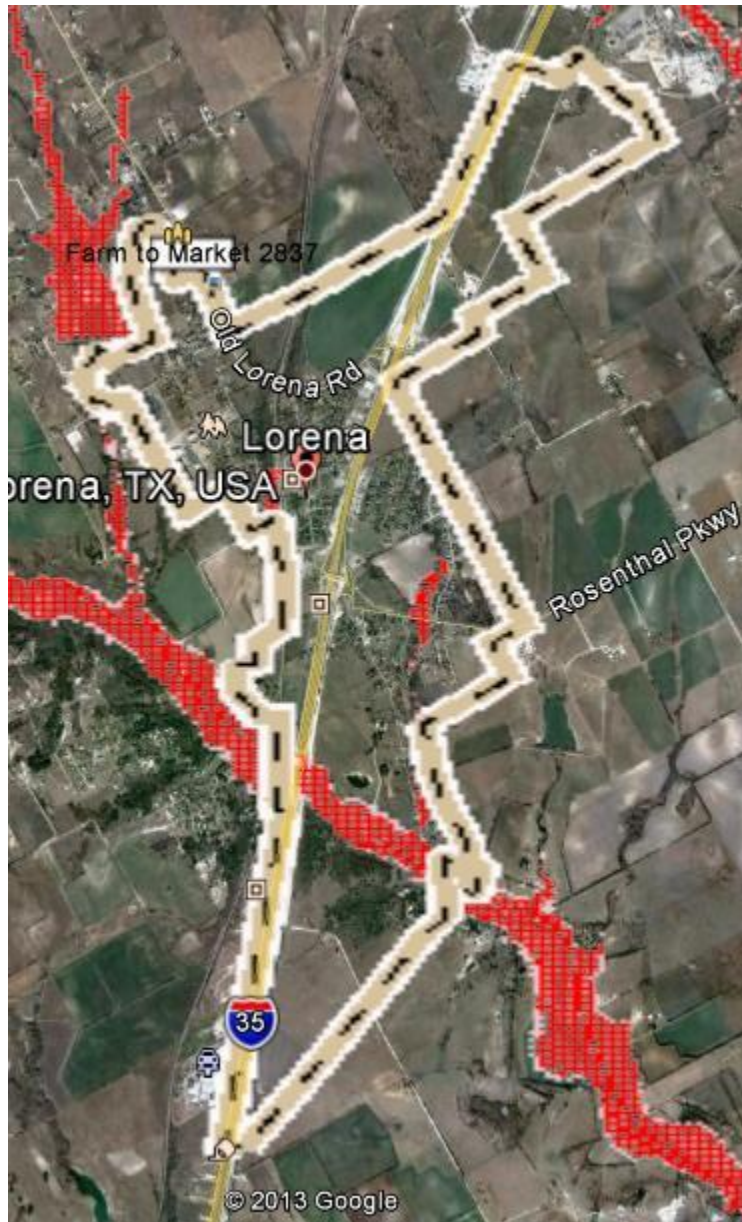


Figure 4-11: Potential Flooding Locations in Mart



Figure 4-12: Potential Flooding Locations in McGregor



Figure 4-13: Potential Flooding Locations in Robinson

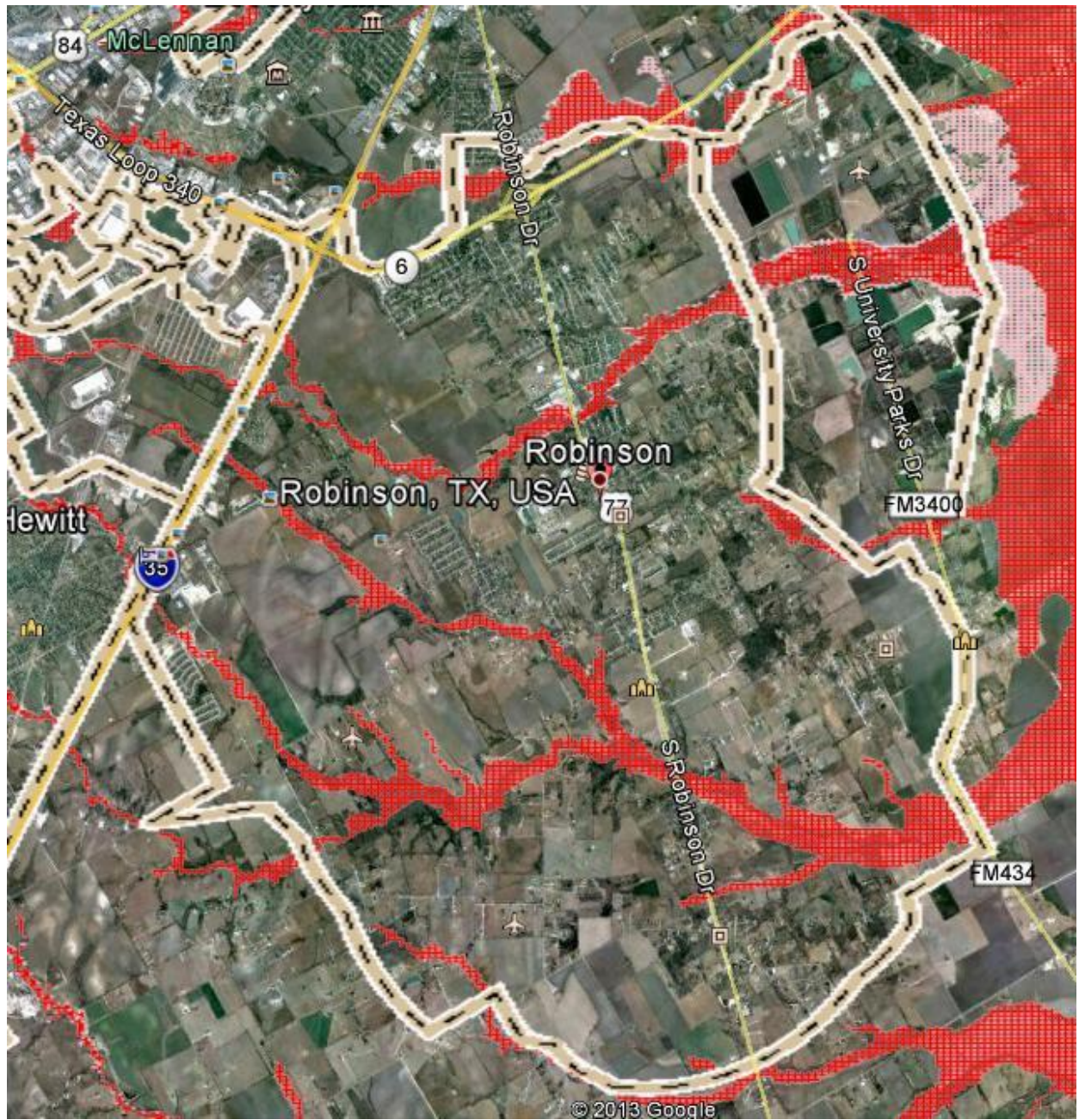


Figure 4-14: Potential Flooding Locations in Ross

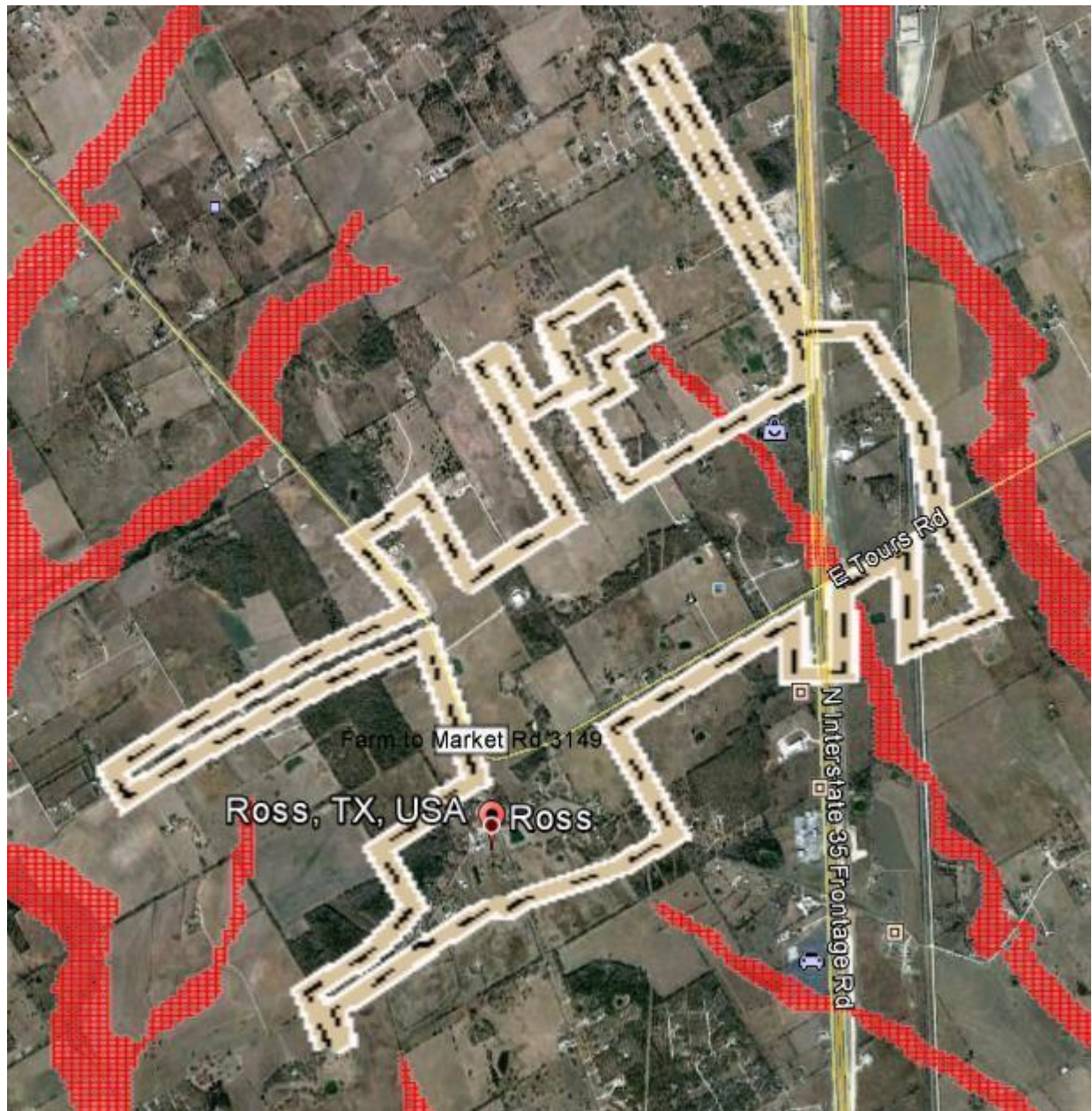


Figure 4-15: Potential Flooding Locations in Waco

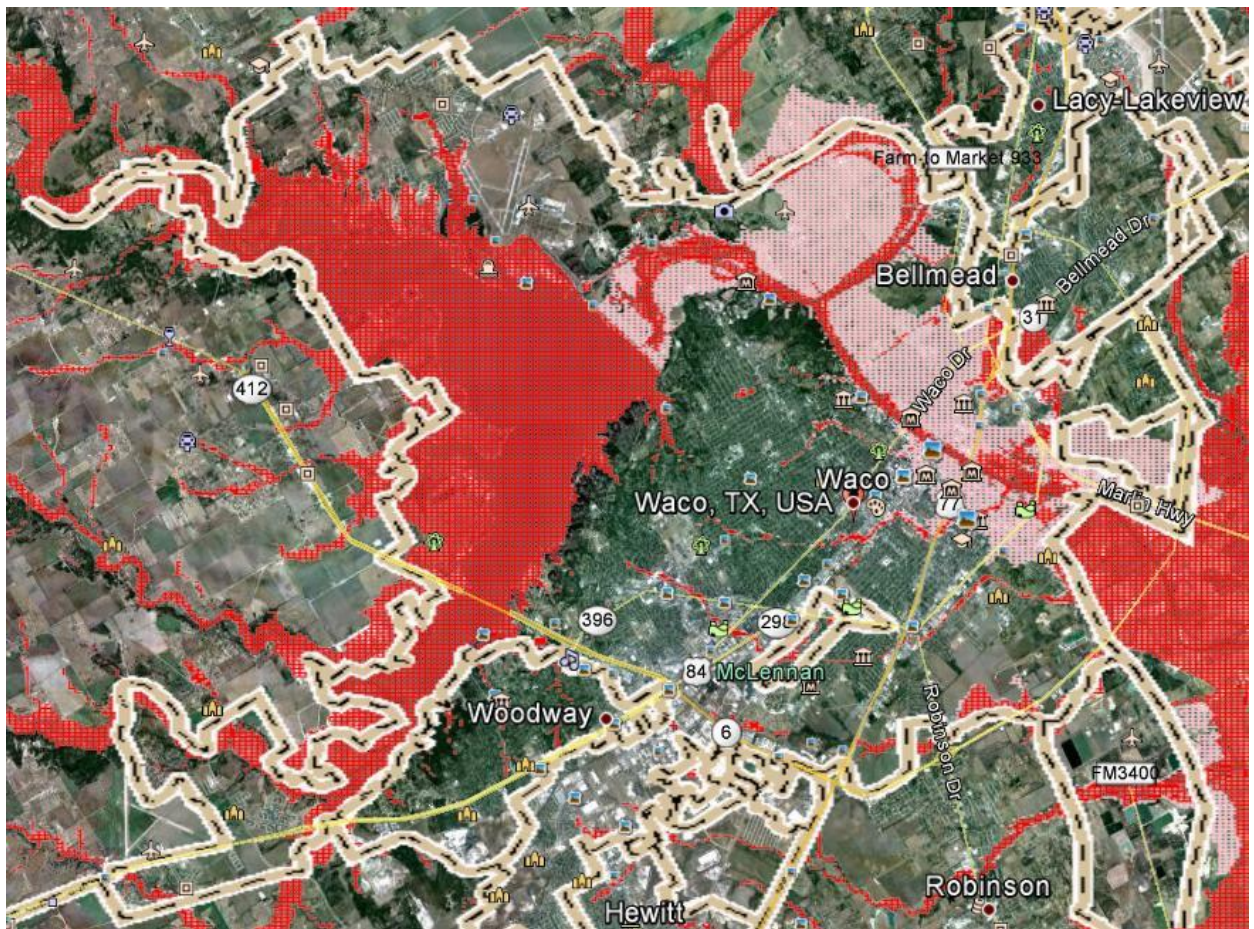


Figure 4-16: Potential Flooding Locations in West

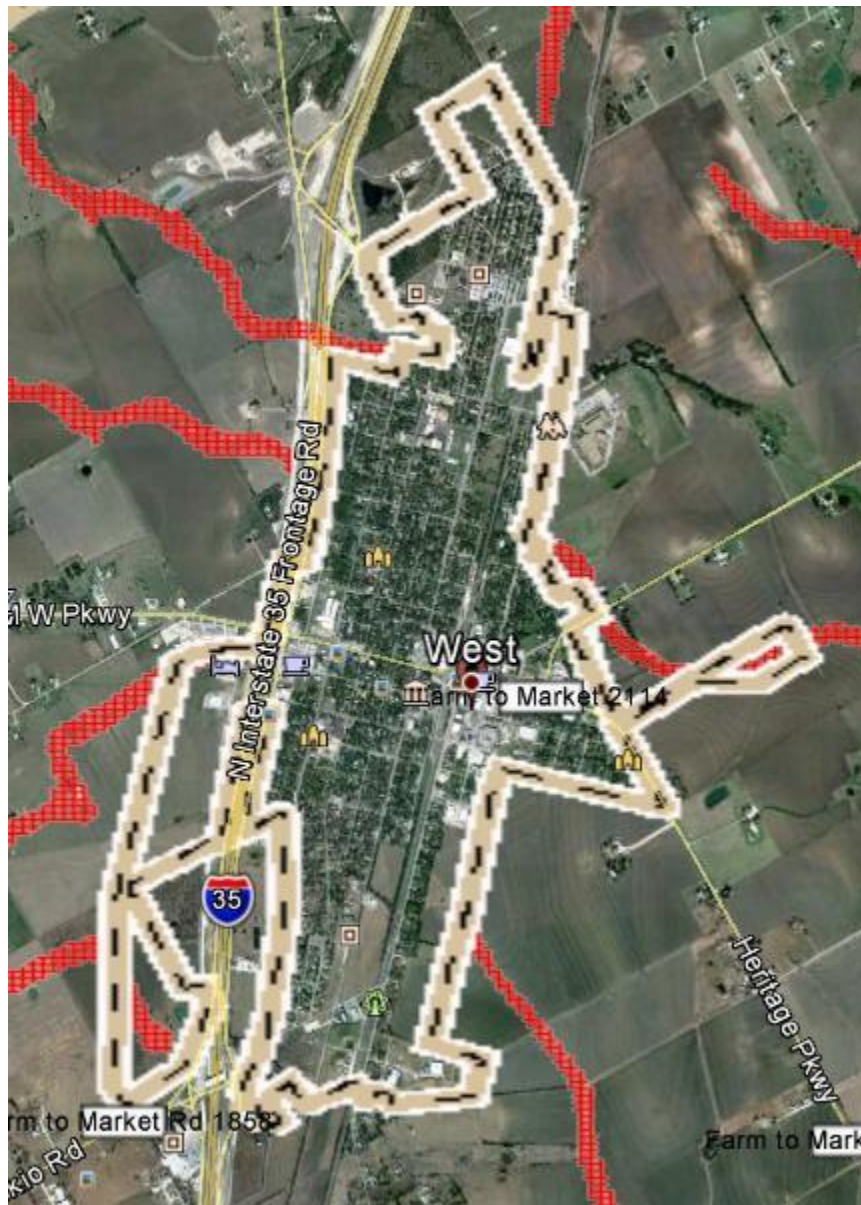


Figure 4-17: Potential Flooding Locations in Woodway



Extent of Flooding

The extent of flooding in McLennan County, including all participating jurisdictions, is shown in Table 4-1 below.

Table 4-1: Extent of Flooding in Participating Jurisdictions

Jurisdiction	Extent of Flooding
McLennan County	Water depths up to eight feet deep
Bellmead	Water depths up to six feet deep
Beverly Hills	Water depths up to five feet deep
Crawford	Water depths up to two feet deep
Gholson	Water depths up to three feet deep
Hallsburg	Water depths up to two feet deep
Hewitt	Water depths up to two feet deep
Lacy-Lakeview	Water depths up to four feet deep
Leroy	Water depth up to one foot deep
Lorena	Water depth up to one foot deep
Mart	Water depth up to one foot deep
McGregor	Water depth up to one foot deep
Robinson	Water depths up to two feet deep
Ross	Water depth up to one foot deep
Waco	Water depths up to ten feet deep
West	Water depth up to one foot deep
Woodway	Water depths up to eight feet deep

History of Flooding

Historical flood events in McLennan County are listed in Table 4-2. The data was retrieved from NOAA Storm Events Database.

Table 4-2: Reported Flood Events, January 1, 2007 to December 31, 2017

Inj: injuries **Prop D:** property damage **Crop D:** crop damage

Location	Date	Time	Death	Inj	Prop D	Crop D
Mart	01/13/2007	1314	0	0	0	0
Woodway	03/13/2007	1800	0	0	20K	0
Robinson	03/29/2007	1830	0	0	20K	0
McGregor	03/30/2007	1631	0	0	40K	0

Hewitt	05/01/2007	1300	0	0	0	0
Gholson	05/26/2007	0730	0	0	10K	0
Mart	05/27/2007	0845	0	0	0	0
McGregor	05/28/2007	0930	0	0	0	0
Crawford	06/17/2007	0745	0	0	0	0
Waco	06/26/2007	1939	0	0	0	0
Waco	06/28/2007	1323	0	0	0	0
Waco	07/03/2007	1632	0	0	20K	0
Waco	08/19/2008	1755	0	0	0	0
Hallsburg	09/13/2009	0852	0	0	0	0
West	10/26/2009	0600	0	0	2K	4K
BeverlyHills	06/09/2010	1030	0	0	100K	0
Leroy	06/10/2010	0402	0	0	0	0
Crawford	09/08/2010	0700	0	0	10K	0
Bosqueville	5/11/2011	17:43	0	0	0	0
China Spring	3/19/2012	23:22	0	0	100K	0
Hillside	3/20/2012	2:30	0	0	0	0
Bellmead	9/20/2013	8:36	0	0	0	0
Waco FLYING	9/20/2013	8:36	0	0	30K	0
Hewitt	5/12/2014	18:08	0	0	5K	0
Hewitt	5/12/2014	18:12	0	0	50K	0
Hewitt	6/12/2014	22:30	1	0	100K	0
Hewitt	6/12/2014	22:30	0	0	100K	0
Beverly Hills	6/12/2014	23:10	0	0	0	0
Hewitt	6/12/2014	23:10	0	0	0	0
Lorena	6/13/2014	1:00	0	0	30K	0
Crawford	6/22/2014	7:15	0	0	0	0
(Act)Madison-Cooper	6/22/2014	17:30	0	0	0	0
Bellmead	6/24/2014	18:30	0	0	10K	0
Robinson	6/24/2014	18:30	0	0	10K	0

West	5/10/2015	19:44	0	0	0	0
Beverly Hills	6/27/2015	4:00	1	0	0	0
Mart	10/23/2015	12:00	0	0	25K	0
Tours	10/23/2015	12:04	0	0	20K	0
Eddy	10/23/2015	13:42	0	0	10K	0
Beverly Hills	10/23/2015	21:30	0	0	10K	0
Elm Mott	10/24/2015	6:44	0	0	100K	0
Mart	10/24/2015	9:45	0	0	150K	0
Robinson	10/30/2015	14:46	0	0	1K	0
Hewitt	10/30/2015	15:26	0	0	1K	0
Waco	3/8/2016	11:15	0	0	0	0
South Bosque	6/3/2016	19:30	0	0	0	0
Bosqueville	6/12/2016	22:01	0	0	5K	0
Beverly Hills	6/12/2016	22:39	0	0	3K	0
McGregor	11/7/2016	17:15	0	0	0	0
West	4/10/2017	21:10	0	0	0	0

NFIP Program Participation

Flood insurance offered through the National Flood Insurance Program (NFIP) is the best way for home and business owners to protect themselves financially against the ravages of flooding. There are currently over 400 flood insurance policies in force in participating McLennan County communities. Table 4-3 gives a summary of the NFIP policies in McLennan County.

Table 4-3: National Flood Insurance Program, Policies and Losses for McLennan County

Community	Policies in Effect	Total Coverage (\$1,000)	Total Losses	Dollars Paid, Historical
McLennan Co.	126	\$18,613	10	\$98,490
Bellmead	11	\$1,616	1	\$8,265
Beverly Hills	12	\$723	10	\$10,770

Hewitt	22	\$3,943	5	\$54,920
Lacy-Lakeview	2	\$198	2	\$6,775
Lorena	3	\$344	1	NA
Mart	6	\$580	2	\$1,772
McGregor	8	\$1,088	NA	NA
Northcrest	18	\$1,325	3	\$7,710
Robinson	13	\$2,191	5	\$86,370
Waco	258	\$37,145	74	\$326,897
Woodway	13	\$1,815	NA	NA

According to FEMA, jurisdictions participate in the NFIP by adopting and enforcing floodplain management ordinances to reduce future flood damage. In exchange, the NFIP makes federally backed flood insurance available to homeowners, renters, and business owners in these communities. Community participation in the NFIP is voluntary.

These jurisdictions maintain their continued NFIP compliance in several ways, including:

- Requiring all new development in the identified flood hazard area to be permitted
- Requiring revisions to existing structures in the identified flood hazard area to be permitted
- Requiring Elevation Certificates to be submitted as part of the permitting process
- Persons looking to purchase flood prone property are being advised of the flood hazard area through credited hazard disclosure measures
- Continued preservation of open space in the floodplain
- Acquisition of existing structures from the floodplain
- Keeping track of building improvements and repairs to structures located in the identified flood hazard area
- Continued enforcement of stream dumping regulations

People and Property at Risk

To assess flood risk, flood areas were modeled for 100-year and 500-year events. Flood depth was estimated at the pixel level for affected areas, along with proportion of the area affected within the census block. HAZUS-MH inventory and damage functions were then utilized to estimate exposure. Because detailed information was not available to calculate potential losses due to flood, it is assumed that in a worst-case-scenario event, all exposed areas would be impacted and the exposed values would equal the potential losses.

Potential Damages and Losses

To estimate annualized losses due to flood, the exposed values were multiplied by the probability of the occurrence of a 100-year flood event (1 percent) to calculate the estimated annualized losses. Table 4-3 shows the estimated buildings and people at risk to flooding.

Because detailed information was not available to calculate potential losses due to flood, it is assumed that in a worst-case-scenario event, all exposed areas would be impacted and the exposed values would equal the potential losses.

Table 4-4 shows the estimated buildings and people at risk to flooding.

Table 4-4: Potential Affected Exposure for 100-Year Flood (Riverine Flooding)

County	Number of Potential Residential	Value of Potential Residential	Number of Potential Commercial	Value of Potential Commercial	People at risk
McLennan	1826	\$559,269	2	\$59,414	7,156

Potential impacts to critical facilities and infrastructure are provided in Table 4-5.

Table 4-5: Critical Facilities and Infrastructure Potentially Damaged, McLennan County

County	Total Number	# in Floodplain	% susceptible to flooding
McLennan	60	0	0%

Repetitive Flood Losses

A repetitive loss property is defined by FEMA as a property that is currently insured through the National Flood Insurance Program (NFIP) that has experienced two or more losses from floods of \$1,000 or more in any rolling 10-year period since 1978. Properties on the Target Repetitive Loss list are those that have experienced two losses within a 10-year period that exceed the value of the structure; three losses within the life of the structure that exceed the value of the structure; or four or more losses. Repetitive losses are provided in Table 4- 6 on the following page.

Table 4-6: Repetitive Losses in McLennan County

McLennan County has four (4) repetitive loss (RL) structures and no Severe Repetitive Loss (SRL) located in the county, according to FEMA's RL and SRL lists. All of these structures are residential.

The City of Hewitt has two (2) repetitive loss (RL) structures and no Severe Repetitive Loss (SRL) structures located in the city. All of these structures are residential.

The City of Lacy Lakeview has one (1) repetitive loss (RL) structures and no Severe Repetitive Loss (SRL) structures located in the city. All of these structures are residential.

The City of Robinson has three (3) repetitive loss (RL) structures and no Severe Repetitive Loss (SRL) structures located in the city. All of these structures are residential.

The City of Waco has five (5) repetitive loss (RL) structures and no Severe Repetitive Loss (SRL) structures located in the city. All of these structures are residential.

SECTION FIVE: DROUGHTS

Why Drought Is a Threat

According to the Texas Parks and Wildlife Department, “Drought is one of the most complex, and least understood, of all natural hazards, affecting more people than do other natural hazards, but differing from them in important ways. Unlike earthquakes, hurricanes and tornadoes, drought unfolds at an almost imperceptible pace with beginning and ending times that are difficult to determine, and with effects that often are spread over vast regions. Drought is the most costly of all natural disasters, and because of the famines it causes, it is the most deadly. ”

Drought is defined as a period of time without substantial rainfall that persists from one year to the next.

Drought is a normal part of virtually all-climatic regimes, including areas with high and low average rainfall. Drought is the consequence of a natural reduction in the amount of precipitation expected over an extended period of time, usually a season or more in length. Droughts can be classified as meteorological, hydrologic, agricultural, and socioeconomic. Table 5-1 provides the definitions of drought classifications.

Table 5-1: Drought Classification Definitions

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

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

Over time, droughts can have very damaging effects on crops, municipal water supplies, recreational uses, and wildlife. If droughts extend over a number of years, the direct and indirect economic impact can be significant.

Droughts can affect a large area and range in size from a couple of counties to several states. Their impact on wildlife and area farming is enormous. Droughts

can kill crops, grazing land, edible plants and even in severe cases, trees. Agricultural losses in Texas from the 1996 drought are estimated at \$2 billion, and losses from the 1998 drought estimated at \$2.1 billion, with some estimates much higher. Estimates of overall state losses from both droughts exceed \$11 billion. Dying vegetation also serves as a prime ignition source for wildfires.

A heat wave combined with a drought is a very dangerous situation. Although drought can occur in any season, when extreme heat combines with drought conditions, the result can be a community disaster.

Droughts occur regularly in Texas and are a normal condition. They can vary greatly, however, in their intensity and duration. On average, a yearlong drought takes place somewhere in Texas once every 3 years and a major drought every 20 years. Major droughts can last for years.

Hazard Profile

There are no defined geographic boundaries for drought and the entire planning area can equally be affected.

The potential severity of impact of droughts in McLennan County is substantial, with the possibility of more than 50% of property or agriculture damaged or destroyed. Economic losses may also occur and small municipalities may find water resources lacking.

For more information on severity of impact for the other participating jurisdictions, please see Table 3-7 located on pages 22-23.

The frequency of occurrence of drought in McLennan County is likely, with an event possible in the next five years.

For more information on the frequency of occurrence for the other participating jurisdictions, please see Table 3-8 located on pages 24-25.

Droughts are slow onset hazards. Warning time for drought is long, since drought events take place over long periods of time. Drought warnings are issued by the State Drought Preparedness Council, as directed by H.B. 2660, based upon input from NOAA, the Office of the State Climatologist, the U.S. Geological Service, the Texas Water Development Board, Texas Commission on Environmental Quality, and the Texas Agricultural Statistics Service. Warnings utilize five “levels of concern” and take into account assessments of climatology, agriculture, and water availability for each of 10 climatic regions of the State.

History of Drought

Historical Drought events in McLennan County are listed in Table 5-2. The data was retrieved from NOAA Storm Events Database.

**Table 5-2: Exposure to Droughts in McLennan County
01/01/2007 to 12/31/2017**

Dth: **deaths** Inj: **injuries** PrD: **property damage** CrD:

crop damage

Date	Dth	Inj	PrD	CrD	Notes
6/24/2008	0	0	0	0	Entire county equally affected
7/1/2008	0	0	0	25K	Entire county equally affected
8/1/2008	0	0	0	5K	Entire county equally affected
3/10/2009	0	0	0	10K	Entire county equally affected
4/1/2009	0	0	0	25K	Entire county equally affected
3/25/2011	0	0	0	5K	Entire county equally affected
4/1/2011	0	0	0	20K	Entire county equally affected
5/1/2011	0	0	0	25K	Entire county equally affected
6/1/2011	0	0	0	32K	Entire county equally affected
7/1/2011	0	0	0	40K	Entire county equally affected
8/1/2011	0	0	0	50 K	Entire county equally affected
9/1/2011	0	0	0	30K	Entire county equally affected
10/1/2011	0	0	0	20K	Entire county equally affected
11/1/2011	0	0	0	12K	Entire county equally affected
12/1/2011	0	0	0	7K	Entire county equally affected
1/1/2012	0	0	0	6K	Entire county equally affected
2/1/2012	0	0	0	0	Entire county equally

					affected
11/20/2012	0	0	0	2K	Entire county equally affected
12/1/2012	0	0	0	10K	Entire county equally affected
1/1/2013	0	0	0	3K	Entire county equally affected
2/1/2013	0	0	0	2K	Entire county equally affected
4/1/2013	0	0	0	2K	Entire county equally affected
5/1/2013	0	0	0	2K	Entire county equally affected
6/1/2013	0	0	0	3K	Entire county equally affected
7/1/2013	0	0	0	3K	Entire county equally affected
8/1/2013	0	0	0	3K	Entire county equally affected
9/1/2013	0	0	0	3K	Entire county equally affected
3/1/2014	0	0	0	4K	Entire county equally affected
4/1/2014	0	0	0	2K	Entire county equally affected
5/1/2014	0	0	0	2K	Entire county equally affected
10/1/2014	0	0	0	.50K	Entire county equally affected
9/1/2015	0	0	0	1K	Entire county equally affected
10/1/2015	0	0	3K	0	Entire county equally affected
12/1/2017	0	0	0	1K	Entire county equally affected
1/23/2018	0	0	0	0	Entire county equally affected
2/1/2018	0	0	0	0	Entire county equally affected
3/1/2018	0	0	0	0	Entire county equally affected

People and Property at Risk

Droughts impact large geographical areas, thus all the population, buildings, critical facilities, infrastructure and lifelines in McLennan County are considered exposed to the hazard and could potentially be impacted.

Potential Damages and Losses

In order to analyze the risk of McLennan County to drought and estimate potential losses, 100 years of statistical data from the University of Nebraska was used (this data was developed by the University based on Palmer Drought and Crop Severity Indices) as well as 1997 USDA agriculture data. A drought event frequency-impact was then developed to determine a drought impact profile on non-irrigated agriculture products and estimate potential losses due to drought in the area. Table 5-3 shows annualized expected exposure for the county.

Table 5-3: Annualized Expected Agricultural Product Market Value Exposed to Drought in McLennan County

County	Annualized Expected Exposure
McLennan	\$8,523,501

Extent of Droughts

In 1965, Wayne 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 the index is now called, is 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 PDSI displayed in Table 5.4 is based on precipitation and temperature. The PDSI can therefore be applied to any site for which sufficient precipitation and temperature data is available. Weekly PDSI events values are calculated for the climate divisions during every growing season and are on the internet from the Climate Prediction Center.

Periods of drought can occur on a frequent basis throughout the planning area with the PDSI values ranging from 0 to -5.45. The jurisdictions can expect drought with PDSI values ranging from 0 - -5.45; therefore the extent of drought is uniform across the planning area.

The PDSI displayed in Table 5.4 is based on precipitation and temperature. According to the Palmer Drought Index the extent of droughts in McLennan County can range from **minor** or **moderate** to **severe**, **extreme** or **exceptional**.

Table 5-4: Palmer Drought Severity Index

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

*NDMC - National Drought Mitigation Center

SECTION SIX: WILDFIRES

Why Wildfires Are a Threat

A wildfire is defined as any fire occurring on grassland, forest, or prairie, regardless of ignition source, damages, or benefits. According to the National Fire Plan, 2000, the wildfire risk is now considered by authorities as “the most significant fire service problem of the Century.”

According to the National Fire Data Center of the U.S. Fire Administration, recent trends do show a decline in the numbers of fires, deaths, injuries, and dollar loss to property. However, despite these encouraging trends, an average of over 5,000 deaths and 28,000 injuries to civilians, and over 100 firefighter deaths occurred annually over the 10-year period from 2000 to 2010.

This plan only addresses wildfires and does not include urban fires. However, the Wildland/Urban Interface (WUI) zone was taken into consideration when creating the risk assessment and mitigation action items for each community.

The U.S. Departments of Agriculture and Interior defines the Wildland/Urban Interface as “the line, area, or zone where structures and other human development meet or intermingle with undeveloped wild or vegetative fuels.”

The interface problem has grown over the last twenty years, spawned by increases in population, urban expansion, land-management decisions that place neighborhoods adjacent to wild preserves, parks, and greenbelts, and the ever-present desire to intermingle with nature.

More and more people are building their homes in woodland settings or near open grasslands. There, homeowners enjoy the beauty of the environment but they also face the very real danger of wildfire.

Years of fire suppression have significantly disturbed natural fire occurrences—nature’s renewal process. The result has been the gradual accumulation of understory and canopy fuels to levels of density that can feed high-energy, intense wildfires and further increase the hazards from and exposure to interface problems.

Three different classes of wildfires exist. A “surface fire” is the most common type and burns along the floor of a forest, moving slowly and killing or damaging trees. A “ground fire” is usually started by lightning and burns on or below the forest floor in the humus layer down to the mineral soil. “Crown fires” spread rapidly by wind and move quickly by jumping along the tops of trees.

Humans start about 90 percent of wildfires (cigarettes thrown from cars, burning of refuse, etc.); lightning starts the other 10 percent.

Hazard Profile

A wildfire event in McLennan County can have a minor severity of impact. It may result in injuries or illnesses that do not result in permanent disability, a possible shutdown of critical facilities for more than 1 week, or more than 10% of property burned, destroyed or with major damage. For more information on severity of impact for the other participating jurisdictions, please see Table 3-7 located on pages 22-23.

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

The probability of a wildfire in McLennan County is likely, with an event possible in the next five (5) years. For more information on the frequency of occurrence for the other participating jurisdictions, please see Table 3-8 located on pages 24-25.

According to the National Climatic Data Center, there are three previous occurrences of wildfire events in McLennan County. The first occurrence was on August 2011; a 500-acre wildfire began in Robinson but resulted in no damage, deaths, or injuries. The second occurrence was on December 2012 leading to 75K in property damage and 1 injury. The third and most recent occurrence took place on September 2015 with 150 burned acres but no damage, death, or injuries.

Location of Hazardous Areas

Figures 6-1 through 6-19 show the potential wildfire locations in McLennan County and participating jurisdictions, as determined by the Texas Forest Service. The map represents the cumulative weights of (1) the risks associated with fuel complexes, (2) the risks associated with population, and (3) the weighted factors of population growth. These combined variables determine the following risk categories:

1. **Very Low** risk: areas that have little population or population densities that are not located near or in a hazardous fuel complex.
2. **Moderate** risk: areas that may have a high population but are located near or in a moderate- or low-hazard fuel complex.
3. **High** risk: areas that have a moderate population and a high growth rate and are located near or in a high- or moderate-hazard fuel complex.

4. **Very High** risk: areas that have high population numbers and moderate-to-high growth rates and are located near or in a high-hazard fuel complex area.

Figures 6-1 through 6-19 show the potential wildfire locations in McLennan County and participating jurisdictions.

Figure 6-1: Potential wildfire risk location for McLennan County

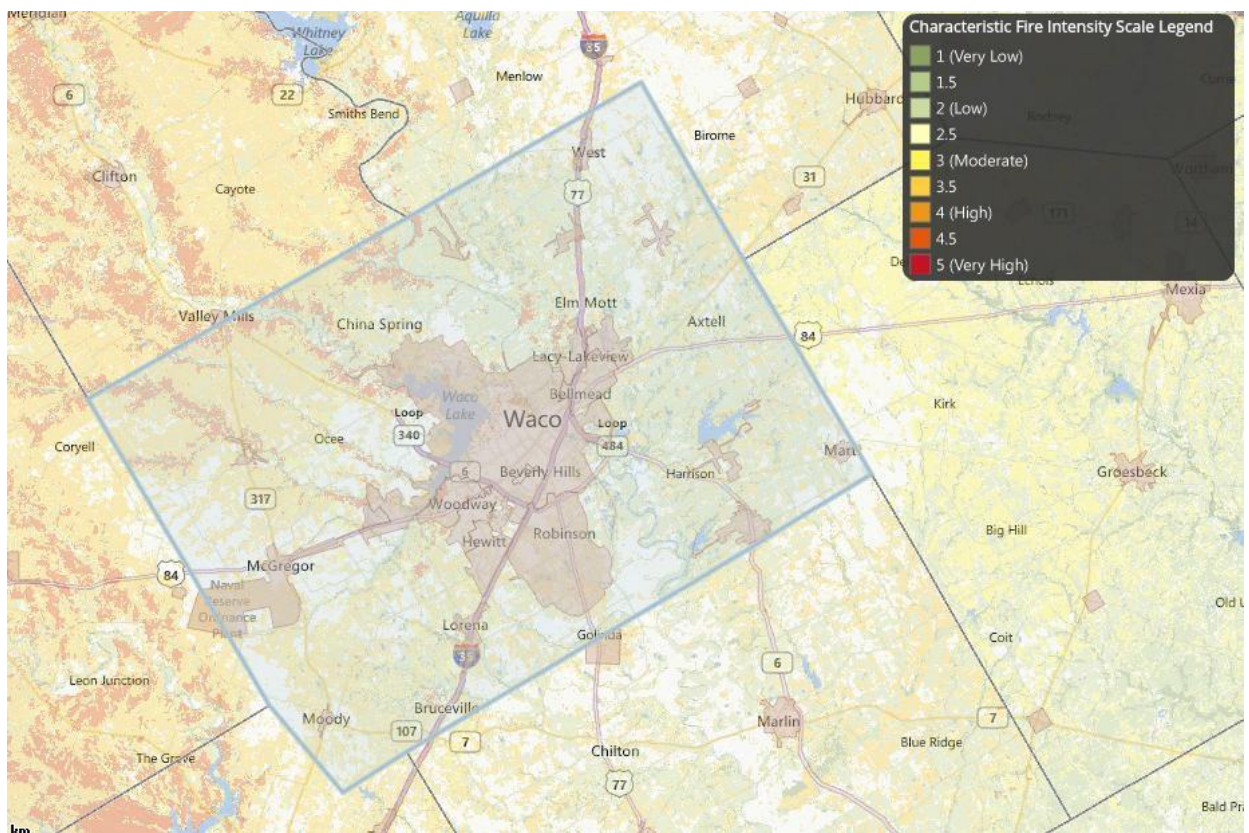


Figure 6-2: Potential wildfire risk location for Bellmead

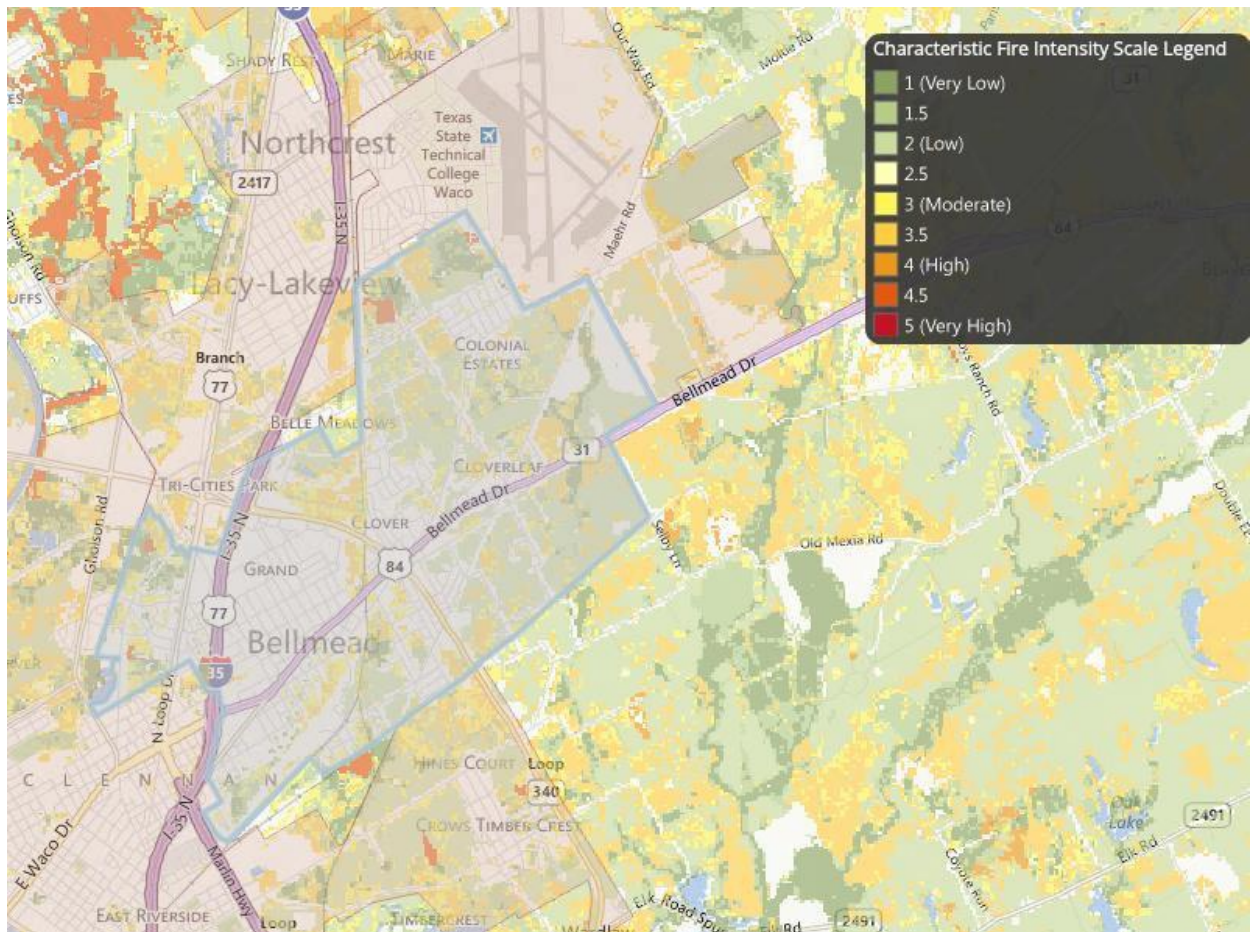


Figure 6-3: Potential wildfire risk location for Beverly Hills

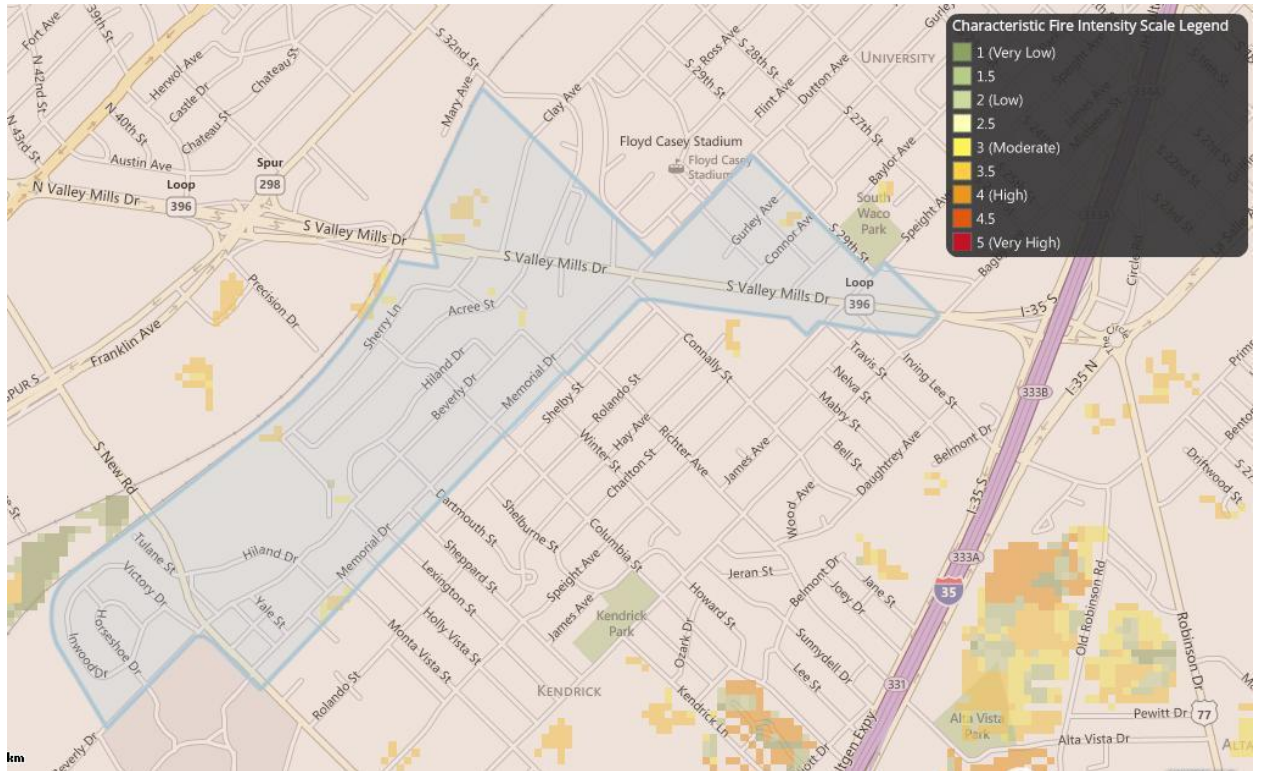


Figure 6-4: Potential wildfire risk location for Crawford

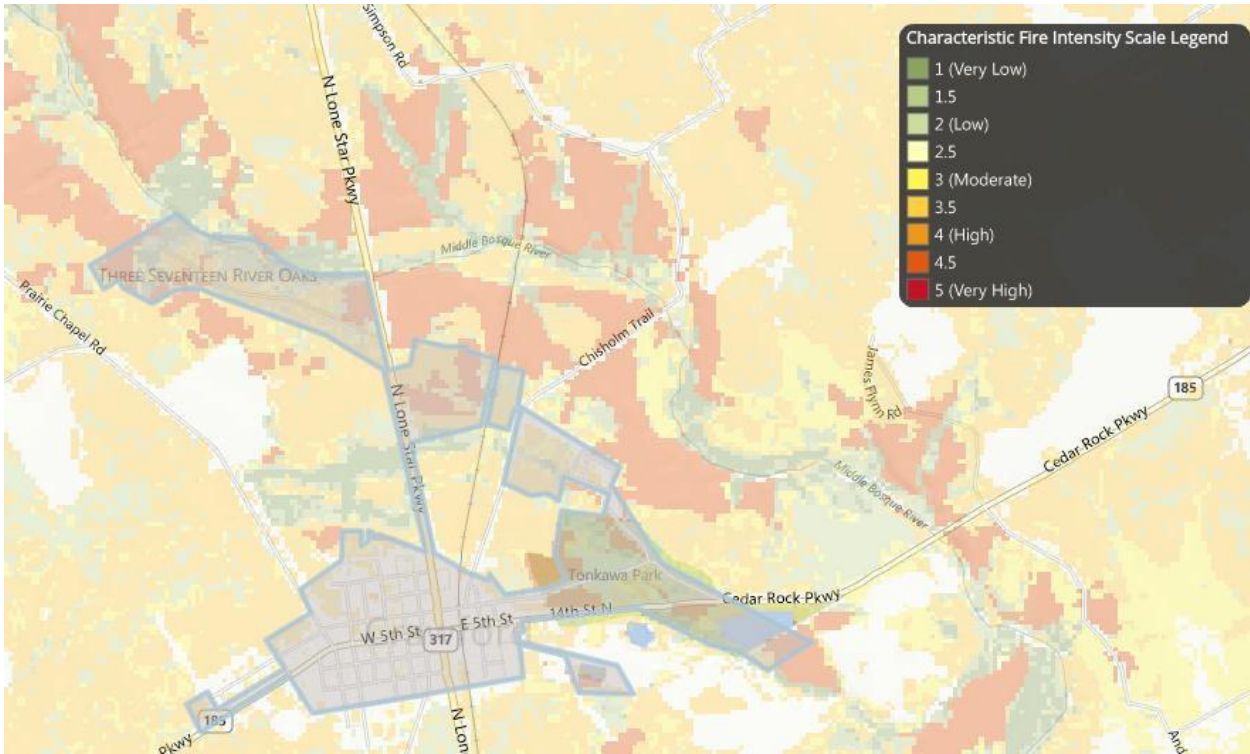


Figure 6-5: Potential wildfire risk location for Gholson

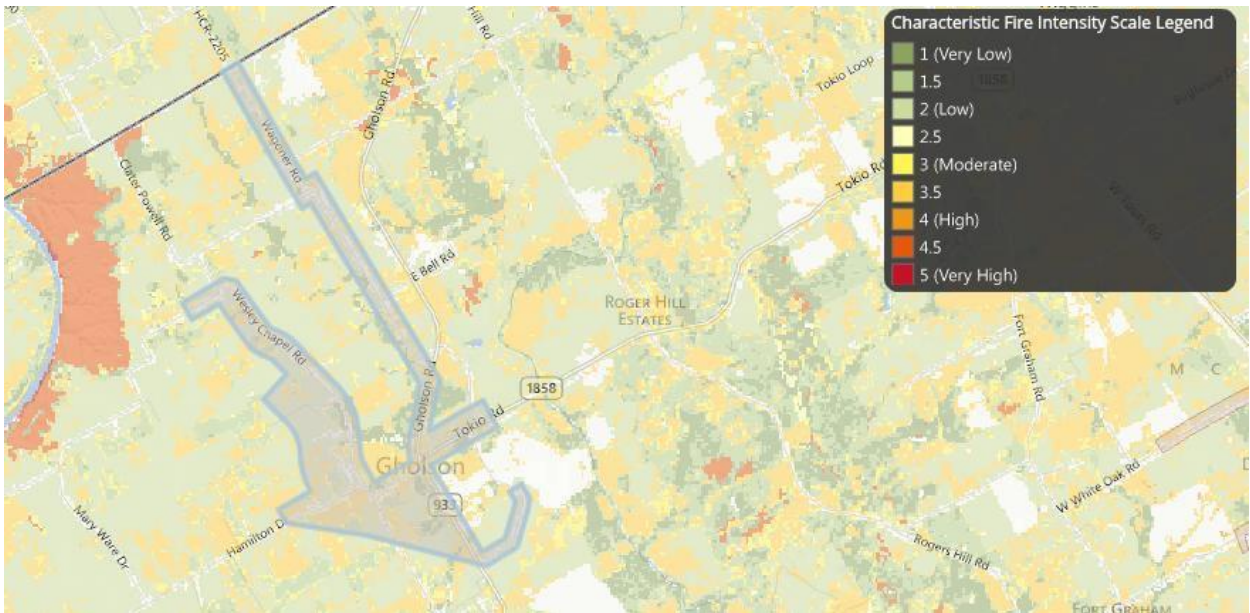


Figure 6-6: Potential wildfire risk location for Hallsburg

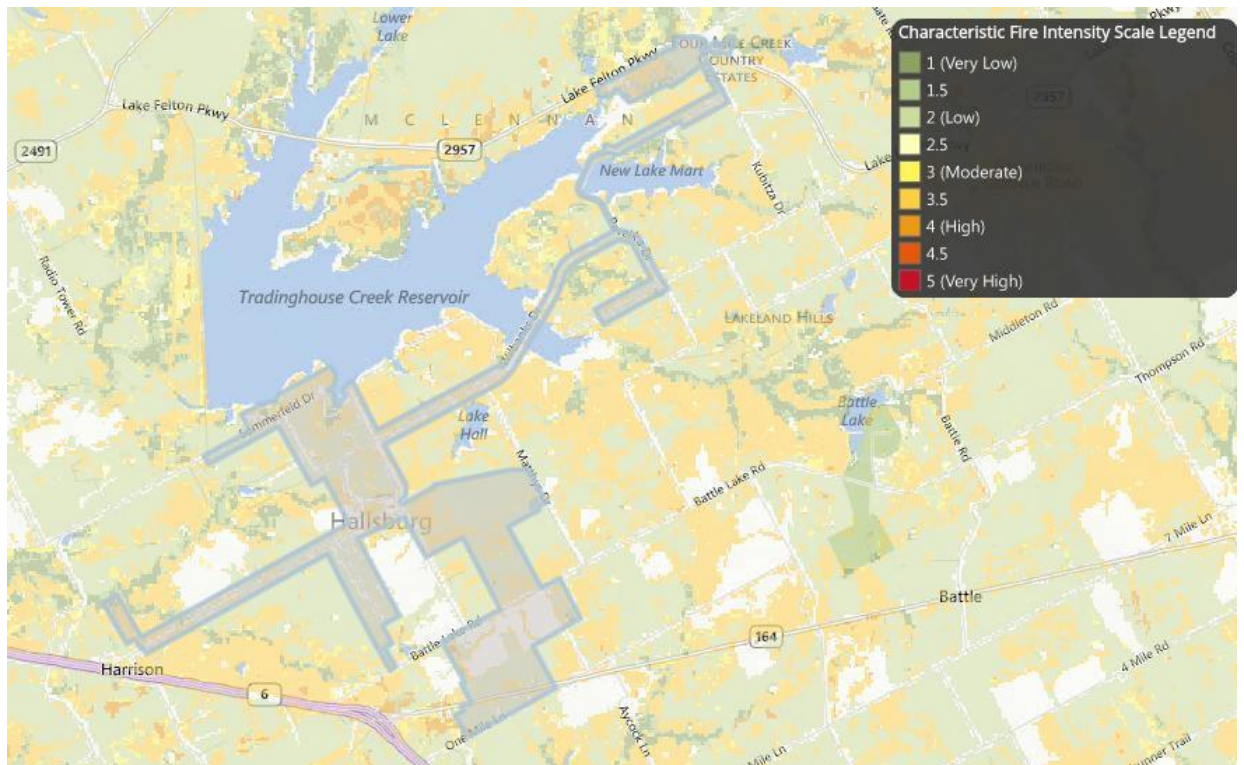


Figure 6-7: Potential wildfire risk location for Hewitt

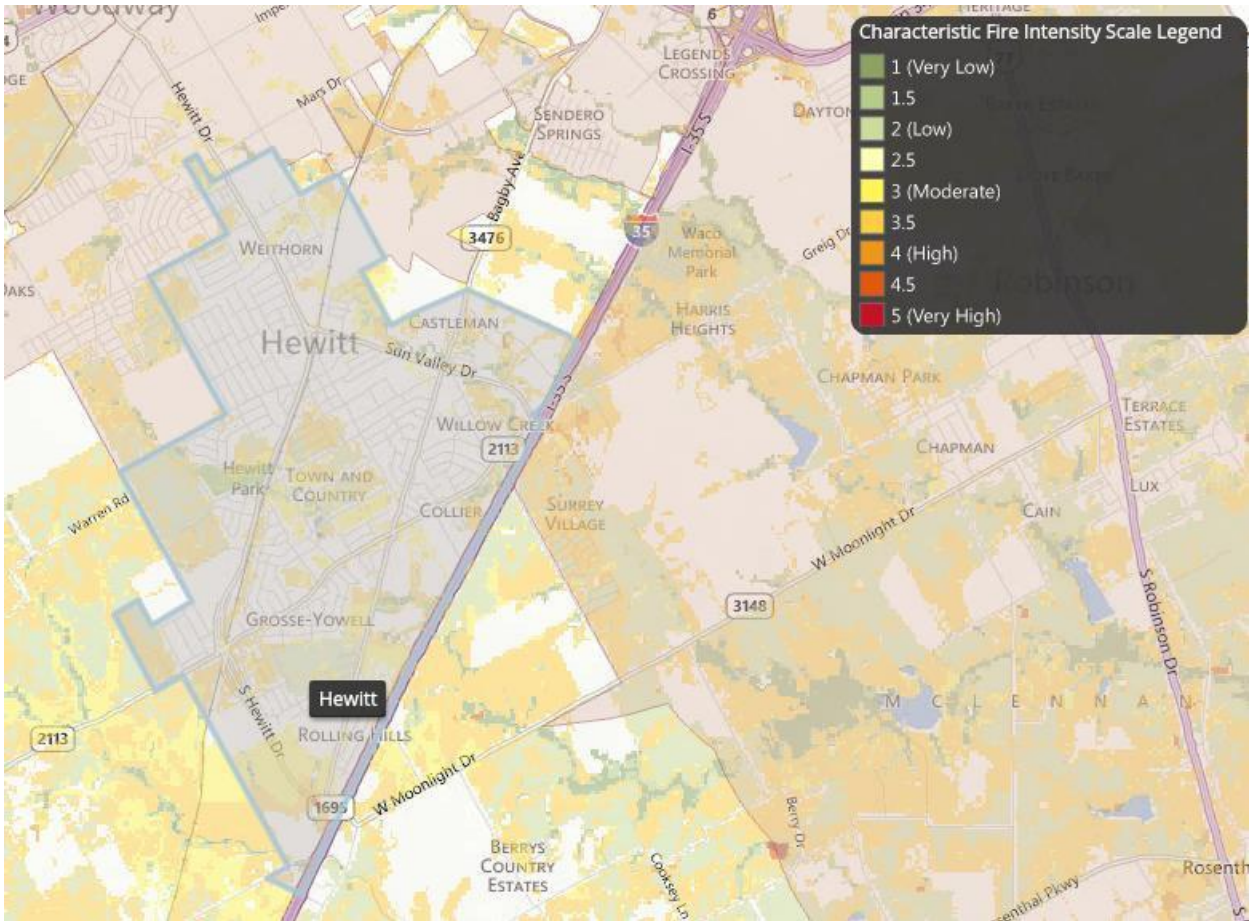


Figure 6-8: Potential wildfire risk location for Lacy-Lakeview

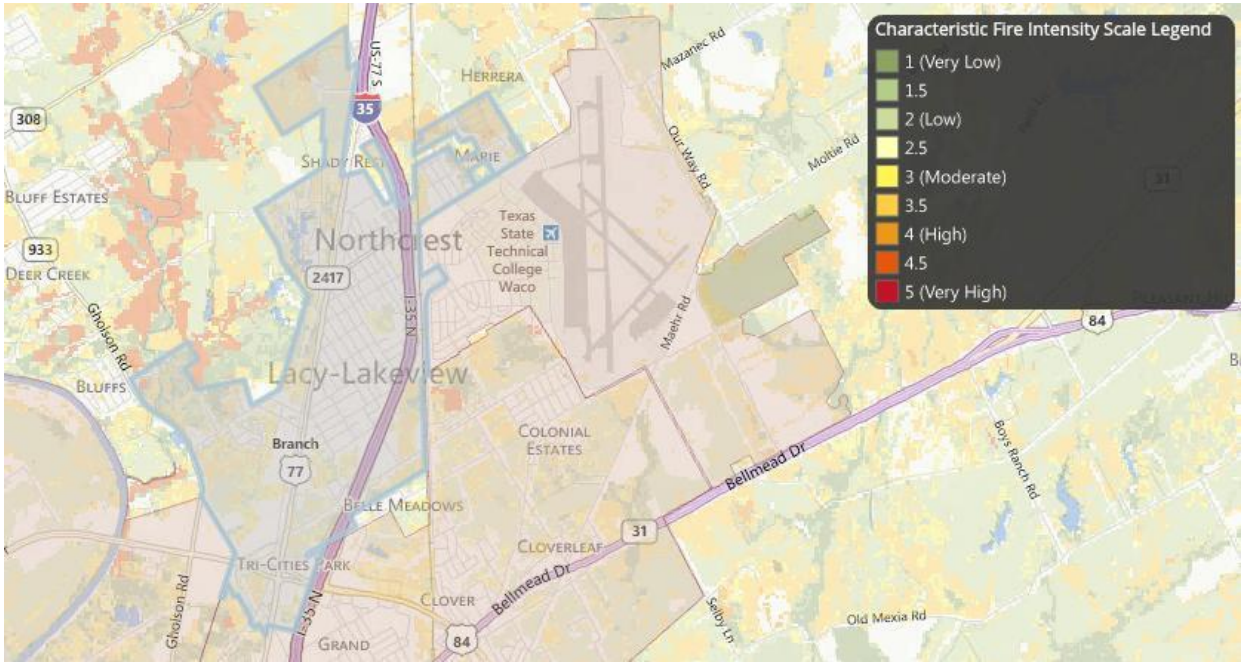


Figure 6-9: Potential wildfire risk location for Leroy

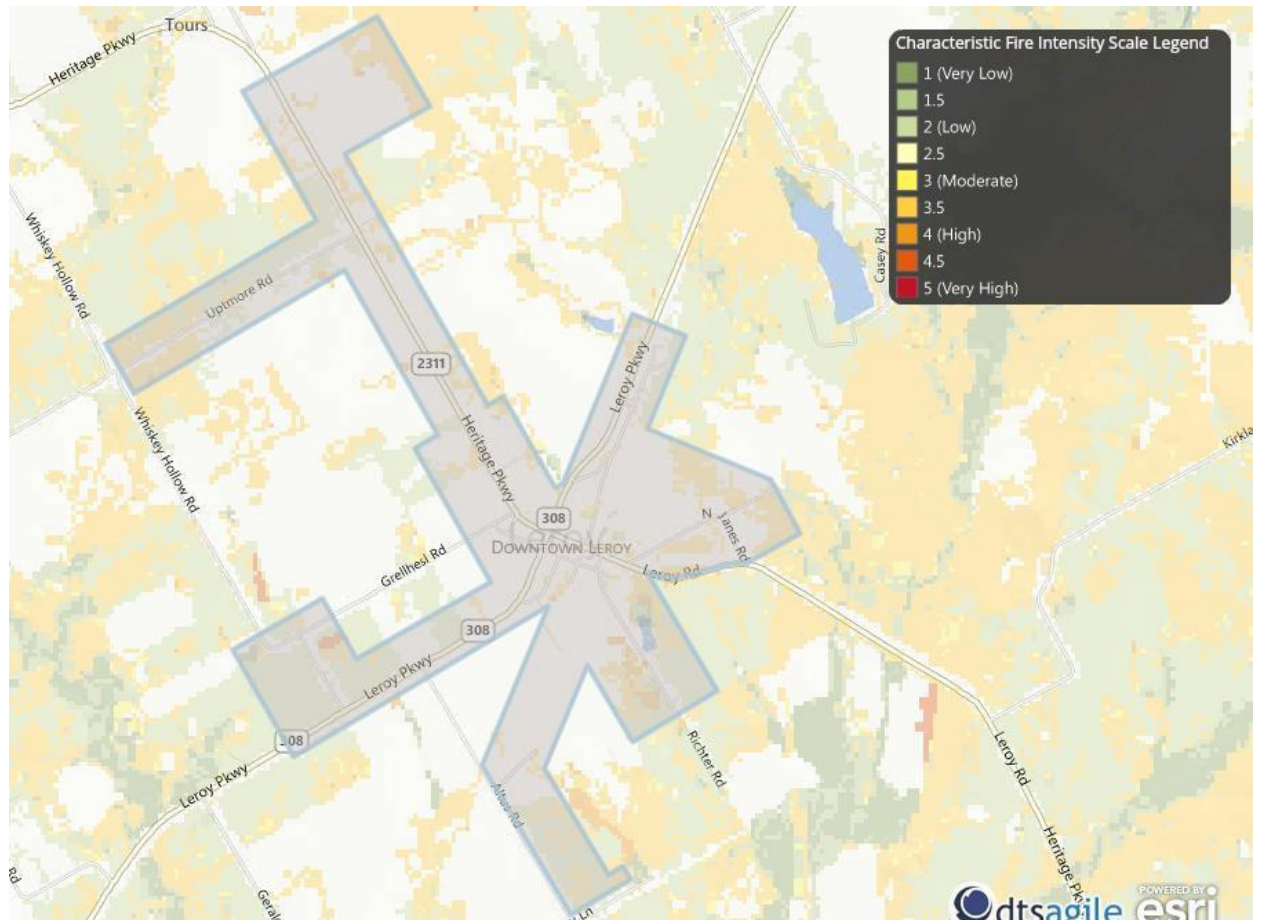


Figure 6-10: Potential wildfire risk location for Lorena

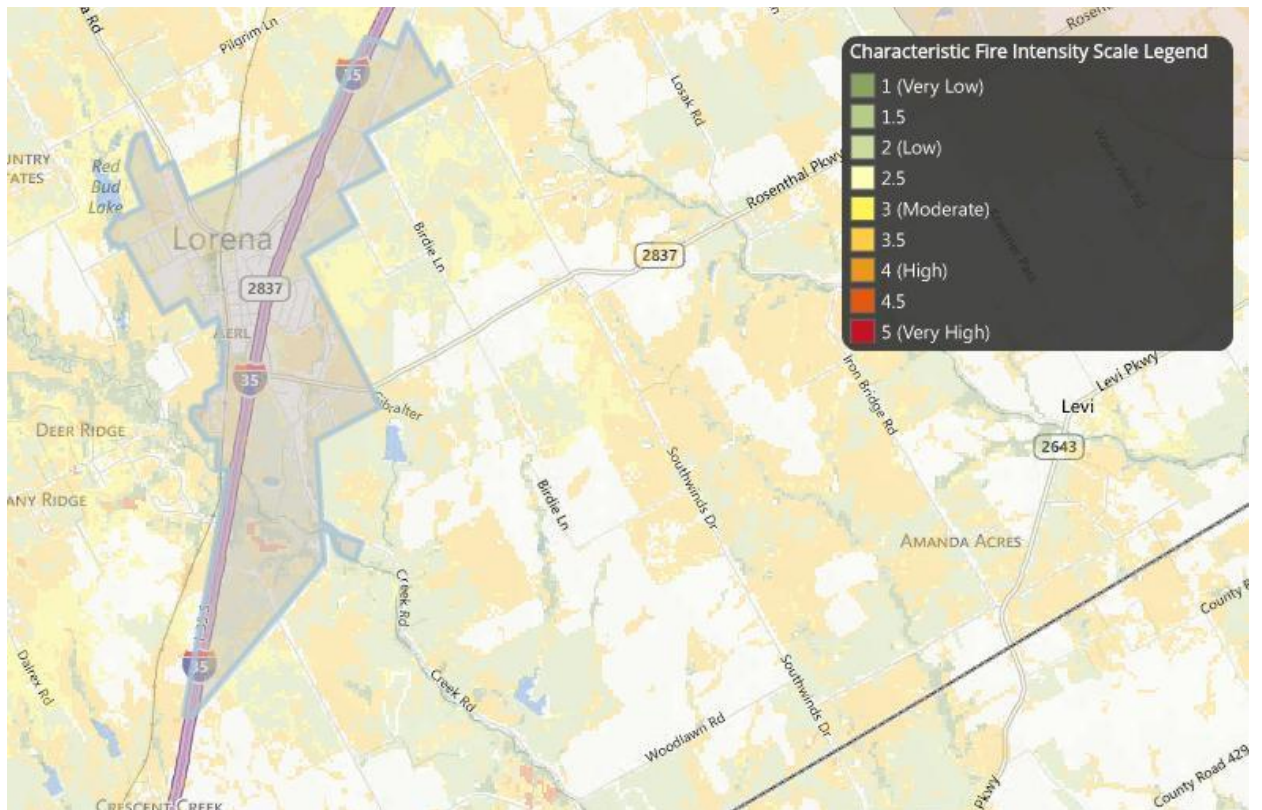


Figure 6-11: Potential wildfire risk location for Mart

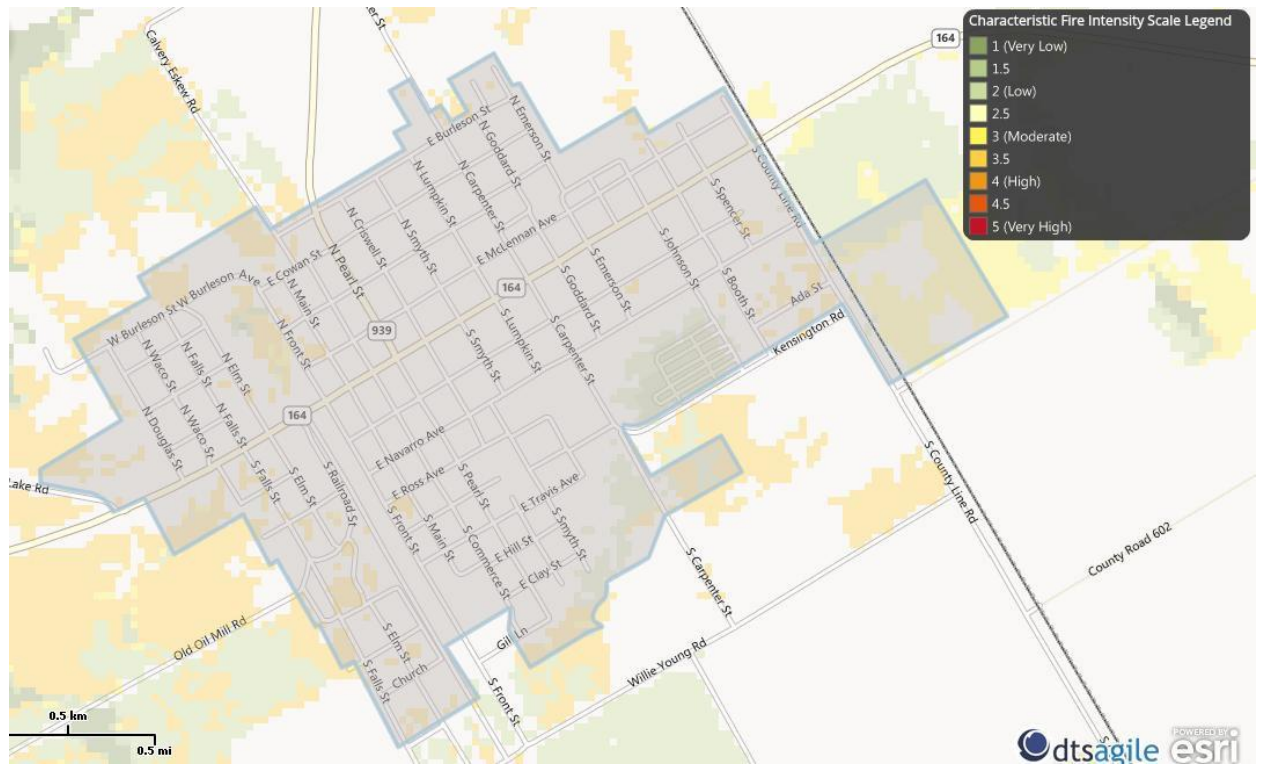


Figure 6-12: Potential wildfire risk location for McGregor



Figure 6-13: Potential wildfire risk location for Robinson

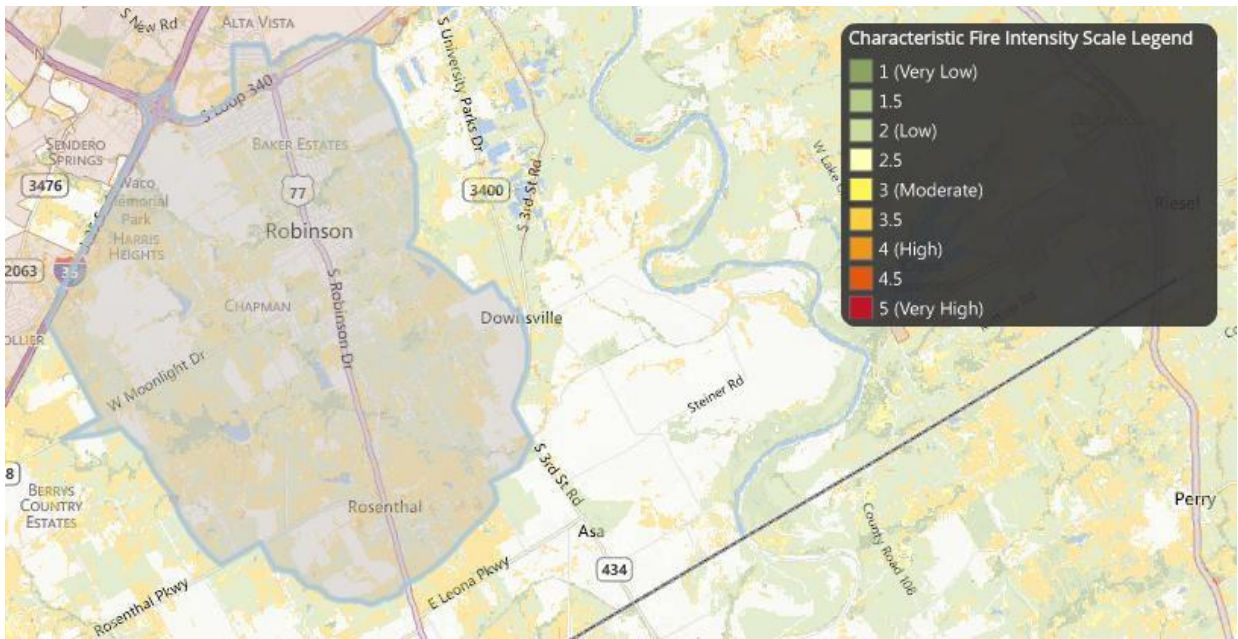


Figure 6-14: Potential wildfire risk location for Ross

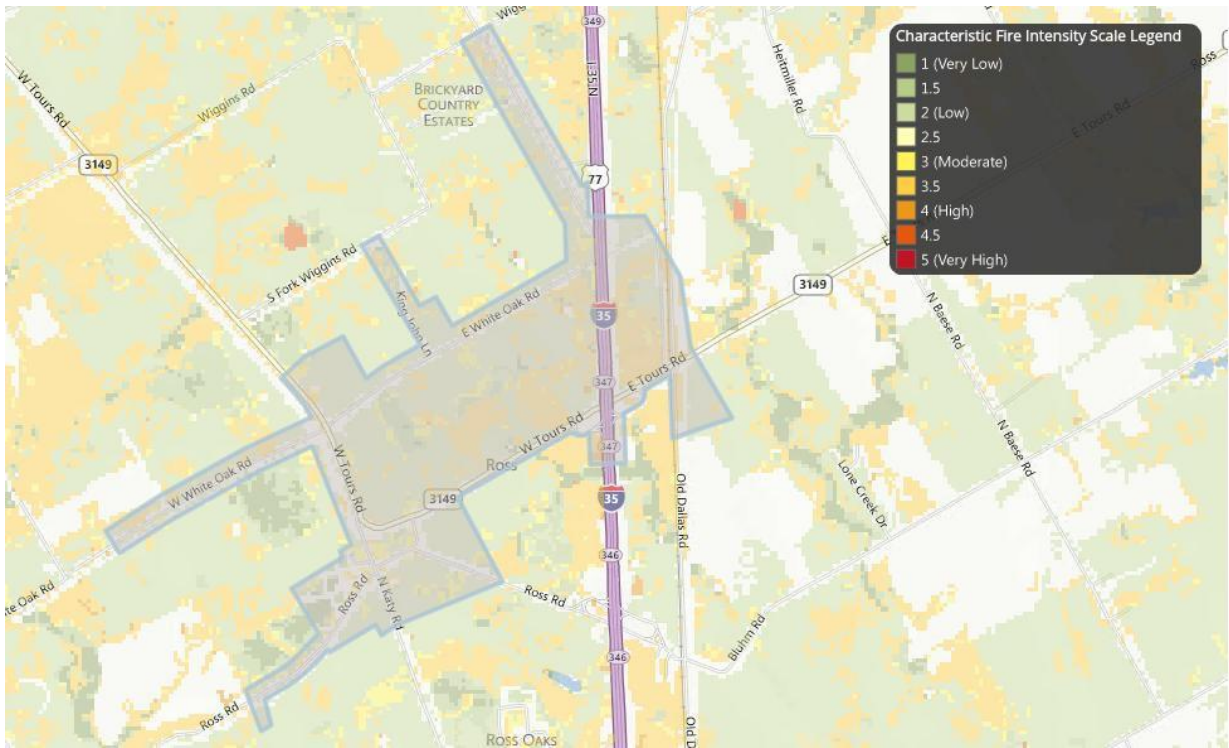


Figure 6-15: Potential wildfire risk location for Waco



Figure 6-16: Potential wildfire risk location for West

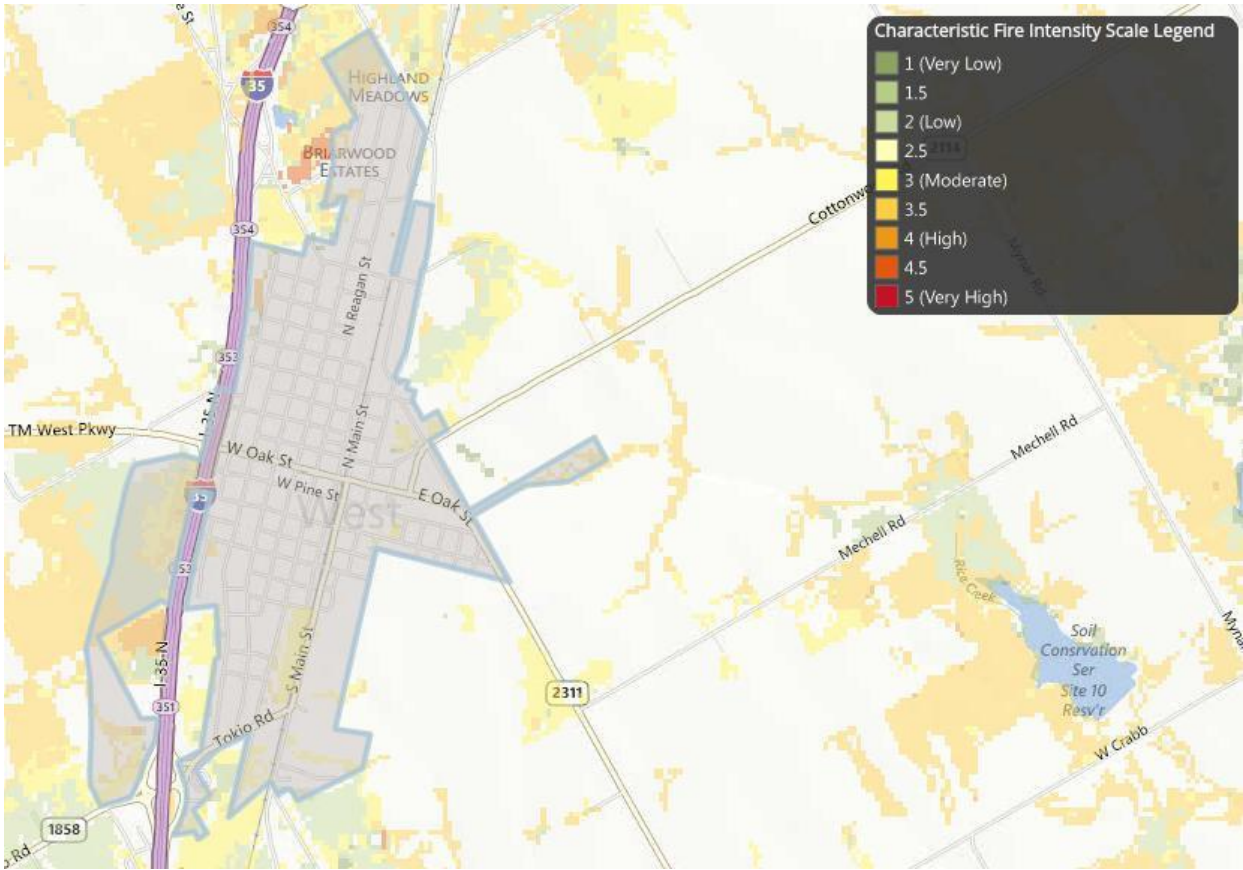
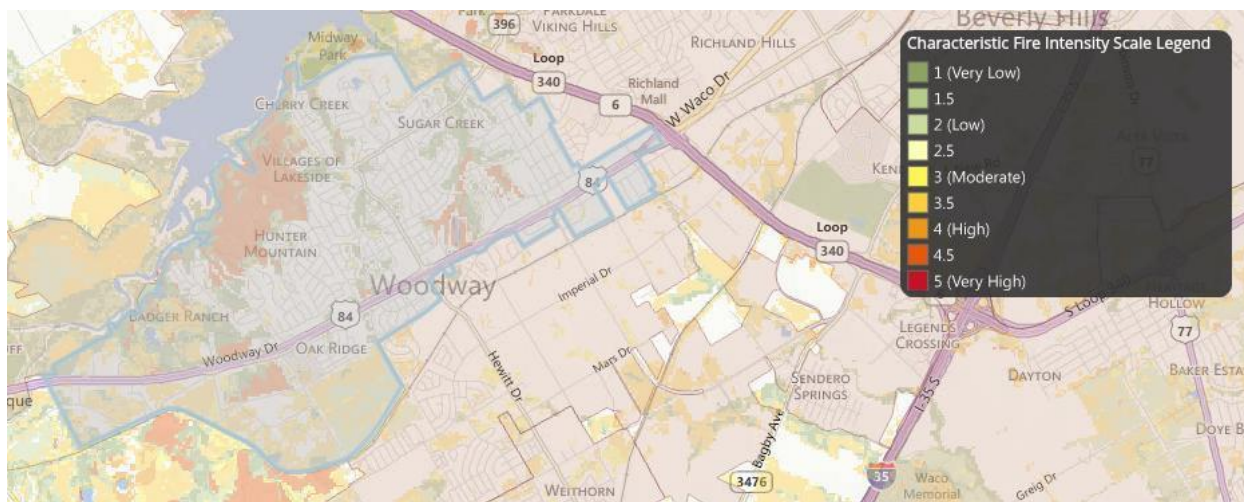


Figure 6-17: Potential wildfire risk location for Woodway



Potential Extent

The potential extent of wildfires is shown for McLennan County and participating jurisdictions in Table 6-1. The Wildland/Urban Interface (WUI) zone was taken into consideration when calculating the data.

Table 6-1: Potential Extent in McLennan County & Participating Jurisdictions

Jurisdiction	Extent of Wildfire
McLennan County	Hundreds of acres burned, several dozen homes destroyed or damaged
Bellmead	A few acres burned, some homes damaged
Beverly Hills	A few acres burned, some homes damaged
Crawford	A few acres burned, some homes damaged
Gholson	A few acres burned, some homes

	damaged or destroyed
Hallsburg	A few acres burned, some homes damaged
Hewitt	A few acres burned, some homes damaged or destroyed
Lacy-Lakeview	A few acres burned, some homes damaged
Leroy	A few acres burned, some homes damaged
Lorena	A few acres burned, some homes damaged
Mart	A few acres burned, some homes damaged or destroyed
McGregor	A few acres burned, some homes damaged
Robinson	A few acres burned, some homes damaged
Ross	A few acres burned, some homes damaged
Waco	Several dozen acres burned, a hundred structures damaged or destroyed
West	A few acres burned, some homes damaged
Woodway	Several acres burned, a dozen homes damaged or destroyed

SECTION SEVEN: TORNADOES

Why Tornadoes Are a Threat

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

The most powerful tornadoes are spawned by “super-cell thunderstorms.” These storms are affected by horizontal wind shears (winds moving in different directions at different altitudes) that begin to rotate the storm. This horizontal rotation can be tilted vertically by violent updrafts, and the rotation radius can shrink, forming a vertical column of very quickly swirling air. This rotating air can eventually reach the ground, forming a tornado.

Table 8.1 shows how tornadoes are rated on the Enhanced Fujita Tornado Scale.

Table 8-1: Enhanced Fujita Tornado Scale Implemented February 1, 2007

ENHANCED FUJITA SCALE	
EF0 (Gale)	65-85 mph 3-second gusts
EF1 (Weak)	86-110 mph 3-second gusts
EF2 (Strong)	111-135 mph 3-second gusts
EF3 (Severe)	136-165 mph 3-second gusts
EF4 (Devastating)	166-200 mph 3-second gusts
EF5 (Incredible)	over 200 mph 3-second gusts

Hazard Profile

Tornadoes do not have a defined geographic boundary and may affect the entire planning area.

Because it cannot be predicted where a tornado will touch down, all buildings and facilities in McLennan County and participating jurisdictions are considered to be exposed to the tornado hazard and could potentially be impacted.

The impact of tornadoes in McLennan County can be substantial. They can cause multiple deaths, completely shut down facilities for thirty days or more, and cause more than fifty percent of affected properties to be destroyed or suffer major damage. For more information on severity of impact for the other participating jurisdictions, please see Table 3-7 located on pages 22-23.

The frequency of occurrence of tornadoes in McLennan County is likely, with an event possible in the next five years. For more information on the frequency of occurrence for the other participating jurisdictions, please see Table 3-8 located on pages 24-25.

The maximum extent of tornadoes that can affect McLennan County and participating jurisdictions is an EF5, which according to the Enhanced Fujita Scale, would be an incredibly strong tornado with winds speeds over 200 miles per hour.

The minimum extent of tornadoes that can affect McLennan County and participating jurisdictions is an EF0, which contains wind speeds between 65-85 miles per hour.

Seasonal patterns are relevant to tornadoes. Thunderstorms form when warm, moist air collides with cooler, drier air. Since these masses tend to come together during the transition from summer to winter, most thunderstorms and resulting tornadoes occur during the spring (March, April, May and June) and, at a lesser intensity, during the fall (September, October, and November). Warning time for tornadoes is minimal.

History of Tornadoes

Historical evidence, as reflected in Table 7-1, shows that all of McLennan County is vulnerable to tornado activity since there is no defined hazard boundary for tornadoes. The data was retrieved from NOAA Storm Events Database. Since the Enhanced Fujita Scale was not implemented until 2007, the original Fujita Scale is included here to help understand the History of Tornado Events scale in Table 7-1. The largest tornado to strike the area was an F5 that hit Waco on May 11, 1953 killing 114 people and causing millions in damages.

ORIGINAL FUJITA SCALE		ENHANCED FUJITA SCALE	
F5	261-318 mph	EF5	+200 mph
F4	207-260 mph	EF4	166-200 mph
F3	158-206 mph	EF3	136-165 mph
F2	113-157 mph	EF2	111-135 mph
F1	73-112 mph	EF1	86-110 mph
F0	<73 mph	EF0	65-85 mph

Table 7-1: Historical Tornado Events for McLennan County from 1/1/2007-2/31/2017

Mag: Magnitude, Dth: Deaths, Inj: Injuries,
PrD: Property Damage, Crd: Crop Damage

Location	Date	Time	Mag	Dth	Inj	PrD	CrD
McGregor	03/30/2007	15:40 PM	EF1	0	0	500K	0
Gholson	03/30/2007	17:00 PM	EF0	0	0	0K	0
McGregor	06/25/2007	20:25 PM	EF0	0	1	50K	0
Leroy	04/26/2011	19:28 PM	EF0	0	0	0K	0
Hallsburg	04/26/2011	19:53 PM	EF0	0	0	0K	0
McLennan	04/10/2017	21:45 PM	EF0	0	0	40K	0

The participating cities of Bellmead, Beverly Hills, Hewitt, Lacy-Lakeview, Mart, Robinson, Ross and Woodway have had no previous tornado occurrences reported.

People and Property at Risk

Because it cannot be predicted where a tornado will touch down, all buildings and facilities in McLennan County and participating jurisdictions are considered to be exposed to the tornado hazard and could potentially be impacted. All the population, buildings, critical facilities, infrastructure and lifelines, and hazardous materials facilities are considered exposed to the hazard and could potentially be impacted.

Potential Damages and Losses

Table 7-2 shows potential annualized expected property losses for each county in McLennan County.

Table 8-5: Potential Annualized Losses from Tornadoes in McLennan County

County	Annualized Expected Property Losses
McLennan	\$62,000

SECTION EIGHT: THUNDERSTORMS/ LIGHTNING

Why Thunderstorms/ Lightning Are a Threat

According to the National Weather Service (NWS), a thunderstorm is a form of turbulent weather characterized by the presence of lightning and its acoustic effect on the Earth's atmosphere known as thunder. Thunderstorms form when clouds develop sufficient upward motion and are cold enough to provide the ingredients (ice and super-cooled water) to generate and separate electrical charges within the cloud.

Thunderstorms are like nature's heat pumps. At the very top of giant thunderstorms, air temperatures can sometimes drop to below -100 degrees F. Sometimes, on a hot summer day, this air originates near the ground at 100 degrees F. Thunderstorms carry the sun's energy from the surface into the cooler reaches of the atmosphere. Without this convective heat transport it is estimated that the mean temperature of the planet would increase by over 20 degrees F, making many areas uninhabitable.

By definition, the National Weather Service (NWS) classifies a thunderstorm as severe if it contains hail of three-quarter inches or larger, and/or wind gusts of 58 mph or higher, and/or a tornado. Severe thunderstorm watches, meaning conditions are suitable for severe thunderstorm development during the next several hours, are issued for areas several hundred miles on a side by the National Weather Service Storm Prediction Center in Norman, Oklahoma. A severe thunderstorm warning is issued by the local NWS office, usually for a county or several counties over an hour or so, based on spotter reports or radar indications of conditions exceeding severe levels. If there is a distinct threat or actual observation of a tornado, a tornado warning is issued.

Along with thunderstorms or sometimes alone, lightning is one of the most common severe weather hazards. According to NOAA, lightning is a rapid discharge of electrical energy in the atmosphere. Lightning strikes the United States about 25 million times a year and throughout the state of Texas. Since lightning often occurs with a thunderstorm, it was decided to pair the two hazards together.

Hazard Profile

Thunderstorms and lightning have no defined geographic boundary and may affect the entire planning area.

The severity of impact of thunderstorms in McLennan County is considered to be minor and may result in injuries or illnesses that do not result in permanent disability, a complete shutdown of critical facilities for more than 1 week, or more than 10% of property destroyed or with major damage.

For more information on severity of impact for the other participating jurisdictions, please see Table 3-7 located on pages 22-23.

The frequency of occurrence of thunderstorms in McLennan County is highly likely, with an event possible in the next three years.

For more information on the frequency of occurrence for the other participating jurisdictions, please see Table 3-8 located on pages 24-25.

The maximum extent of recent thunderstorm types in McLennan County and participating jurisdictions can be classified as a T-3 Heavy Thunderstorm, as described in the Thunderstorm Criteria Scale below.

Extreme Weather Madness Thunderstorm Criteria

THUNDERSTORM TYPES	Rainfall Rate/hr	MAX WIND GUST	HAIL SIZE	PEAK TORNADO Possibility	LIGHTNING FREQUENCY (5 min Intervals)	Darkness Factor	STORM IMPACT
T-1 – Weak thunderstorms or Thundershowers	.03-.10	< 25 MPH	None	None	Only a few strikes during the storm.	Slightly Dark. Sunlight may be seen under the storm.	1. No damage. 2. Gusty winds at times.
T-2 – Moderate Thunderstorms.	.10”-.25”	25-40 MPH	None	None	Occasional 1-10	Moderately Dark. Heavy downpours may cause the need for car lights.	1. Heavy downpours. 2. Occasional lightning. 3. Gusty winds. 4. Very little damage. 5. Small tree branches may break 6. Lawn furniture moved around
T-3 – Heavy Thunderstorms 1. Singular or lines of storms.	.25”-.55”	40-57 MPH	1/4 “ to 3/4”	EF0	Occasional to Frequent 10-20	Dark. Car lights used. Visibility low in heavy rains. Cars may pull off the road.	1. Minor Damage. 2. Downpours that produce some flooding on streets. 3. Frequent lightning could cause house fires. 4. Hail occurs within the downpours. 5. Small branches are broken. 6. Shingles are blown off roofs.
T-4 – Intense Thunderstorms 1. Weaker supercells 2. Bow Echos or lines of Storms	.55” – 1.25”	58 to 70 MPH	1” to 1.5”	EF0 to EF2	Frequent 20-30	Very Dark. Car lights used. Some street lights come on.	1. Moderate Damage. 2. Heavy rains can cause flooding to streams and creeks. Roadway flooding. 3. Hail can cause dents on cars and cause crop damage. 3. Wind damage to trees and buildings. 4. Tornado damage. 5. Power outages
T-5 – Extreme Thunderstorms 1. Supercells with family of tornadoes. 2. Derecho Windstorms	1.25” – 4”	Over 70 Mph	Over 1.5” to 4”	EF3 to EF5	Frequent to Continuous. > 30	Pitch Black. Street Lights come on. House lights may be used	1. Severe Damage to Trees and Property. Damage is widespread. 2. Flooding rains. 3. Damaging hail. 4. Damaging wind gusts to trees and buildings. 5. Tornadoes F3-F5 or family of tornadoes can occur. Tornadoes can cause total devastation. 6. Widespread power outages.

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"Lightning is a massive electrostatic discharge between electrically charged regions within clouds, or between a cloud and the Earth's surface.

According to The National Lightning Safety Institute <http://www.lightningsafety.com> the following forms of lightning are defined:

Direct Strike - This is the most dangerous hazard, wherein the person or structure is in a direct path for lightning currents to seek ground. The magnitude of the current determines its effects. A typical amperage of 20kA acting on a ground of 10 ohms creates 200,000V. A large strike can attain 150kA levels.

Side Strike - This hazard results from the breakup of the direct strike when alternate parallel paths of current flow into the ground via a person or structure. When the initial current path offers some resistance to current flow, a potential above ground develops and the person or structure's resistance to ground becomes the alternate path of conduction.

Conducted Strike - This hazard occurs when lightning strikes a conductor which in turn introduces the current into an area some distance from the ground strike point. Unprotected connected equipment can be damaged and personnel injured if they become an indirect path in the completion of the ground circuit.

Structure Voltage Gradient - When current passes through two or more structures momentary voltage differentials are created. Poor interconnect bonding may cause a completed circuit potential difference. The same hazard is created, for example, by a person touching an ungrounded object while he himself is grounded. The electrical circuit is completed through him, sometimes with fatal consequences.

Induced Effects - Lightning can induce electric field and magnetic field coupling into structures and into wiring. Magnetic coupling is transformer action, and the common laws for transformers prevail.

Streamer Conductor - The streamer hazard occurs when a lightning leader influences electric behavior of objects on the earth. Even streamers which do not become a part of the main channel can contain significant amounts of current. Streamer current exposure can affect people and sensitive electronics.

Sequelae - These secondary effects are many. Forest and grass fires, explosive steam conditions in masonry, trees and other water-bearing objects, and consequences of the thunder clap startling a person so as to drop a wrench or inadvertently throw a switch are examples.

Step Voltage/Touch Voltage - This hazard occurs as a result of a lightning strike hitting the ground and dissipating its energy through the ground. The ground current creates a voltage drop across the surface of the earth, emanating from the earth entry point radially. A person standing on the earth within several hundred feet from the lightning strike point can have several hundred volts generated between his feet. This hazard is identical to a person being grounded while touching two live wires, one with each hand.

Throughout the planning area, lightning is a high probability hazard given that

thunderstorms have a high probability.

Along with these images

Impact and Vulnerability














The impact of lightning may vary from jurisdiction to jurisdiction. Lightning could be harmful if it were to hit a critical facility that is not grounded. The impact could mean one of the critical facilities goes down if there is no back up source of power.

Overall, the vulnerability of lightning is minor to limited meaning the following.

Minor- severity of impact may result in injuries or illnesses that do not result in permanent disability, a complete shutdown of critical facilities for more than 1 week, or more than 10% of property destroyed or with major damage. Limited- severity of impact may result in injuries or illnesses that are treatable with first aid, minor quality of life lost, shutdown of critical facilities and services for 24 hours or less, or less than 10% of property destroyed or with major damage.

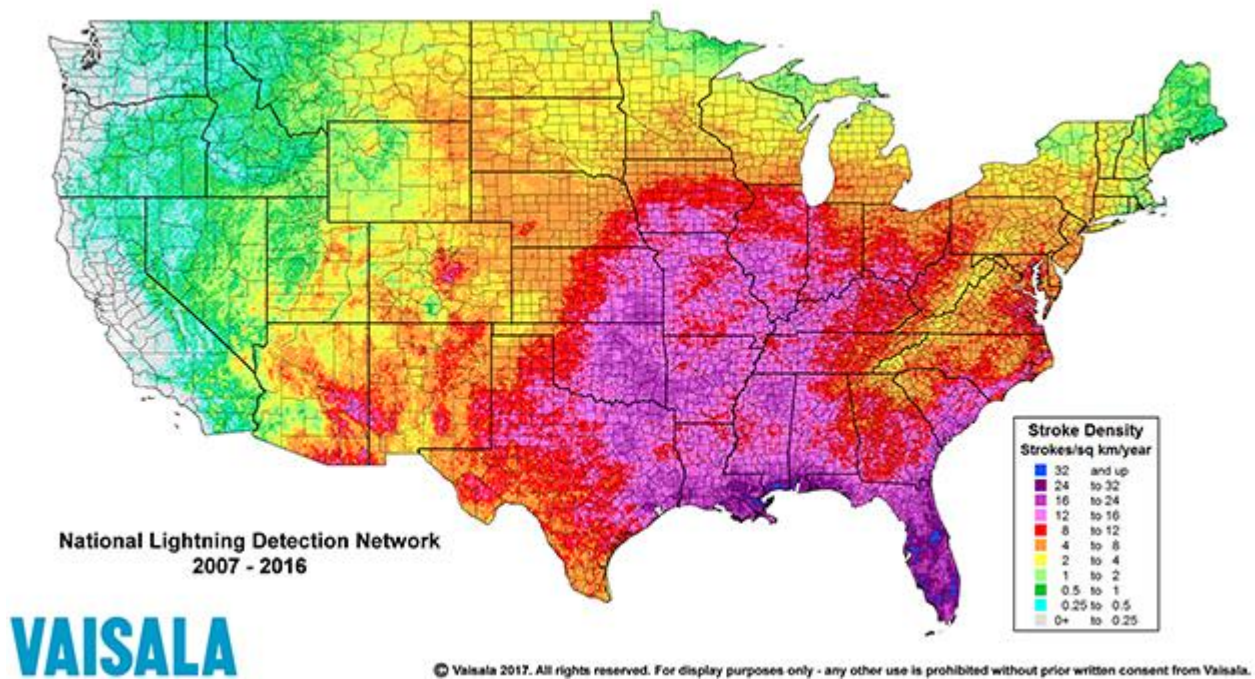
Lighting has a highly likely to likely probability of occurring throughout the planning area meaning the event is possible in the range of the next three to five years. From 2007 to 2017, there has been an estimated \$111,000 in property damage as well as one recorded death.

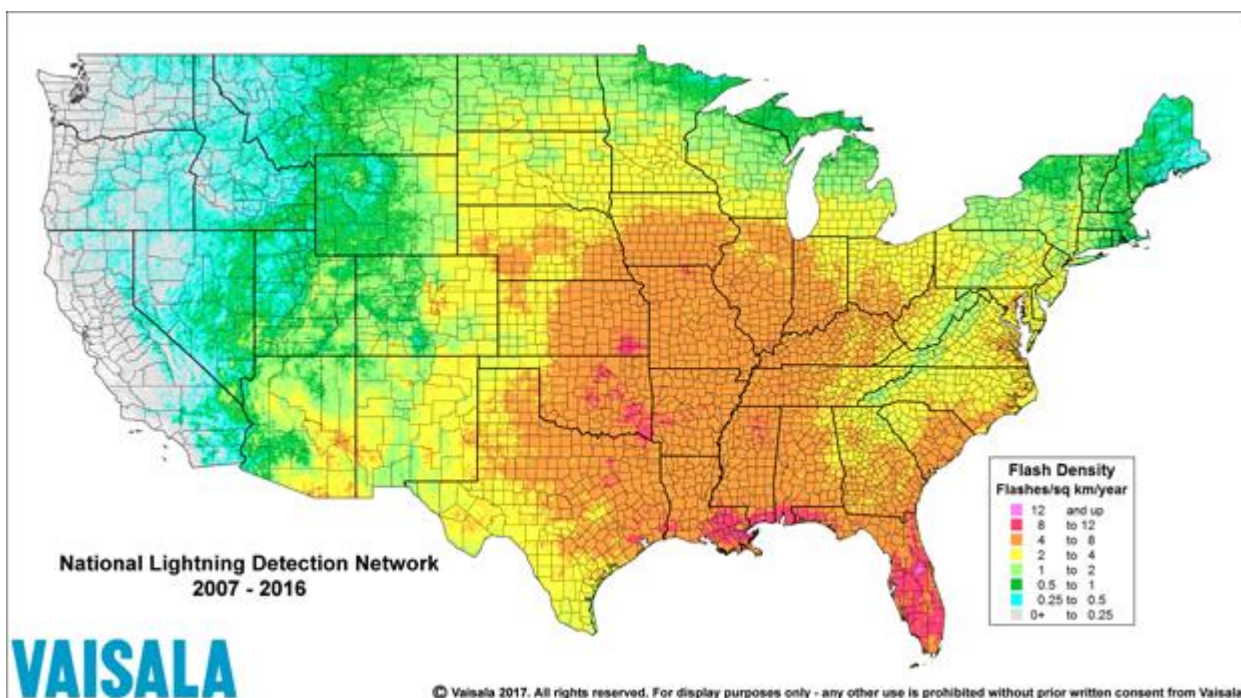
Beaufort Scale

Beaufort number	Wind Speed (mph)	Seaman's term		Effects on Land
0	Under 1	Calm		Calm; smoke rises vertically.
1	1-3	Light Air		Smoke drift indicates wind direction; vanes do not move.
2	4-7	Light Breeze		Wind felt on face; leaves rustle; vanes begin to move.
3	8-12	Gentle Breeze		Leaves, small twigs in constant motion; light flags extended.
4	13-18	Moderate Breeze		Dust, leaves and loose paper raised up; small branches move.
5	19-24	Fresh Breeze		Small trees begin to sway.
6	25-31	Strong Breeze		Large branches of trees in motion; whistling heard in wires.
7	32-38	Moderate Gale		Whole trees in motion; resistance felt in walking against the wind.
8	39-46	Fresh Gale		Twigs and small branches broken off trees.
9	47-54	Strong Gale		Slight structural damage occurs; slate blown from roofs.
10	55-63	Whole Gale		Seldom experienced on land; trees broken; structural damage occurs.
11	64-72	Storm		Very rarely experienced on land; usually with widespread damage.
12	73 or higher	Hurricane Force		Violence and destruction.

Most thunderstorms occur during the spring (March, April and May) and the fall, during the month of September.

Warning times for thunderstorms in McLennan County are generally minimal and are reported on local radio stations and television channels.





History of Thunderstorms

Historical thunderstorm events are detailed in Table 8-1. The data was retrieved from NOAA Storm Events Database. It is important to note that only thunderstorms that have been reported to the National Weather Service are recorded in these tables. It is likely that a higher number of occurrences have not been reported.

Table 8-1: Thunderstorms in McLennan County, 2007-2017

Mag: Magnitude, Dth: Deaths, Inj: Injuries, PrD: Property Damage, Crd: Crop Damage

Location	Date	Time	Mag	Dth	Inj	PrD	CrD
McGregor	3/30/2007	1800	50	0	0	2K	0
WACO	3/3/2008	455	51	0	0	0	0
Spring Valley	3/3/2008	515	61	0	0	80K	0
Waco	4/10/2008	302	57	0	0	0	0
Ocee	4/23/2008	2135	61	0	0	15K	0
Hallsburg	5/7/2008	1550	50	0	0	3K	0
Waco	5/14/2008	5	50	0	0	1K	0
Northcrest	7/13/2008	1905	52	0	0	0	0
Northcrest	7/31/2008	1930	50	0	0	2K	0
Leory	7/31/2008	1930	50	0	0	15K	0
Waco	8/3/2008	2015	50	0	0	6K	0
Hewitt	11/11/2008	700	55	0	0	0	0
McGregor	2/10/2009	2110	60	0	3	60K	0
Madison-Copper	2/10/2009	2119	51	0	0	0	0
Waco	2/10/2009	2135	60	0	0	25K	0
East Waco	2/10/2009	2135	70	0	0	10K	0
Eddy	2/10/2009	2140	61	0	0	0	0
Crawford	6/29/2009	1245	56	0	0	250	0
Crawford	6/29/2009	1245	56	0	0	3K	0
Waco	6/29/2009	1325	50	0	0	1K	0
Hillside	8/23/2009	1601	61	0	0	2K	0
Hewitt	8/23/2009	1601	61	0	0	5K	0
West Womack Arpt	10/1/2009	1945	65	0	0	4K	0
Lorena	10/9/2009	405	56	0	0	1.5K	0
McGregor	4/23/2010	2308	53	0	0	2K	0
China Spring	4/23/2010	2315	56	0	0	3K	0
Waco	4/23/2010	2320	57	0	0	10K	0
East Waco	4/23/2010	2320	48	0	0	2K	0
Woodway	4/23/2010	2323	63	0	0	5K	0
West	4/23/2010	2330	56	0	0	4K	0
Ross	4/23/2010	2330	56	0	0	4K	0
Axtell	4/23/2010	2335	65	0	0	8K	0
McGregor	5/17/2010	1700	50	0	0	0	0
Moody	5/17/2010	1700	50	0	0	20K	0
Atco	5/17/2010	1700	54	0	0	0	0
McGregor AFB	5/20/2010	2010	54	0	0	0	0
South Bosque	5/20/2010	2010	52	0	0	0	0

South Bosque	5/20/2010	2018	61	0	0	3K	0
(ACT)Madison-Cooper	7/25/2010	1755	67	0	0	15K	0
Bosqueville	8/24/2010	1407	61	0	0	5K	0
Lacy Lakeview	9/1/2010	2135	52	0	0	3K	0
Mart	10/11/2010	1820	50	0	0	7K	0
McGregor Muni Arpt	4/22/2011	155	52	0	0	4K	0
Trading House Res	4/26/2011	1757	61	0	0	0	0
McGregor	6/21/2011	2145	52	0	0	5K	0
Waco	6/21/2011	2210	52	0	0	2K	0
(ACT)Madison-Cooper	7/15/2012	1551	44	0	0	4K	0
China Spring	8/8/2012	1240	50	0	0	5K	0
(ACT)Madison-Cooper	2/10/2013	244	55	0	0	5K	0
Leroy	2/10/2013	255	56	0	0	8K	0
Erath	6/22/2014	1708	52	0	0	7K	0
(ACT)Madison-Cooper	6/22/2014	1711	51	0	0	7K	0
Waco	6/22/2014	1720	52	0	0	50K	0
East Waco	6/22/2014	1720	52	0	0	100K	0
Bellmead	6/24/2014	1800	43	0	0	15K	0
Crawford	10/2/2014	1718	50	0	0	1K	0
Beverly Hills	10/2/2014	1718	50	0	0	1K	0
Bellmead	10/2/2014	1750	52	0	0	5K	0
Crawford	10/2/2014	1753	50	0	0	1K	0
Waco	10/2/2014	1758	50	0	0	1K	0
Woodway	10/2/2014	1800	60	0	0	5K	0
Waco	10/2/2014	1807	55	0	0	5K	0
Waco	10/2/2014	1815	50	0	0	5K	0
Woodway	10/2/2014	1818	50	0	0	1K	0
Waco	10/2/2014	1827	50	0	0	5K	0
Hewitt	10/2/2014	1845	56	0	0	10K	0
Beverly Hills	9/25/2015	1511	43	0	0	10K	0
Woodway	12/13/2015	215	48	0	0	12K	0
China Spring	5/10/2016	1837	56	0	0	2K	0
Madison Cooper	5/10/2016	1847	65	0	0	8K	0

China Spring	5/10/2016	1850	55	0	0	0	0
Speegleville	5/10/2016	1850	56	0	0	3K	0
Golinda	5/10/2016	1905	52	0	0	1K	0
West	5/10/2016	1912	53	0	0	3K	0
Waco Madison Cooper	6/12/2016	2108	63	0	0	2K	0
McGregor	1/2/2017	425	56	0	0	0	0
Waco Lake	1/2/2017	431	57	0	0	0	0
Waco	1/2/2017	432	60	0	0	1K	0
Mart	4/10/2017	2143	52	0	0	2K	0
Mart	4/10/2017	2143	52	0	0	1K	0
Mart	4/10/2017	2230	43	0	0	1K	0

**Table 8-2 : Lightning in McLennan County, 2007-2017
(Just lightning occurrences)**

Mag: Magnitude, Dth: Deaths, Inj: Injuries, PrD: Property Damage, Crd: Crop Damage

Location	Date	Time	Mag	Dth	Inj	PrD	Crd
Hallsburg	5/2/2007	1730	0	1	0	0	0
Elm Mott	5/14/2008	550	0	0	0	50000	0
Hewitt	5/11/2011	1644	0	0	0	50000	0
Waco	5/12/2014	1735	0	0	0	5000	0
Waco	5/12/2014	1815	0	0	0	5000	0
Atco	4/27/2016	200	0	0	0	1000	0

SECTION NINE: WINTER STORMS

Why Winter Storms Are a Threat

A winter storm is an event in which the varieties of precipitation are formed that only occur at low temperatures, such as snow or sleet, or a rainstorm where ground temperatures are low enough to allow ice to form (i.e. freezing rain).

A severe winter storm event includes a storm with snow, ice or freezing rain—all of which can cause significant problems for area residents. Winter storms that threaten McLennan County usually start out as powerful cold fronts that push south from central Canada.

Most of the precipitation seen in McLennan County from severe winter storms takes the form of ice or sleet. Freezing rain occurs when rain developing in a relatively warm (above freezing) layer of air falls through a layer of air that is below freezing (25-32° F). The rain is “supercooled” as it falls through the cold layer near the surface of the earth. When the supercooled but still liquid raindrops strike the ground or an object already below freezing, they freeze on contact. The resulting coating of ice is commonly known as glaze.

A heavy accumulation of ice can topple power and telephone lines, television towers, and trees. Highways become impossible to travel on, and even stepping outdoors can be extremely risky. The severity of an ice storm and the amount of damage caused by the storm depends on the amount of rain and thus the amount of icing taking place, the strength of the wind, and whether or not the storm strikes an urban or rural area. Urban areas tend to suffer more damage than rural areas because of the concentration of utilities and transportation systems (aircraft, trains, buses, trucks, and cars), all of which may be affected to a great degree by the icing.

Hazard Profile

The severity of impact of winter storms in McLennan County is considered minor and the event may cause injuries or illnesses that do not result in permanent disability, a complete shutdown of critical facilities for more than 1 week, or more than 10% of property destroyed or with major damage.

For more information on severity of impact for the other participating jurisdictions, please see Table 3-7 located on pages 22-23.

The frequency of occurrence of a winter storm in McLennan County is likely, with an event possible in the next 5 years.

For more information on the frequency of occurrence for the other participating jurisdictions, please see Table 3-8 located on pages 24-25.

The extent of winter storms in McLennan County and participating jurisdictions can extend from something as minor as winter weather advisory's or as major as

freezing temperatures with sleet, snow and wind chill. The maximum extent of winter storms for McLennan County and participating jurisdictions include low temperatures below 32 degrees, freezing rain and sleet, and/or snow amounts up to 3-8 inches.

Warning time for winter storms is generally six to twelve hours.

Table 9-1: Winter Weather Alerts

Winter weather advisory	This alert may be issued for a variety of severe conditions. Weather advisories may be announced for snow, blowing or drifting snow, freezing drizzle, freezing rain, or a combination of weather events.
Winter storm watch	Severe winter weather conditions may affect your area (freezing rain, sleet or heavy snow may occur separately or in combination).
Winter storm warning	Severe winter weather conditions are imminent.
Freezing rain or freezing drizzle	Rain or drizzle is likely to freeze upon impact, resulting in a coating of ice glaze on roads and all other exposed objects.
Sleet	Small particles of ice usually mixed with rain. If enough sleet accumulates on the ground, it makes travel hazardous.
Blizzard warning	Sustained wind speeds of at least 35 mph are accompanied by considerable falling or blowing snow. This alert is the most perilous winter storm with visibility dangerously restricted.
Frost/freeze warning	Below freezing temperatures are expected and may cause significant damage to plants, crops and fruit trees.
Wind chill	A strong wind combined with a temperature slightly below freezing can have the same chilling effect as a temperature nearly 50 degrees lower in a calm atmosphere. The combined cooling power of the wind and temperature on exposed flesh is called the wind-chill factor.

History of Severe Winter Storms

Winter storm events that have occurred in McLennan County from 2007 to 2017 are presented in Table 9-2. The data was retrieved from NOAA Storm Events Database. All participating jurisdictions in this plan were also affected by the same winter storms, since the hazard event has no defined geographic boundaries.

Table 9-2: Winter Weather including storms, heavy snow

McLennan County, 2007-2017

Dth: Deaths, Inj: Injuries, PrD: Property Damage, CrD: Crop Damage

Type	Date	Time	Dth	Inj	PrD	CrD
Winter Weather	12/22/2004	1:00	0	0	0	0
Ice Storm	01/14/2007	18:00	0	0	5K	0
Winter Weather	12/15/2008	18:00	0	0	0	0
Winter Weather	1/5/2009	8:00	0	0	7K	0
Ice Storm	01/27/2009	21:00	0	0	70K	0
Winter Weather	2/11/2010	17:00	0	0	10K	0
Winter Weather	02/11/2010	17:00	0	0	10K	0
Winter Weather	12/6/2017	8:45	0	0	0	0
Winter Weather	12/31/2017	16:00	0	0	50K	0

People and Property at Risk

Winter storms usually impact large geographical areas; thus, all the population, buildings, critical facilities, infrastructure and lifelines in McLennan County and participating jurisdictions are considered exposed to the hazard and could potentially be impacted.

Potential Damages and Losses

Table 9-3 presents annualized expected property losses due to winter storms in McLennan County

Table 10-4: Potential Annualized Losses due to Winter Storms in McLennan County

Location	Annualized Expected Property Losses (\$)
McLennan	\$1,450,000

SECTION TEN: HAIL

Why Hailstorms Are a Threat

Hail is defined as a form of solid precipitation. Hail is made up of spherical balls of ice and is a product of thunderstorms or intense showers. It is generally white and translucent, consisting of liquid or snow particles encased with layers of ice.

Hail is formed within the high tops of well-organized thunderstorms. An updraft will sometimes throw rain droplets high up into the tops of a cloud, where the temperature is well below freezing. The droplet freezes, then falls and can become caught in another updraft. This time, a second coating of ice is added, making the hail stone larger. This cycle continues until the hailstone is too heavy to be lifted again and falls to the ground as hail. The stronger the updraft, the longer the hail develops and the bigger the hailstone is when it falls.

Hail is not to be confused with sleet, which consists of frozen raindrops that fall during winter storms. Hail can be smaller than a pea or as large as a softball and can be very destructive to plants, cars, homes, buildings and crops.

The development and maturation of hailstones are very complex processes. Numerous factors impact the resultant size of the hailstone including updraft strength, storm scale wind profile, height of the freezing level, and the mean temperature and relative humidity of downdraft air. The complexities of hail formation and sub-cloud processes make utilizing Doppler radar data to forecast the occurrence of large hail difficult. Verification of hail events is also important, but is a cumbersome process due to the limited temporal and spatial distribution of the event.

Large hailstones fall at speeds faster than 100 mph. Large falling balls of ice can be very dangerous. Large hail can do significant damage to automobiles, windows, roofs, crops and animals. When caught in a hailstorm, it is important to seek shelter immediately. Pets and livestock are particularly vulnerable to hail, and should be brought into a shelter.

Hazard Profile

Hailstorms have no defined geographic boundary and may affect the entire planning area. Their severity of impact is considered minor in McLennan County and may result in injuries or illnesses that do not result in permanent disability, a complete shutdown of critical facilities for more than 1 week, or more than 10% of property destroyed or with major damage.

For more information on severity of impact for the other participating jurisdictions, please see Table 3-7 located on pages 22-23.

Hail events in McLennan County are likely, with an event possible in the next five years.

For more information on the frequency of occurrence for the other participating jurisdictions, please see Table 3-8 located on pages 24-25.

The extent of hail in McLennan County and participating jurisdictions can range from ¾ of an inch up to 2.75 inches, which, according to the Tornado and Storm Research Organization (TORRO) Hailstorm Intensity Scale shown below, is classified as an H7 with baseball size hailstorms. These hail storms can lead to severe damage to fruit and crops, the wholesale destruction of glass, damage to tiled roofs, and creates a risk of injuries to people not protected by shelter.

HAIL CHARACTERISTICS			
Size	Equiv	Terminal velocity (mph)	Energy (ft-lbs)
1/2"	-	35	.09
3/4"	dime	43	.44
1"	quarter	50	1.4
1.25"	halfdollar	56	4
1.5"	walnut	61	7
1.75"	golfball	66	14
2"	hen egg	72	24
2.25"	-	76	38
2.5"	tennis ball	80	57
2.75"	baseball	85	86
3"	tea cup	89	122
3.25"	-	93	173
3.5"	-	98	235
3.75"	-	102	314
4"	grapefruit	106	413
4.5"	softball	OUCH	OWIE

THE TORRO HAIL-SCALE		
CAT	Equiv	Size
H1	Green pea	.2-.4 inch
H2	Mothball	.4-.6 inch
H3	Marble	.6-.8 inch
H4	Walnut	.8-1.2 inch
H5	Golfball	1.3-1.8 inch
H6	Hen's Egg	1.9-2.4 inch
H7	Baseball	2.4-3.2 inch
H8	Softball	3.3-4.0 inch
H9	Melon	4.0-5.0 inch
H10	Coconut	>5 inch

Most hailstorms occur during the spring (March, April and May) and the fall, during the month of September.

History of Hailstorms

Table 10-1 lists the previous occurrences of hail in McLennan County. The data was retrieved from NOAA Storm Events Database.

Table 10-1: Overall Historical Hail occurrences for McLennan County 2007-2017

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

Location	Date	Time	Mag	Dth	Inj	PrD	CrD
McGregor	3/30/2007	1800	1	0	0	0	0
Axtell	2/16/2008	0	1.75	0	0	5K	0
Moody	4/4/2008	756	0.88	0	0	0	0
Hewitt	4/4/2008	810	1.75	0	0	5K	0
Moody	4/8/2008	2029	0.88	0	0	0	0
Moody	4/8/2008	2035	1.75	0	0	5K	0
Moody	4/8/2008	2037	1.25	0	0	0	0
Spring Valley	4/8/2008	2059	0.75	0	0	0	0
Ocee	4/25/2008	1516	0.75	0	0	0	0
Ocee	4/25/2008	1529	0.75	0	0	0	0
Ocee	4/25/2008	1532	1.5	0	0	0	0
Gholson	4/25/2008	1534	0.88	0	0	0	0
Woodway	4/25/2008	1605	1.75	0	0	10K	0
Woodway	4/25/2008	1610	0.88	0	0	0	0
Woodway	4/25/2008	1613	1	0	0	0	0
Crawford	5/9/2008	2028	0.88	0	0	0	0
Erath	5/9/2008	2050	1.25	0	0	0	0
Atco	12/9/2008	746	1	0	0	0	0
Waco	12/9/2008	755	0.75	0	0	0	0
Lorena	2/10/2009	2130	1.75	0	0	5K	0
Gholson	4/16/2009	1745	1.75	0	0	10K	0
China Spring	4/16/2009	1749	1	0	0	2K	0
West	4/16/2009	1815	1	0	0	0	0
West	4/16/2009	1822	1	0	0	0	0
Lorena	4/17/2009	919	0.88	0	0	0	0
Crawford	4/23/2010	2308	1	0	0	0	0
Eddy	4/23/2010	2320	1	0	0	0	0
Leroy	5/20/2010	1830	2.75	0	0	1K	0
Axtell	5/20/2010	1923	0.75	0	0	0	0
China Spring	5/20/2010	1923	1.75	0	0	1K	0
Mart	5/20/2010	1945	1	0	0	0	0

McGregor AFB	5/20/2010	2018	0.88	0	0	0	0
Woodway	5/20/2010	2025	1.75	0	0	20K	0
Beverly Hills	5/20/2010	2026	1	0	0	0	0
Hewitt	5/20/2010	2031	1.25	0	0	1K	0
Hillside	5/20/2010	2031	1.75	0	0	10K	0
Lacy Lakeview	9/1/2010	2135	1	0	0	0	0
Bellmead	9/1/2010	2145	1	0	0	0	0
Hewitt	10/11/2010	1721	0.88	0	0	0	0
Hewitt	10/11/2010	1732	1	0	0	0	0
Harrison	10/11/2010	1800	1.75	0	0	0	0
Reisel	10/11/2010	1810	1	0	0	0	0
Moody	10/24/2010	1535	0.88	0	0	0	0
Moody	10/24/2010	1549	1	0	0	0	0
Lorena	10/24/2010	1550	0.75	0	0	0	0
Spring Valley	10/24/2010	1552	1.75	0	0	3K	0
Lorena	10/24/2010	1603	1.75	0	0	30K	0
McGregor	2/27/2011	2344	0.88	0	0	0	0
McGregor	2/27/2011	2345	0.75	0	0	0	0
Bellmead	4/25/2011	1605	0.75	0	0	0	0
Lacy Lakeview	4/25/2011	1610	1.75	0	0	20K	0
Axtell	4/25/2011	1615	1	0	0	0	0
Bellmead	4/25/2011	1617	1.75	0	0	25K	0
Waco Connally Arpt	4/25/2011	1620	1.5	0	0	7K	0
Northcrest	4/26/2011	1733	1.75	0	0	4K	0
Lacy Lakeview	4/26/2011	1736	2.75	0	0	50K	0
Mart	4/26/2011	1750	1.25	0	0	0	0
Northcrest	4/26/2011	1923	2.75	0	0	20K	0
Elm Mott	4/26/2011	1925	1.75	0	0	4K	0
Leroy	4/26/2011	1931	1	0	0	0	0

Leroy	4/26/2011	1936	1.75	0	0	4K	0
Bellmead	4/26/2011	1955	1.5	0	0	20K	0
Waco	4/26/2011	1958	1.75	0	0	25K	0
(Act) Madison- Cooper	4/26/2011	2006	0.88	0	0	0	0
Bruceville- Eddy	5/11/2011	1713	0.88	0	0	0	0
Moody	5/11/2011	1908	1	0	0	0	0
Moody	5/11/2011	1915	1.25	0	0	0	0
Lorena	5/11/2011	1923	1	0	0	0	0
Waco	5/20/2011	1645	1	0	0	0	0
Eddy	6/5/2011	1858	1	0	0	0	0
Hewitt	11/21/2011	2317	1	0	0	0	0
Waco	11/21/2011	2323	0.88	0	0	0	0
East Waco	11/21/2011	2325	0.75	0	0	500	0
Woodway	3/19/2012	2107	0.75	0	0	0	0
(Act) Madison- Cooper	4/3/2012	1445	1.75	0	0	75K	0
China Spring	4/3/2012	1447	1.75	0	0	15K	0
Waco Madison Cooper	4/3/2012	1452	1.75	0	0	15K	0
West	4/3/2012	1507	1	0	0	0	0
Waco	4/3/2012	1514	1	0	0	0	0
Speegleville	4/3/2012	1520	0.75	0	0	0	0
Lacy Lakeview	4/3/2012	1520	1.5	0	0	5K	0
McGregor	10/26/2013	1906	1	0	0	0	0
McGregor Muni Airport	10/26/2013	1936	1	0	0	0	0
China Spring	4/3/2014	1838	1	0	0	0	0
Beverly Hills	4/14/2014	843	0.75	0	0	0	0
Northcrest	4/14/2014	857	1	0	0	0	0
Hallsburg	5/9/2014	1750	1	0	0	0	0
Robinson	10/2/2014	1755	1	0	0	0	0
Robinson	10/2/2014	1755	1	0	0	0	0
Robinson	10/2/2014	1758	1.25	0	0	0	0
East Waco	10/2/2014	1759	1.75	0	0	5K	0

Robinson	10/2/2014	1806	1.5	0	0	5K	0
Bruceville-Eddy	4/22/2015	1853	0.75	0	0	0	0
Hewitt	5/25/2015	1424	1	0	0	0	0
Gholson	6/12/2016	1757	1.75	0	0	5K	0
Woodway	6/12/2016	2120	1	0	0	0	0
Robinson	6/12/2016	2219	1	0	0	0	0
China Spring	4/10/2017	1941	1.75	0	0	0	0
Leroy	4/10/2017	2000	1	0	0	0	0
Mart	4/10/2017	2150	2.5	0	0	10K	0
West	5/3/2017	1330	1	0	0	1K	0
West	5/3/2017	1330	1.75	0	0	1.5K	0
Leroy	5/3/2017	1340	1.25	0	0	1K	0
Ocee	5/21/2017	625	1.25	0	0	0	0
Erath	5/21/2017	645	1.25	0	0	0	0
(ACT) Madison-Cooper	5/21/2017	655	1	0	0	0	0
Elm Mott	5/21/2017	730	1	0	0	0	0
Northcrest	5/21/2017	731	1	0	0	0	0

**Table 10-2. Overall Historical Hail Impact in McLennan County
(National Climatic Data Center)**

Location	Number of Events	Maximum Diameter (inches)
McLennan County and participating jurisdictions	78	2.75

People and Property at Risk

Because it cannot be predicted where hail may fall, all buildings and facilities in McLennan County and participating jurisdictions are considered to be exposed to this hazard and could potentially be impacted.

Table 10-3 shows potential annualized losses by participating jurisdictions.

**Table 10-3. Overall Historical Hail Impact for McLennan County
(National Climatic Data Center)**

Location	Annualized Expected Property Damage
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McLennan County and participating jurisdictions	\$68,000
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SECTION ELEVEN: DAM FAILURE

Why Dam Failure Is a Threat

Dams are water storage, control, or diversion barriers that impound water upstream in reservoirs. Dams provide many benefits and are an important part of our public works infrastructure. They are built for a variety of reasons, including maintenance of lake levels, flood control, power production, and water supply.

Although dams have many benefits, the risk that a dam could fail still exists. Dams can pose a risk to communities if not designed, operated and maintained properly. Dam failure is defined as a collapse or breach in the structure. While most dams have storage volumes small enough that failures have little or no repercussions, dams with large storage amounts can cause significant flooding downstream. Dam failures can result from any one or a combination of the following causes:

1. Prolonged periods of rainfall and flooding, which cause most failures;
2. Inadequate spillway capacity, resulting in excess overtopping flows;
3. Internal erosion caused by embankment or foundation leakage or piping;
4. Improper maintenance, including failure to remove trees, repair internal problems, or maintain gates, valves, and other operational components;
5. Improper design, such as use of improper construction materials;
6. Failure of upstream dams in the same drainage basin;
7. Landslides into reservoirs, which cause surges that result in overtopping;
8. High winds, which can cause significant wave action and result in substantial erosion;
9. Earthquakes, which typically cause longitudinal cracks at the tops of the embankments, leading to structural failure.

Dam failures may result in the quick release of all the water in the lake. In the event of a dam failure, the energy of the water stored behind the dam is capable of causing rapid and unexpected flooding downstream, resulting in loss of life and great property damage downstream of the dam.

Hazard Profile

There have been no previous occurrences of a major dam failure in McLennan County or the participating jurisdictions.

The frequency of occurrence of a major dam in McLennan County is a highly unlikely event, with an event possible, but not probable, in the next twenty years.

For more information on the frequency of occurrence for the other participating jurisdictions, please see Table 3-8 located on pages 24-25.

The severity of impact to McLennan County is considered limited and may result in injuries or illnesses that are treatable with first aid, minor quality of life lost, shutdown of critical facilities and services for 24 hours or less, or less than 10% of property destroyed or with major damage.

If the dam at Lake Waco on the Bosque River should fail, however, the severity of impact could be substantial to the City of Waco. Depending on what type of infrastructure is downstream, the event could cause multiple deaths, completely shut down facilities for thirty days or more, and cause more than fifty percent of affected properties to be destroyed or severely damaged.

For more information on severity of impact for the other participating jurisdictions, please see Table 3-7 located on pages 22-23. Due to the low probability of occurrence and limited severity of impact, the jurisdictions in this plan will not address the hazard of dam failure with action items in Section 14, with the exception of the City of Waco and McLennan County.

Flooding that may cause a dam failure would most likely occur in months when floods are most likely -- during the spring (April, May and June) and fall (October, November, and December). Warning time for dam failure, or the potential speed of onset, varies with the causes but is estimated to be three to six hours.

Location of Hazardous Areas

Lake Waco Dam sits on the Bosque River and is located west of the City of Waco. Lake Waco's capacity is nearly 190,000 acre-feet and encompasses a surface area of 8,190 acres. The dam is classified as a "high hazard" dam, which means that loss of human life can occur and that economic and environmental losses can be expected to occur, should the dam fail.

Figures 11-1 through 11-4 show the location of Lake Waco, the flood plains around Lake Waco, the potential inundation areas to the hazard event, and evacuation routes away from the hazard location.

Figure 11-1: Location of Lake Waco

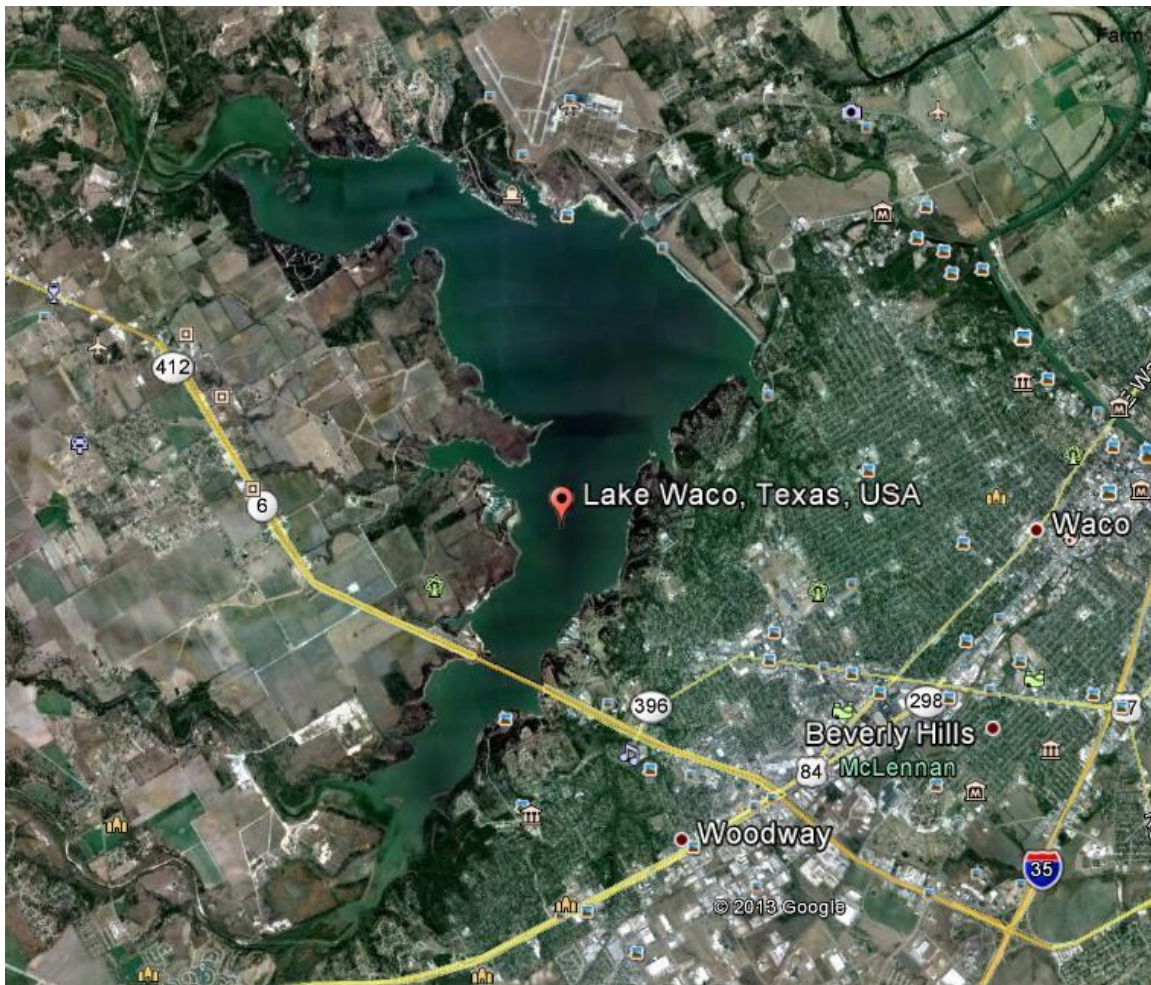
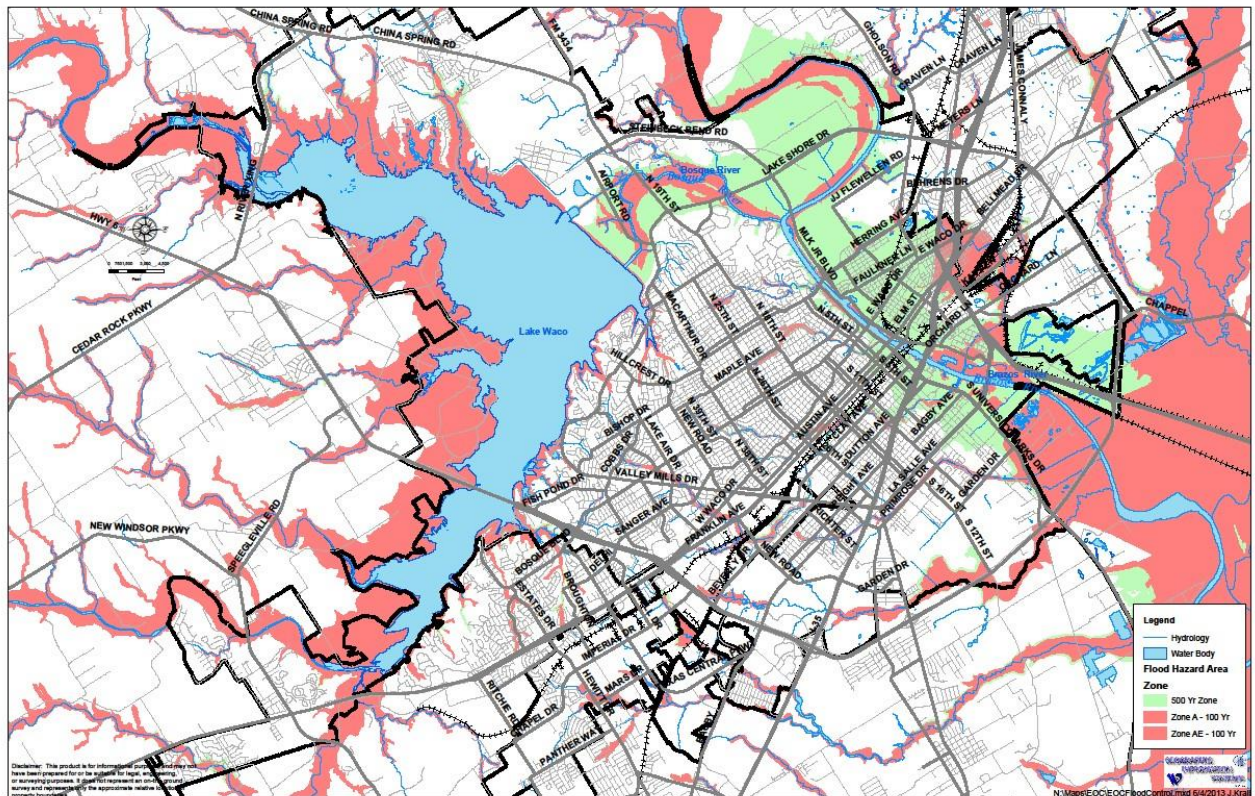
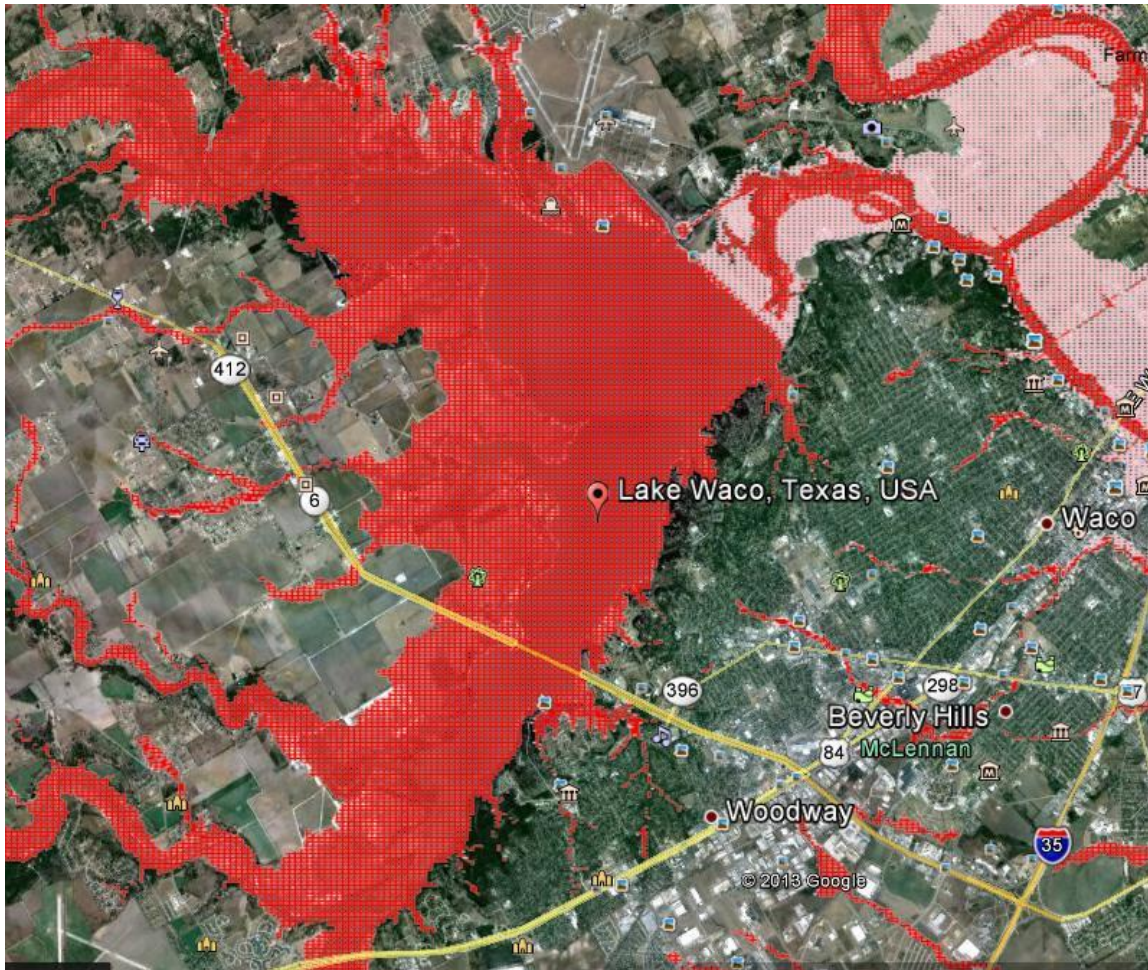


Figure 11-2: Flood Plain Locations of Lake Waco



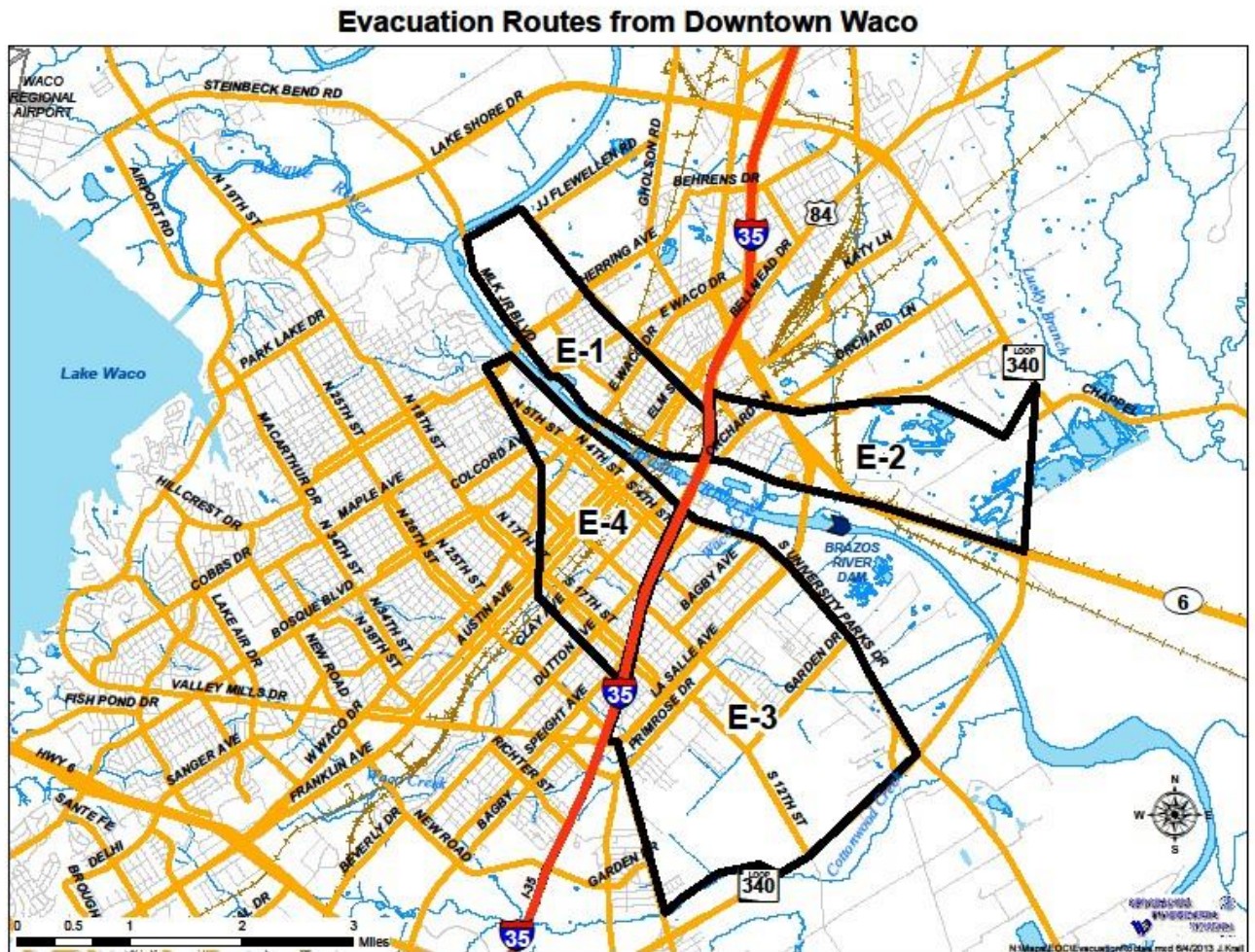
The dam failure inundation area is represented in the above map in green color. The red color represents the 100 year flood plain location.

Figure 11-3: Potential Inundation Location of Lake Waco



Here the dam failure inundation area is represented in the above map in pink color. The dark red color represents the 100 year flood plain location.

Figure 11-4: Evacuation Routes from Lake Waco



Extent Potential

Table 11-3 shows the risk to people and buildings from a dam failure on Lake Waco. It was assumed that a dam break happens most likely at the time of maximum capacity and that a downstream quarter-circle buffer proportional to the maximum capacity of dams represents the maximum impact area. There have been no previous occurrences of dam failure at high hazard dams in McLennan County or the participating jurisdictions.

Table 11-3 shows the extent of risk to property from a dam failure on Lake Waco.

Table 11-3: Extent of Failure of Lake Waco Dam

Dam Location	Maximum Capacity	Acreage Impacted	Water Depth	Water Volume
Lake Waco Dam, McLennan County	190K acre-feet	760K	25 feet	61 billion gallons

There are eighteen (18) other dams located in McLennan County that are defined as “high hazard” by the Texas Commission on Environmental Quality. This means that that loss of human life can occur and that economic and environmental losses can be expected to occur, should the dam fail. These dams are mostly a series of small dams located along portions of the Cow Bayou, watershed, Castleman Creek and Tehuacana Creek.

All of these dams are located in mostly rural McLennan County and are not upstream of any large population centers. If a dam failure were to occur, very few structures are expected to be impacted.

Each of these dams has an Emergency Action Plan (EAP) on file at the McLennan County Office of Emergency Management. Information such as the location of the dams, maximum storage volume, dam inundation area maps and other information are contained within the EAP’s. For the purpose of this plan, portions of the EAP’s may be found in Appendix D.

Tables 11-4 and 11-5 show the names of the high hazard dams and their expected extent should they fail. All flood waters from a dam failure are expected to remain on the property of the dam owner.

Table 11-4: High Hazard Dams in McLennan County

Name of Dam	Name of Dam	Name of Dam
COW BAYOU WS SCS SITE 10 DAM	CASTLEMAN CREEK WS SCS SITE 1 DAM	TEHUACANA CREEK WS SCS SITE 14 DAM
COW BAYOU WS SCS SITE 26 DAM	CASTLEMAN CREEK WS SCS SITE 2 DAM	TEHUACANA CREEK WS SCS SITE 15 DAM
COW BAYOU WS SCS SITE 29 DAM	CASTLEMAN CREEK WS SCS SITE 3 DAM	TEHUACANA CREEK WS SCS SITE 17 DAM
	CASTLEMAN CREEK WS SCS SITE 6 DAM	TEHUACANA CREEK WS SCS SITE 18 DAM
		TEHUACANA CREEK WS SCS SITE 20 DAM

		TEHUACANA CREEK WS SCS SITE 21 DAM
		TEHUACANA CREEK WS SCS SITE 22 DAM
		TEHUACANA CREEK WS SCS SITE 23 DAM
		TEHUACANA CREEK WS SCS SITE 24 DAM
		TEHUACANA CREEK WS SCS SITE 25 DAM
		TEHUACANA CREEK WS SCS SITE 26 DAM

Table 11-5: Extent of Acres Flooded from the High Hazard Dams

Name of Dam	Acreage Impacted	Name of Dam	Acreage Impacted	Name of Dam	Acreage Impacted
COW BAYOU WS SCS SITE 10 DAM	30	CASTLEMAN CREEK WS SCS SITE 1 DAM	170	TEHUACANA CREEK WS SCS SITE 14 DAM	40
COW BAYOU WS SCS SITE 26 DAM	10	CASTLEMAN CREEK WS SCS SITE 2 DAM	30	TEHUACANA CREEK WS SCS SITE 15 DAM	80
COW BAYOU WS SCS SITE 29 DAM	20	CASTLEMAN CREEK WS SCS SITE 3 DAM	20	TEHUACANA CREEK WS SCS SITE 17 DAM	120
		CASTLEMAN CREEK WS SCS SITE 6 DAM	20	TEHUACANA CREEK WS SCS SITE 18 DAM	35
				TEHUACANA CREEK WS SCS SITE 20 DAM	20
				TEHUACANA CREEK WS SCS SITE 21 DAM	100
				TEHUACANA CREEK WS SCS SITE 22 DAM	70
				TEHUACANA CREEK WS SCS SITE 23 DAM	10

				TEHUACANA CREEK WS SCS SITE 24 DAM	50
				TEHUACANA CREEK WS SCS SITE 25 DAM	120
				TEHUACANA CREEK WS SCS SITE 26 DAM	30

SECTION TWELVE: GOALS AND OBJECTIVES

Mitigation Goals and Objectives

Overall Goal

To reduce or eliminate the long-term risks to loss of life and property damage in McLennan County and the cities of Bellmead, Beverly Hills, Crawford, Gholson, Hallsburg Hewitt, Lacy-Lakeview, Leroy, Lorena, Mart, McGregor, Robinson, Ross, Waco, West and Woodway from a range of natural hazard disasters.

Goal 1 Increase public understanding, support and demand for hazard mitigation.

Objective 1.1 Heighten public awareness of a range of natural and man-caused hazards they face.

Objective 1.2 Educate the public on actions they can take to prevent or reduce the loss of life or property from all hazards.

Objective 1.3 Publicize and encourage the adoption of appropriate hazard mitigation measures.

Goal 2 Protect public health and safety.

Objective 2.1 Advise the public about health and safety precautions to guard against injury and loss of life from hazards.

Objective 2.2 Maximize the utilization of the latest technology to provide adequate warning, communication, and mitigation of hazard events.

Objective 2.3 Reduce the danger to, and enhance protection of, dangerous areas during hazard events.

Objective 2.4 Protect critical facilities and services.

Goal 3 Protect existing and new properties.

Objective 3.1 Reduce repetitive losses to the National Flood Insurance Program.

Objective 3.2 Use the most cost-effective approaches to protect existing buildings and public infrastructure from hazards.

Objective 3.3 Enact and enforce regulatory measures to ensure that development will not put people in harm's way or increase threats to existing properties.

Goal 4 Build and support local capacity and commitment to continuously become less vulnerable to hazards.

Objective 4.1 Build and support local partnerships to continuously become less vulnerable to hazards.

Objective 4.2 Build a cadre of committed volunteers to safeguard the community before, during, and after a disaster.

Objective 4.3 Build hazard mitigation concerns into planning and budgeting processes.

Goal 5 Promote growth in a sustainable manner.

Objective 5.1 Incorporate hazard mitigation into the long-range planning and development activities.

Objective 5.2 Promote beneficial uses of hazardous areas while expanding open space and recreational opportunities.

Objective 5.3 Utilize regulatory approaches to prevent creation of future hazards to life and property.

Goal 6 Maximize the resources for investment in hazard mitigation.

Objective 6.1 Maximize the use of outside sources of funding.

Objective 6.2 Maximize participation of property owners in protecting their properties.

Objective 6.3 Maximize insurance coverage to provide financial protection against hazard events.

Objective 6.4 Prioritize mitigation projects, based on cost-effectiveness and starting with those sites facing the greatest threat to life, health and property.

SECTION THIRTEEN: PREVIOUS MITIGATION ACTIONS

Through the Hazard Mitigation Grant Program (HMGP), FEMA has financially helped the State of Texas to permanently reduce or eliminate future damages and losses due to natural hazards. HMGP funds promote safer building practices that improve existing structures and supporting infrastructure. The HMGP currently provides post-disaster funds, which can be used anywhere in the State, up to 15.0 percent of obligations for individual and public assistance. Grants are for planning and projects, including acquisition of real property, relocation and demolition of structures, seismic retrofitting, strengthening of existing structures, initial implementation of vegetative management programs, elevation of residential structures, elevation or dry flood-proofing of non-residential structures, and other activities that bring a structure into compliance with the floodplain management requirements of the National Flood Insurance Program.

There are no projects in the McLennan County or the participating jurisdictions under the Project Impact, Pre-Disaster Mitigation Grant Program, or Hurricane-Property Protection Mitigation program.

In addition, the United States Army Corps of Engineers (USACE) has worked on flood control projects within McLennan County to lessen the affects from floods, as shown below in Table 13-1.

Table 13-1: USACE Studies for McLennan County

Project Name	Date of Project	Date of Completion	Project Description
Lake Waco Pool Raise Waco, Texas	2003	September 1, 2003	The top of the conservation pool was raised from 455 feet to 462, increasing the water storage in the reservoir by 47,526 acre-feet.
Waco Lake Dam Safety Project, Waco Lake, Texas	1998	1998	Waco Lake Dam Safety Project consists of raising the main embankment crest elevation of Waco Dam by 4.6 feet.

Project Name	Date of Project	Date of Completion	Project Description
Bosque River Watershed Environmental Base-Line Assessment	1998	1999	An environmental base-line assessment of the water quality and contamination susceptibility of the Bosque River watershed.
Brazos River at Waco Sewer System Section 14 Emergency Streambank Protection Project	2001	2001	This project consists of approximately 800-feet of toe and slope protection at the Waco sewage treatment plant on the Brazos River.
Middle Brazos River Basin, Texas, Reconnaissance Study	Study completed March, 1999	Feasibility Study completed in 2008.	Study focused on describing the conditions to restore the environment, improve water quality, and control and minimize flood losses.

State Mitigation Programs

The Texas Water Development Board (TWDB) administers the FEMA Flood Mitigation Assistance program (FMA), which provides planning and project grants aimed at reducing the number of structures that have incurred repetitive losses and are insured through the National Flood Insurance Program. FMA Planning grants may be used to develop or update Flood Mitigation Plans. Project grants may be used to mitigate insured structures by activities such as acquiring structures and real property, dry flood proofing, and elevating structures and structure elements. Only activities specified in a FEMA-approved Flood Mitigation Plan are eligible for project grants.

TWDB Flood Protection Planning Grants provide State funds for regional flood protection planning, considering the needs of the entire watershed, including upstream or downstream effects of proposed solutions. Eligible activities under Flood Protection Planning include studies and analyses to identify problems resulting from or relating to flooding; determine views and needs of the affected public; identify potential solutions; estimate benefits and costs of potential solutions, including structural and nonstructural measures; evaluate environmental, social, and cultural factors; and recommend feasible solutions to flooding. There have been no TWDB Grants provided to McLennan County or the participating jurisdictions.

Previous Planning Efforts

Two jurisdictions in McLennan County have received Emergency Management Performance Grants (EMPG) from FEMA. The jurisdictions are McLennan County and the City of Waco. These grants are intended to help develop comprehensive, all-hazards emergency management and improve local capabilities for emergency planning, preparedness, mitigation, response, and recovery. Assistance includes grant funding covering 13 key functional areas, including laws and authorities; hazard identification and risk assessment; hazard management; resource management; planning; direction, control, and coordination; communications and warning; operations and procedures; logistics and facilities; training; exercises; public education and information; and finance and administration.

Other related planning efforts include development of Emergency Operation Plans, Annex P, comprehensive plans, capital improvement plans, drainage and storm water plans, and flood mitigation plans. Table 13-2 details these previous planning efforts by the participating jurisdictions

Table 13-2: Previous Planning Efforts

Jurisdiction	Received EM Grant Funds?	Planning Documents Completed for Texas	Other Plan of Undertake	
		Basic Plan	Annexes**	
McLennan County				
McLennan County	Y	Y	All Annexes	DOJ/DPA
City of Bellmead	N	Y	All Annexes	DOJ/DPA
City of Beverly Hills*	N	Y	All Annexes	
City of Crawford	N	Y	All Annexes	DOJ/DPA
City of Gholson*	N	Y	All Annexes	

Jurisdiction	Received EM Grant Funds?	Planning Documents Completed for Texas Division of Emergency Management		Other Planning Efforts Undertaken (list)
		Basic Plan	Annexes**	
City of Hallsburg*	N	Y	All Annexes	
City of Hewitt	N	Y	All Annexes except for P	FEMA Flood Mitigation Assistance plan Comprehensive plan DOJ/DPA
City of Lacy Lakeview	N	Y	All Annexes	Long-range growth plan Watershed Protection plan Master drainage and stormwater plan Comprehensive plan Capital Improvement plan DOJ/DPA
City of Leroy*	N	Y	All Annexes	DOJ/DPA
City of Lorena	N	Y	All Annexes	Long-range growth plan Master drainage and stormwater plan Comprehensive plan Capital Improvement plan DOJ/DPA
City of Mart	N	Y	All Annexes	
City of McGregor	N	Y	All Annexes	FEMA Flood Mitigation Assistance plan Long-range growth plan Comprehensive plan Capital Improvement plan DOJ/DPA

Jurisdiction	Received EM Grant Funds?	Planning Documents Completed for Texas Division of Emergency Management		Other Planning Efforts Undertaken (list)
		Basic Plan	Annexes**	
City of Robinson*	N	Y	All Annexes	DOJ/DPA
City of Ross	N	Y	All Annexes	DOJ/DPA
City of Waco	Y	Y	All Annexes	DOJ/DPA
City of West	N	Y	All Annexes	FEMA Hazard Mitigation Grant Program plan DOJ/DPA
City of Woodway	N	Y	All Annexes	DOJ/DPA

*Annex A Warning
 Annex B Communications
 Annex C Shelter and Mass Care
 Annex D Radiological Protection
 Annex E Evacuation
 Annex F Firefighting and Fire/Rescue
 Annex G Law Enforcement
 Annex H Health and Medical Services
 Annex I Emergency Public Information
 Annex J Damage Assessment/Recovery
 Annex K Public Works and Engineering
 Annex L Utilities
 Annex M Resource Management
 Annex N Direction and Control
 Annex O Human Services
 Annex P Hazard Mitigation
 Annex Q Hazardous Materials and Oil Spill Response
 Annex R Search and Rescue
 Annex S Transport
 Annex T Donations
 Annex U Legal
 Annex V Terrorist Incident

Building and Fire Codes

Building codes are laws, ordinances, or government regulations that set forth standards and requirements for the construction, maintenance, operation, occupancy, use, or appearance of buildings, premises, and dwelling units. Building codes are an effective way to ensure that development is built to withstand natural hazards. Building codes apply primarily to new construction.

Adherence to existing building codes and standards is essential to maintain public safety and promote an effective local mitigation program—so much so that the insurance industry has moved to rate communities according to their ability to enforce the building code and by the qualifications and training of their staff.

There are four principal types of building codes, promulgated by various code organizations:

- Uniform Building Code, promulgated by the International Conference of Building Officials (ICBO),
- National Building Code, promulgated by the Building Officials and Code Administrators International, Inc. (BOCA),
- Standard Building Code, promulgated by the Southern Building Code Congress, International (SBCCI), and
- International Building Codes, promulgated by the International Code Council (ICC).

The building codes are periodically reviewed by the respective organizations and revised, as appropriate, when new requirements and materials are introduced. In the past, local governments have adopted these codes either in their entirety or as amended to adapt them to their local conditions. Legislation passed by the Texas Legislature in 2001, however, now requires communities to adopt the International Building Code.

Table 13-3 shows the effective date of each jurisdiction's building code, the name of the code, the type of code on which it is based, and whether any amendments have been made. Only the cities have the authority to adopt building codes; counties do not have this authority.

Table 13-3: Building Code Information

	Current Building Code							
Jurisdiction	Effective Date ¹	Name	Type					Amend ments made (Y /N)
			UBC	NBC	SBC	IBC	Other	
McLennan County								
McLennan County	NA							
City of Bellmead	March 2013	2012 International Building Code				X		Y
City of Beverly Hills*		2006 International Building Code	-	-	-	X	-	Y
City of Crawford	03-25-97	Standard Building Code, 1994			X			N
City of Gholson*	-	-	-	-	-	-	-	-
City of Hallsburg*	-	-	-	-	-	-	-	-
City of Hewitt		2015 International Building Codes				X		Y
City of Lacy Lakeview		International Building Code 2006				X		N
City of Leroy*	-	-	-	-	-	-	-	-
City of Lorena	02-18-02	International Building Code				X		N

¹ “NA” in this column indicates that the jurisdiction responded but has no building code.

Jurisdiction	Current Building Code							
	Effective Date ¹	Name	Type					Amend ments made (Y /N)
			UBC	NBC	SBC	IB	Other	

City of Mart	05-20-02	2000 Int. Building Code				X		N
City of McGregor	2011	International Building Code 2009 edition				X		Y
City of Robinson*	-	-	-	-	-	-	-	-
City of Ross	NA							
City of Waco	July 2016	International Building Code 2015 edition				X		Y
City of West	May 2013	IBC Building Code 2012 edition						
City of Woodway		International Building Code 2003 edition				X		N

FIRE CODES

Fire codes are laws, ordinances, or government regulations that set forth standards and requirements for the construction, maintenance, operation, occupancy, use, or appearance of buildings, premises, and dwelling units in order to prevent damage and loss of life from fire hazards.

There are three principal types of fire codes, promulgated by various code organizations. They are:

- Uniform Fire Code (UFC), published by the International Fire Code Institute,
- International Fire Code (IFC), published by the International Code Council, and
- Standard Fire Code (SFC), published by the SBCC.

The fire codes are periodically reviewed and revised by the relevant organizations, as appropriate, when new requirements and materials are introduced. Local governments have adopted these codes either in their entirety or amended them as appropriate to their local conditions.

Table 13-4 shows the effective date of each jurisdiction's fire code, the name of the code, the type of code on which it is based, and whether any amendments have been made.

Table 13-4: Fire Code Information

Jurisdiction	Current Fire Code					
	Effective	Name	Type			
			UFC	IF	SFC	Other
McLennan County						
McLennan County	NA					
City of Bellmead	February 2006	2003 International Fire Code		X		
City of Beverly Hills*	April 2010	2009 International Fire Code	-	X	-	-
City of Crawford	03-25-97	Standard Fire Prevention Code, 1994			X	
City of Gholson*	-	-	-	-	-	-
City of Hallsburg*	-	-	-	-	-	-
City of Hewitt	July 2007	International Fire Code 2006 edition		X		
City of Lacy Lakeview	2000	International Fire Code		X		
City of Leroy*	-	-	-	-	-	-
City of Lorena	-	International Fire Code 2006 edition		X		
City of Mart	05-07-02	2000 International Fire Code		X		

² “NA” in this column indicates that the jurisdiction responded but has no fire code.

Jurisdiction	Current Fire Code					
	Effective	Name	Type			
			UFC	IF	SFC	Other
City of McGregor	-	-			X	
City of Robinson*	-	-	-	-	-	-
City of Ross	NA					

City of Waco	August 2016	International Fire Code, 2015 edition		X		
City of West	August 2016	International Fire Code, 2015 edition				
City of Woodway	March 2008	2003 International Fire Code		X		

Floodplain Management Ordinances

Table 13-5 below describes the floodplain management ordinances currently in use in McLennan County and participating jurisdictions. Each jurisdiction has designated floodplain manager.

Table 13-5: Floodplain Management Ordinances in McLennan County

	Current Flood Ordinance	
	Effective	Description
Jurisdiction		
McLennan County		

	Current Flood Ordinance	
	Effective	Description
Jurisdiction		
McLennan County	Sept. 23, 2008	County Engineer floodplain manager. Permit required for all new work or revisions of structures in the identified flood hazard area.
City of Bellmead	2008	Permit required for all new work or revisions of structures in the identified flood hazard area.
City of Beverly Hills	2008	Permit required for all new work or revisions of structures in the identified flood hazard area.
City of Crawford	2008	Permit required for all new work or revisions of structures in the identified flood hazard area.
City of Gholson	2008	Permit required for all new work or revisions of structures in the identified flood hazard area.
City of Hallsburg	2008	Permit required for all new work or revisions of structures in the identified flood hazard area.
City of Hewitt	2008	Permit required for all new work or revisions of structures in the identified flood hazard area.
City of Lacy Lakeview	2008	Permit required for all new work or revisions of structures in the identified flood hazard area.
City of Leroy	2008	Permit required for all new work or revisions of structures in the identified flood hazard area.
City of Lorena	2008	Permit required for all new work or revisions of structures in the identified flood hazard area.
City of Mart	2008	Permit required for all new work or revisions of structures in the identified flood hazard area.
City of McGregor	2008	Site plan review – If a building is to be constructed in the floodplain, the Engineer’s drawings are required. Otherwise, the permit will not be issued.

	Current Flood Ordinance	
	Effective	Description
Jurisdiction		
City of Robinson	2008	Permit required for all new work or revisions of structures in the identified flood hazard area.
City of Ross	2008	Permit required for all new work or revisions of structures in the identified flood hazard area.
City of Waco	Sept. 23, 2008	The permitting process goes through Inspection Services. City staff member is the local floodplain manager. Permit required for all new work or revisions of structures in the identified flood hazard area.
City of West	2013	Permit required for all new work or revisions of structures in the identified flood hazard area. Updated in 2013.
City of Woodway	2008	Permit required for all new work or revisions of structures in the identified flood hazard area.

FEMA Community Assistance Program Involvement

The Federal Emergency Management Agency's Community Assistance Program (CAP) is a product-oriented financial assistance program directly related to the flood loss reduction objectives of the National Flood Insurance Program (NFIP). States and communities that are participating in the NFIP are eligible for this assistance. The CAP is intended to identify, prevent, and resolve floodplain management issues in participating communities before they develop into problems requiring enforcement action. The program involves Community Assistance Contacts (CACs) and Community Assistance Visits (CAVs). During CACs and CAVs, officials discuss current local ordinances, the number of floodplain insurance policies in the community, floodplain administration, permitting, and annexation issues.

Expanding and Improving Codes, Policies, and Programs

All of the cities have the ability to expand and improve codes, policies, and programs based on recommendations or possible complaints from other city departments as well as citizens. This is a reactive approach and they are also proactive by keeping up to date with current trends. For example, regarding floodplain codes, the county is working with both FEMA and USACE to update maps to include watershed information. For the purposes of this plan, "the county" refers to all of the participating jurisdictions. Some other examples include the emergency action plan for the Waco Lake Dam. All of the participating jurisdictions have ordinances in regarding at least one of the various storm water, land use, fire prevention, emergency management,

building regulations, substandard buildings, and or flood damage. These have been reviewed and incorporated into this plan. Both the County and the city (Waco's ETJ) require developers of larger platted subdivisions to do a pre-development and post-development flood studies for areas within the SFHA (SFHA) to ensure no increase in flooding occurs. The county does have some control as they regulate to a greater extent then what FEMA requires, which decreases the vulnerability.

SECTION FOURTEEN: MITIGATION ACTIONS

The following mitigation actions are ideas proposed by McLennan County and the participating jurisdictions to attempt to mitigate the known hazards that can have negative effects on the county and participating jurisdictions. For the purposes of this plan, “the county” refers to all of the participating jurisdictions.

Each mitigation action table includes a description of the action, the estimated costs (if available), and the benefits derived if the project is ever funded and completed. Each table also includes the responsible organization for completing the action, an implementation schedule, objective(s) to which it is to achieve, the priority status of each action, and the potential funding sources.

McLennan County and the participating jurisdictions will seek to obtain the necessary funding to implement the mitigation actions set forth when possible.

However, in this era of increased demands and constrained resources at all levels of government, the lack of resources, especially from external sources, may hamper the ability of the jurisdictions to implement some mitigation actions identified in the plan or to implement them within the timeframe specified.

Since mitigation grants generally do not pay for 100% of the necessary funds to complete the action, each participating jurisdiction will consider economic factors before deciding whether or not to apply for any of these grants.

Members of the Hazard Mitigation Team looked at the status of mitigation actions from the 2013 plan in order to plan for the mitigation actions of the 2018 plan. There was a county EMC meeting held on March 13, 2018 which led to a discussion of the plan and mitigation actions items. Each representative also received an email to check on the status of projects from the 2013 plan. Actions that were not completed in 2013 were carried over to the 2018 plan because the team felt the projects were still of value. Each member used a structured process was used to develop, prioritize and include the mitigation actions for this plan. Projects that were carried over have been noted.

McLennan County Mitigation Action Items

McLennan County	
ACTION: Per the National Flood Insurance Program (NFIP) continued compliance, acquire homes located in the identified flood hazard area	
Hazard	Floods
Background	Portions of McLennan County can be vulnerable to flooding after severe thunderstorms based on previous occurrences. Some older structures were built in the identified flood hazard area.
Benefits	By permanently removing these older buildings in the flood hazard area, this will help to decrease the potential damages.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$100,000 per structure
Responsible organization	McLennan County , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried over from 2013 plan?	Yes
Other Information	Project carried over from 2013 plan due to lack of funding.

McLennan County	
ACTION: Per NFIP continued compliance, elevate homes located in the identified flood hazard area	
Hazard	Floods
Background	Portions of McLennan County can be vulnerable to flooding. Some older structures were built in the identified flood hazard area with their first floor below Base Flood Elevation (BFE).
Benefits	Buildings will be elevated permanently above the BFE in the identified flood hazard area, thus preventing future damages due to floods.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$80,000 per structure
Responsible organization	McLennan County , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried over from 2013 plan?	Yes
Other Information	Project carried over from 2013 due to lack of funding.

McLennan County	
ACTION: Encourage preventive measures to reduce stormwater runoff	
Hazard	Floods
Background	Stormwater runoff has a large impact on the flooding in the area. There are many ways to help the runoff from use of porous pavement, vegetative buffers, and etc. to help decrease urban flooding potential.
Benefits	By encouraging and education the public on the benefits of mitigation actions like porous pavement, vegetative buffers, and etc., there is a chance to decrease urban flooding. This will encourage the whole community approach.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	Free
Responsible organization	McLennan County , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2020
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	No
Other Information	This is a new project for the 2018 update

McLennan County	
ACTION: Acquire homes located in the identified flood hazard area downstream of Lake Waco Dam	
Hazard	Dam Failure
Background	Portions of McLennan County downstream of Lake Waco can be vulnerable to flooding. Some older structures were built in the identified flood hazard area.
Benefits	Buildings will be removed permanently from the identified flood hazard area, thus preventing future damages due to floods.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$100,000 per structure
Responsible organization	McLennan County , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over from 2013 due to lack of funding.

McLennan County	
ACTION: Prevent any new structures from being located in the identified flood hazard area downstream of Lake Waco Dam	
Hazard	Dam Failure
Background	Portions of McLennan County downstream of Lake Waco can be vulnerable to flooding and would be impacted by a dam failure event.
Benefits	New buildings and structures will not be allowed to be built downstream of Lake Waco in the identified flood hazard area by amending the local floodplain ordinance.
New or Existing Structures?	New structures
Priority	Medium
Estimated cost	No cost
Responsible organization	McLennan County , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	No costs
Carried over?	Yes
Other Information	Project carried over from 2013 due to new floodplain maps being developed in order to create more accurate ordinances.

McLennan County	
ACTION: Build a dual-use community safe room	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community does not have many reinforced structures that can protect the citizens from severe storm events.
Benefits	A reinforced building for residents to go during severe storm events can save lives.
New or Existing Structures?	New structures
Priority	Medium
Estimated cost	\$1.6,000,000
Responsible organization	McLennan County , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over from the 2013 plan due to lack of funding.

McLennan County	
ACTION: Individual Safe Room Program	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	Local residents may place individual safe rooms inside their existing or new home for protection from severe storm events.
Benefits	Safe rooms provide a place for people to go to during a disaster and decrease potential injuries.
New or Existing Structures?	New
Priority	Medium
Estimated cost	\$5,000 for each individual safe room
Responsible organization	McLennan County , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over from 2013 due to lack of staff to manage the project.

McLennan County	
ACTION: Burn Bans	
Hazard	Wildfire
Background	Create and Implement an ordinance that would ban the burning of outdoor brush during periods of drought or other wildfire favorable conditions.
Benefits	Prevention of wildfires can save lives and prevent property damage.
New or Existing Structures?	Existing structures
Priority	Medium

Estimated cost	No cost
Responsible organization	McLennan County , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over as burn bans are implemented on a case by case basis based on drought conditions.

McLennan County	
ACTION: Community Outreach & Education	
Hazard	Wildfire
Background	The community can educate citizens on the dangers of wildfires and how to preserve a Wildland/Urban Interface around their homes.
Benefits	Educating residents on how to protect their homes against wildfires can save lives.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	McLennan County , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding Source	Local Funds
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to changing population and need to continue education for new residents.

McLennan County	
ACTION: Ordinance	
Hazard	Drought
Background	Multiple cities throughout the United States have implemented the following ordinance- No Outside Watering from 10 am to 6 pm between May 1 and October 31 of each year.
Benefits	This reduces water usage as during this time it takes more water to irrigate during the heat of the day and this is the hottest time of the year.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	McLennan County , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	Local funds
Carried Over?	No
Other Information	This is a new project for the 2018 Hazard Mitigation plan update.

McLennan County	
ACTION: Posting warning signage about hail at local parks and other outdoor venue	
Hazard	Hail
Background	Hail is a threat especially when people are outside.
Benefits	By posting signage in public areas, this educates residents on the dangers of hail when in outdoor spaces.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$1,000
Responsible organization	McLennan County , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	Local funds
Carried Over?	No
Other Information	This is a new project for the 2018 update

McLennan County	
ACTION: Increase underground water storage	
Hazard	Wildfire, Drought, and flooding
Background	Drought can create a shortage of available water for general public use and for fighting wildfires.
Benefits	By increasing underground reservoirs, this not only provides a way to get rid of extra surface water to decrease chance of flooding but also provides a source during a drought and fighting wildfires.
New or Existing Structures?	New Structures
Priority	Medium
Estimated cost	\$6,000,000

Responsible organization	McLennan County , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	Local Funds
Carried Over?	No
Other Information	This is a new project for the 2018 update

McLennan County	
ACTION: Community Outreach & Education	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community can educate citizens on the dangers of severe storm events and how to take cover in their own homes.
Benefits	Educating residents on where to go during severe storm events can save lives.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$800
Responsible organization	McLennan County , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2019
Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to changing population and need to continue education for new residents.

McLennan County	
ACTION: Build structures such as bridges, culverts, or low water crossing.	
Hazard	Flood
Background	These barriers can serve multiple purposes besides helping to mitigate members of the community from driving into flooded areas as well as allowing first responders access to areas they may not have during times of floods.
Benefits	Help prevent members of the community from driving into flooded areas as well as aiding with first responder pathways.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$100,000
Responsible organization	McLennan County , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	This is a new project for the 2018 plan

McLennan County	
ACTION: Community Outreach & Education	
Hazard	Drought
Background	The community can educate citizens on the dangers of severe storm events and how to take cover in their own homes.
Benefits	Educating residents on where to go during severe storm events can save lives.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$800
Responsible organization	McLennan County , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2019
Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to changing population and need to continue education for new residents.

City of Bellmead Mitigation Action Items

Bellmead	
ACTION: Per the National Flood Insurance Program (NFIP) continued compliance, acquire homes located in the identified flood hazard area	
Hazard	Floods
Background	Portions of Bellmead can be vulnerable to flooding. Some older structures were built in the identified flood hazard area.
Benefits	By permanently removing these older buildings in the flood hazard area, this will help to decrease the potential damages.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$100,000 per structure
Responsible organization	Bellmead , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to lack of funding

Bellmead	
ACTION: Per NFIP continued compliance, elevate homes located in the identified flood hazard area	
Hazard	Floods
Background	Portions of Bellmead can be vulnerable to flooding. Some older structures were built in the identified flood hazard area with their first floor below Base Flood Elevation (BFE).
Benefits	Buildings will be elevated permanently above the BFE in the identified flood hazard area, thus preventing future damages due to floods.

New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$80,000 per structure
Responsible organization	Bellmead , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over due to lack of funding

Bellmead	
ACTION: Encourage preventive measures to reduce stormwater runoff	
Hazard	Floods
Background	Stormwater runoff has a large impact on the flooding in the area. There are many ways to help the runoff from use of porous pavement, vegetative buffers, and etc. to help decrease urban flooding potential.
Benefits	By encouraging and education the public on the benefits of mitigation actions like porous pavement, vegetative buffers, and etc., there is a chance to decrease urban flooding. This will encourage the whole community approach.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$500
Responsible organization	Bellmead , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2020
Funding sources	No cost
Carried Over?	No

Other Information	This is a new project for the 2018 update.
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Bellmead	
ACTION: Build a dual-use community safe room	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community does not have many reinforced structures that can protect the citizens from severe storm events.
Benefits	A reinforced building for residents to go during severe storm events can save lives.
New or Existing Structures?	New structures
Priority	Medium
Estimated cost	\$1.6,000,000
Responsible organization	Bellmead , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over due to lack of funding.

Bellmead	
ACTION: Individual Safe Room Program	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	Local residents may place individual safe rooms inside their existing or new home for protection from severe storm events.
Benefits	A reinforced building within their own home for residents to go during severe storm events can save lives.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	\$2,500 for each individual safe room
Responsible organization	Bellmead , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to lack of staff to manage the project.

Bellmead	
ACTION: Burn Bans	
Hazard	Wildfire
Background	Create and Implement an ordinance that would ban the burning of outdoor brush during periods of drought or other wildfire favorable conditions.
Benefits	Prevention of wildfires can save lives and prevent property damage.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Bellmead , Office of Emergency Management, Emergency Management Coordinator

Target completion date	Complete
Funding sources	No Cost required
Carried Over?	No
Other Information	Ordinance in place on burn bans

Bellmead	
ACTION: Community Outreach & Education	
Hazard	Wildfire
Background	The community can educate citizens on the dangers of wildfires and how to preserve a Wildland/Urban Interface around their homes.
Benefits	Educating residents on how to protect their homes against wildfires can save lives and help to reduce damages.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Bellmead , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	No Cost required

Bellmead	
ACTION: Community Outreach & Education	
Hazard	Drought
Background	The community can educate citizens on the dangers of drought and how to conserve water around the home.
Benefits	Educating residents on how to save water can help conserve local water supplies for drinking or fighting wildfires.
New or Existing Structures?	Existing and new structures
Priority	Medium

Estimated cost	\$200
Responsible organization	Bellmead , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2020
Funding sources	Local funds

Bellmead	
ACTION: Increase underground water storage	
Hazard	Wildfire, Drought, and flooding
Background	Drought can create a shortage of available water for general public use and for fighting wildfires.
Benefits	By increasing underground reservoirs, this not only provides a way to get rid of extra surface water to decrease chance of flooding but also provides a source during a drought and wildfire.
New or Existing Structures?	New Structures
Priority	Medium
Estimated cost	\$6,000,000
Responsible organization	Bellmead , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	Local Funds

Bellmead	
ACTION: Community Outreach & Education	
Hazard	Drought
Background	The community can educate citizens on the dangers of drought and how to conserve water around the home.
Benefits	Educating residents on how to save water can help conserve local water supplies for drinking or fighting wildfires.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Bellmead , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over due to population changing and need to continuously educate residents.

Bellmead	
ACTION: Posting warning signage about Hail at local parks and other outdoor venue	
Hazard	Hail
Background	Hail is a threat especially when people are outside.
Benefits	By posting signage in public areas, this educates residents on the dangers of hail when in outdoor spaces.
New or Existing Structures?	Existing structures
Priority	Low
Estimated cost	\$1,000

Responsible organization	Bellmead , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	No cost
Carried Over?	No
Other Information	This is a new project for the 2018 plan

Bellmead	
ACTION: Community Outreach & Education	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community can educate citizens on the dangers of severe storm events and how to take cover in their own homes.
Benefits	Educating residents on where to go during severe storm events can save lives.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$800
Responsible organization	Bellmead , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2020
Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to changing population and need to continuously educate residents.

Bellmead	
ACTION: Ordinance	
Hazard	Drought
Background	Multiple cities throughout the United States have implemented the following ordinance- No Outside Watering from 10 am to 6 pm between May 1 and October 31 of each year.
Benefits	This reduces water usage as during this time it takes more water to irrigate during the heat of the day and this is the hottest time of the year.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Bellmead , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	Local funds
Carried Over?	No
Other Information	This is a new project for the 2018 Hazard Mitigation plan update.

City of Beverly Hills Mitigation Action Items

Beverly Hills	
ACTION: Per the National Flood Insurance Program (NFIP) continued compliance, acquire homes located in the identified flood hazard area	
Hazard	Floods
Background	Portions of Beverly Hills can be vulnerable to flooding. Some older structures were built in the identified flood hazard area.
Benefits	By permanently removing these older buildings in the flood hazard area, this will help to decrease the potential damages.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$100,000 per structure
Responsible organization	City of Beverly Hills, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Other Information	Project carried over from 2013 plan
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to lack of funding.

Beverly Hills	
ACTION: Per NFIP continued compliance, elevate homes located in the identified flood hazard area	
Hazard	Floods
Background	Portions of Beverly Hills can be vulnerable to flooding. Some older structures were built in the identified flood hazard area with their first floor below Base Flood Elevation (BFE).

Benefits	Buildings will be elevated permanently above the BFE in the identified flood hazard area, thus preventing future damages due to floods.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$80,000 per structure
Responsible organization	City of Beverly Hills, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Other Information	Project carried over from 2013 plan
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to lack of funding.

Beverly Hills	
ACTION: Encourage preventive measures to reduce stormwater runoff	
Hazard	Floods
Background	Stormwater runoff has a large impact on the flooding in the area. There are many ways to help the runoff from use of porous pavement, vegetative buffers, and etc. to help decrease urban flooding potential.
Benefits	By encouraging and education the public on the benefits of mitigation actions like porous pavement, vegetative buffers, and etc., there is a chance to decrease urban flooding. This will encourage the whole community approach.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	\$0
Responsible organization	Beverly Hills , Office of Emergency Management, Emergency Management Coordinator

Target completion date	Ongoing
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	No
Other Information	This is a new project for the 2018 update.

Beverly Hills	
ACTION: Build a dual-use community safe room	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community does not have many reinforced structures that can protect the citizens from severe storm events.
Benefits	A reinforced building for residents to go during severe storm events can save lives.
New or Existing Structures?	New structures
Priority	Medium
Estimated cost	\$1.6,000,000
Responsible organization	Beverly Hills , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Other Information	Project carried over from 2013 plan
Carried Over?	Yes

Other Information	Project carried over from 2013 plan due to lack of funding.
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Beverly Hills	
ACTION: Individual Safe Room Program	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	Local residents may place individual safe rooms inside their existing or new home for protection from severe storm events.
Benefits	A reinforced building within their own home for residents to go during severe storm events can save lives.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	\$2,500 for each individual safe room
Responsible organization	Beverly Hills , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to lack of funding.

Beverly Hills	
ACTION: Burn Bans	
Hazard	Wildfire
Background	Create and Implement an ordinance that would ban the burning of outdoor brush during periods of drought or other wildfire favorable conditions.
Benefits	Prevention of wildfires can save lives and prevent property damage.
New or Existing Structures?	New and Existing structures

Priority	Medium
Estimated cost	No cost
Responsible organization	Beverly Hills , Office of Emergency Management, Emergency Management Coordinator
Target completion date	Ongoing
Funding sources	No cost
Carried Over?	Yes
Other Information	Project carried over from 2013 plan as the burn ban is implemented on a case by case basis depending on weather conditions,

Beverly Hills	
ACTION: Increase underground water storage	
Hazard	Wildfire, Drought, and flooding
Background	Drought can create a shortage of available water for general public use and for fighting wildfires.
Benefits	By increasing underground reservoirs, this not only provides a way to get rid of extra surface water to decrease chance of flooding but also provides a source during a drought or during a wildfire.
New or Existing Structures?	New Structures
Priority	Medium
Estimated cost	\$6,000,000
Responsible organization	Beverly Hills , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants, Local Funds
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to lack of funding.

Beverly Hills	
ACTION: Community Outreach & Education	
Hazard	Drought
Background	The community can educate citizens on the dangers of drought and how to conserve water around the home.
Benefits	Educating residents on how to save water can help conserve local water supplies for drinking or fighting wildfires.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$300
Responsible organization	Beverly Hills , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to lack of funding.

Beverly Hills	
ACTION: Posting warning signage about Hail at local parks and other outdoor venue	
Hazard	Hail
Background	Hail is a threat especially when people are outside.
Benefits	By posting signage in public areas, this educates residents on the dangers of hail when in outdoor spaces.
New or Existing Structures?	Existing structures
Priority	Low

Estimated cost	\$1,000
Responsible organization	Beverly Hills , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	No cost
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to lack of funding.

Beverly Hills	
ACTION: Community Outreach & Education	
Hazard	Wildfire
Background	The community can educate citizens on the dangers of wildfires and how to preserve a Wildland/Urban Interface around their homes.
Benefits	Educating residents on how to protect their homes against wildfires can save lives and help to reduce damages.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Beverly Hills , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	No Cost required
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to lack of funding.

Beverly Hills	
ACTION: Community Outreach & Education	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community can educate citizens on the dangers of severe storm events and how to take cover in their own homes.
Benefits	Educating residents on where to go during severe storm events can save lives.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$800
Responsible organization	Beverly Hills , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2019
Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to lack of funding.

Beverly Hills	
ACTION: Ordinance	
Hazard	Drought
Background	Multiple cities throughout the United States have implemented the following ordinance- No Outside Watering from 10 am to 6 pm between May 1 and October 31 of each year.
Benefits	This reduces water usage as during this time it takes more water to irrigate during the heat of the day and this is the hottest time of the year.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Beverly Hills , Office of Emergency Management, Emergency Management Coordinator

Target completion date	2023
Funding sources	Local funds
Carried Over?	No
Other Information	This is a new project for the 2018 Hazard Mitigation plan update.

City of Crawford Mitigation Action Items

Crawford	
ACTION: Per NFIP continued compliance, acquire homes located in the identified flood hazard area	
Hazard	Floods
Background	Portions of Crawford can be vulnerable to flooding. Some older structures were built in the identified flood hazard area.
Benefits	By permanently removing these older buildings in the flood hazard area, this will help to decrease the potential damages.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$100,000 per structure
Responsible organization	Crawford Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to lack of funding.

Crawford	
ACTION: Elevate homes located in the identified flood hazard area	
Hazard	Floods
Background	Portions of Crawford can be vulnerable to flooding. Some older structures were built in the identified flood hazard area with their first floor below Base Flood Elevation (BFE).
Benefits	Buildings will be elevated permanently above the BFE in the identified flood hazard area, thus preventing future damages due to floods.
New or Existing Structures?	Existing structures

Priority	Medium
Estimated cost	\$80,000 per structure
Responsible organization	Crawford, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to lack of funding.

Crawford	
ACTION: Encourage preventive measures to reduce stormwater runoff	
Hazard	Floods
Background	Stormwater runoff has a large impact on the flooding in the area. There are many ways to help the runoff from use of porous pavement, vegetative buffers, and etc. to help decrease urban flooding potential.
Benefits	By encouraging and education the public on the benefits of mitigation actions like porous pavement, vegetative buffers, and etc., there is a chance to decrease urban flooding. This will encourage the whole
New or Existing Structures?	New and existing structures
Priority	Medium
Estimated cost	\$0
Responsible organization	Crawford, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to lack of funding.

Crawford	
ACTION: Build a dual-use community safe room.	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community does not have many reinforced structures that can protect the citizens from severe storm events.
Benefits	Safe rooms provide places for people to go to during a disaster and decrease potential injuries.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	\$1.6,000,000
Responsible organization	Crawford, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to lack of funding.

Crawford	
ACTION: Individual Safe Room Program	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	Local residents may place individual safe rooms inside their existing or new home for protection from severe storm events.
Benefits	A reinforced building within their own home for residents to go during severe storm events can save lives.
New or Existing Structures?	New and Existing structures
Priority	Medium

Estimated cost	\$2,500 for each individual safe room
Responsible organization	Crawford, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to lack of funding.

Crawford	
ACTION: Community Outreach & Education	
Hazard	Wildfire
Background	The community can educate citizens on the dangers of wildfires and how to preserve a Wildland/Urban Interface around their homes.
Benefits	Educating residents on how to protect their homes against wildfires can save lives and help to reduce damages.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Crawford, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	\$500
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to lack of funding.

Crawford	
ACTION: Burn Bans	

Hazard	Wildfire
Background	Create and implement an ordinance that would ban the burning of outdoor brush during periods of drought or other wildfire favorable conditions.
Benefits	Prevention of wildfires can save lives and prevent property damage.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Crawford, Office of Emergency Management, Emergency Management Coordinator
Target completion date	Ongoing
Funding sources	No Cost required
Carried Over?	Yes
Other Information	Project carried over as burn ban is implemented on a case by case basis due to constantly changing conditions.

Crawford	
ACTION: Increase underground water storage	
Hazard	Wildfire, Drought, and flooding
Background	Drought can create a shortage of available water for general public use and for fighting wildfires.
Benefits	By increasing underground reservoirs, this not only provides a way to get rid of extra surface water to decrease chance of flooding but also provides a source during a drought.
New or Existing Structures?	New Structures
Priority	Medium
Estimated cost	\$6,000,000
Responsible organization	Crawford, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022

Funding sources	Local Funds
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to lack of funding.

Crawford	
ACTION: Community Outreach & Education	
Hazard	Drought
Background	The community can educate citizens on the dangers of drought and how to conserve water around the home.
Benefits	Educating residents on how to save water can help conserve local water supplies for drinking or fighting wildfires.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Crawford, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to lack of funding.

Crawford	
ACTION: Posting warning signage about hail at local parks and other outdoor venue	
Hazard	Hail
Background	Hail is a threat especially when people are outside.
Benefits	By posting signage in public areas, this educates residents on the dangers of hail when in outdoor spaces.
New or Existing Structures?	Existing structures
Priority	Low
Estimated cost	\$1,000
Responsible organization	Crawford Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program
Carried Over?	No
Other Information	This is a new project for the 2018 plan.

Crawford	
ACTION: Community Outreach & Education	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community can educate citizens on the dangers of severe storm events and how to take cover in their own homes.
Benefits	Educating residents on where to go during severe storm events can save lives.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$800
Responsible organization	Crawford Office of Emergency Management, Emergency Management Coordinator

Target completion date	2019
Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to lack of funding.

Crawford	
ACTION: Ordinance	
Hazard	Drought
Background	Multiple cities throughout the United States have implemented the following ordinance- No Outside Watering from 10 am to 6 pm between May 1 and October 31 of each year.
Benefits	This reduces water usage as during this time it takes more water to irrigate during the heat of the day and this is the hottest time of the year.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Crawford , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	Local funds
Carried Over?	No
Other Information	This is a new project for the 2018 Hazard Mitigation plan update.

City of Gholson Mitigation Action Items

Gholson	
ACTION: Acquire homes located in the identified flood hazard area	
Hazard	Floods
Background	Portions of Gholson can be vulnerable to flooding after severe thunderstorms based on previous occurrences. Some older structures were built in the identified flood hazard area.
Benefits	By permanently removing these older buildings in the flood hazard area, this will help to decrease the potential damages.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$100,000 per structure
Responsible organization	Gholson Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Other Information	Project carried over from 2013 due to lack of funding

Gholson	
ACTION: Per NFIP continued compliance, elevate homes located in the identified flood hazard area	
Hazard	Floods
Background	Portions of Robinson can be vulnerable to flooding. Some older structures were built in the identified flood hazard area with their first floor below Base Flood Elevation (BFE).
Benefits	Buildings will be elevated permanently above the BFE in the identified flood hazard area, thus preventing future damages due to floods.
New or Existing Structures?	Existing structures

Priority	Medium
Estimated cost	\$80,000 per structure
Responsible organization	Gholson Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Other Information	Project carried over due to lack of funding

Gholson	
ACTION: Encourage preventive measures to reduce stormwater runoff	
Hazard	Floods
Background	Some older structures were built in the identified flood hazard area with their first floor below Base Flood Elevation (BFE).
Benefits	By encouraging and education the public on the benefits of mitigation actions like porous pavement, vegetative buffers, and etc., there is a chance to decrease urban flooding. This will encourage the whole community approach.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	Free
Responsible organization	Gholson Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Other Information	New project for 2018 plan

Gholson	
ACTION: Community Outreach & Education	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community can educate citizens on the dangers of severe storm events and how to take cover in their own homes.
Benefits	Educating residents on where to go during severe storm events can save lives.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$800
Responsible organization	Gholson Office of Emergency Management, Emergency Management Coordinator
Target completion date	2019
Funding sources	Local funds
Other Information	Project carried over from 2013 plan due to changing population and need to increase educational outreach

Gholson	
ACTION: Build a dual-use community safe room	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community does not have many reinforced structures that can protect the citizens from severe storm events.
Benefits	A reinforced building for residents to go during severe storm events can save lives.
New or Existing Structures?	New structures
Priority	Medium
Estimated cost	\$1.6,000,000
Responsible organization	Gholson, Office of Emergency Management, Emergency Management Coordinator

Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Other Information	Project carried over from 2013 plan due to lack of funding

Gholson	
ACTION: Individual Safe Room Program	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	Local residents may place individual safe rooms inside their existing or new home for protection from severe storm events.
Benefits	A reinforced area within their own home for residents to go during severe storm events can save lives.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	\$2,500 for each individual safe room
Responsible organization	Gholson, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Other Information	Project carried over from 2013 plan due to increasing population and wanting to expand the program

Gholson	
ACTION: Burn Bans	
Hazard	Wildfire
Background	Create and implement an ordinance that would ban the burning of outdoor brush during periods of drought or other wildfire favorable conditions.

Benefits	Prevention of wildfires can save lives and or prevent property damage.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Gholson, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2020
Funding sources	No Cost required
Other Information	Project carried over from 2013 plan due to the burn ban will be implemented on a case by case basis

Gholson	
ACTION: Community Outreach & Education	
Hazard	Wildfire
Background	The community can educate citizens on the dangers of wildfires and how to preserve a Wildland/Urban Interface around their homes.
Benefits	Educating residents on how to protect their homes against wildfires can save lives.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Gholson , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding Source	Local funds
Other Information	Project carried over from 2013 plan dye to increasing population

Gholson	
ACTION: Increase underground water storage	
Hazard	Wildfire, Drought, and flooding
Background	Drought can create a shortage of available water for general public use and for fighting wildfires.
Benefits	By increasing underground reservoirs, this not only provides a way to get rid of extra surface water to decrease chance of flooding but also provides a source during a drought.
New or Existing Structures?	New Structures
Priority	Medium
Estimated cost	\$6,000,000
Responsible organization	Gholson , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	Local Funds
Other Information	New project for 2018 plan

Gholson	
ACTION: Community Outreach & Education	
Hazard	Drought
Background	The community can educate citizens on the dangers of drought and how to conserve water around the home.
Benefits	Educating residents on how to save water can help conserve local water supplies for drinking or fighting wildfires.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Gholson, Office of Emergency Management, Emergency Management Coordinator

Target completion date	2023
Funding sources	Local funds
Other Information	Project carried over from 2013 plan due to increasing and ever changing population

Gholson	
ACTION: Developing new water supplies	
Hazard	Drought
Background	Drought can create a shortage of available water for general public use and for fighting wildfires.
Benefits	Developing new water supplies, such as drilling new water wells, means that additional water supplies are available during periods of severe drought.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$500
Responsible organization	Gholson , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2017
Funding sources	Local Funds
Other Information	New project for 2018 plan

Gholson	
ACTION: Posting warning signage about hail at local parks and other outdoor venue	
Hazard	Hail
Background	Hail is a threat especially when people are outside.
Benefits	By posting signage in public areas, this educates residents on the dangers of hail when in outdoor spaces.
New or Existing Structures?	Existing structures

Priority	Medium
Estimated cost	\$1,000
Responsible organization	Gholson, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	No cost
Other Information	New project for 2018 plan

Gholson	
ACTION: Ordinance	
Hazard	Drought
Background	Multiple cities throughout the United States have implemented the following ordinance- No Outside Watering from 10 am to 6 pm between May 1 and October 31 of each year.
Benefits	This reduces water usage as during this time it takes more water to irrigate during the heat of the day and this is the hottest time of the year.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Gholson , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	Local funds
Carried Over?	No
Other Information	This is a new project for the 2018 Hazard Mitigation plan update.

City of Hallsburg Mitigation Action Items

Hallsburg	
ACTION: Acquire homes located in the identified flood hazard area	
Hazard	Floods
Background	Portions of Hallsburg were built in the identified flood hazard area. These buildings run a higher potential flood risk. Given that flooding has a high probability of occurring, these buildings will continue to increase cost damages for future flooding
Benefits	By removing permanently removing these buildings from the identified flood hazard area, it reduces costs to the city, residents, and decreases the potential amount of damage.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$100,000 per structure
Responsible organization	Hallsburg Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over due to lack of funding

Hallsburg	
ACTION: Elevate homes located in the identified flood hazard area	
Hazard	Floods
Background	Portions of Hallsburg can be vulnerable to flooding. Some older structures were built in the identified flood hazard area with their first floor below Base Flood Elevation (BFE). This increases the potential for flood damages.
Benefits	By permanently elevating buildings with first floors below the BFE, this will help to reduce future damages from floods.

New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$80,000 per structure
Responsible organization	Hallsburg, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to lack of funding

Hallsburg	
ACTION: Encourage preventive measures to reduce stormwater runoff	
Hazard	Floods
Background	Stormwater runoff has a large impact on the flooding in the area. There are many ways to help the runoff from use of porous pavement, vegetative buffers, and etc. to help decrease urban flooding potential.
Benefits	By encouraging and education the public on the benefits of mitigation actions like porous pavement, vegetative buffers, and etc., there is a chance to decrease urban flooding. This will encourage the whole community approach.
New or Existing Structures?	New structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Hallsburg, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	No

Other Information	This is a new project for the 2018 update
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Hallsburg	
ACTION: Community Outreach & Education	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community does not have many reinforced structures that can protect the citizens from severe storm events.
Benefits	A reinforced building for residents to go during severe storm events can save lives.
New or Existing Structures?	New structures
Priority	Medium
Estimated cost	\$800,000
Priority	Medium
Estimated cost	\$800
Responsible organization	Hallsburg, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to changing population and need to continuously educate residents.

Hallsburg	
ACTION: Individual Safe Room Program	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	Local residents may place individual safe rooms inside their existing or new home for protection from severe storm events.

Benefits	A reinforced building within their own home for residents to go during severe storm events can reduce potential number of injuries and or loss of life..
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	\$5,000 for each individual safe room
Responsible organization	Hallsburg, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over due to lack of staff to manage the project

Hallsburg	
ACTION: Burn Bans	
Hazard	Wildfire
Background	Create and implement an ordinance that would ban the burning of outdoor brush during periods of drought or other wildfire favorable conditions.
Benefits	Prevention of wildfires can reduce potential number of injuries, loss of life and, and or prevent property damage.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Hallsburg, Office of Emergency Management, Emergency Management Coordinator
Target completion date	Complete

Funding sources	No Cost required
Carried Over?	No
Other Information	Ordinance on burn bans completed

Hallsburg	
ACTION: Increase underground water storage	
Hazard	Wildland fire, Drought, and flooding
Background	Drought can create a shortage of available water for general public use and for fighting wildfires.
Benefits	By increasing underground reservoirs, this not only provides a way to get rid of extra surface water to decrease chance of flooding but also provides a source during a drought. It can also help for fighting wildfires.
New or Existing Structures?	New Structures
Priority	Medium
Estimated cost	\$6,000,000
Responsible organization	Hallsburg, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding Sources	Local Funds
Carried Over?	No
Other Information	New project for 2018 plan

Hallsburg	
ACTION: Community Outreach & Education	
Hazard	Drought

Background	The community can educate citizens on the dangers of drought and how to conserve water around the home.
Benefits	Educating residents on how to save water can help conserve local water supplies for drinking or fighting wildfires.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Hallsburg, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over due to changing population and need to continuously educate residents.

Hallsburg	
ACTION: Posting warning signage about hail at local parks and other outdoor venue	
Hazard	Hail
Background	Hail is a threat especially when people are outside.
Benefits	By posting signage in public areas, this educates residents on the dangers of hail when in outdoor spaces.
New or Existing Structures?	Existing structures
Priority	Low
Estimated cost	\$1,000
Responsible organization	Hallsburg , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	No cost

Carried Over?	No
Other Information	This is a new project for the 2018 update

Hallsburg	
ACTION: Community Outreach & Education	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community can educate citizens on the dangers of severe storm events and how to take cover in their own homes.
Benefits	Educating residents on where to go during severe storm events can save lives.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$800
Responsible organization	Hallsburg , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2019
Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over due to changing population and need to continuously educate residents.

Hallsburg	
ACTION: Ordinance	
Hazard	Drought
Background	Multiple cities throughout the United States have implemented the following ordinance- No Outside Watering from 10 am to 6 pm between May 1 and October 31 of each year.
Benefits	This reduces water usage as during this time it takes more water to irrigate during the heat of the day and this is the hottest time of the year.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Hallsburg , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	Local funds
Carried Over?	No
Other Information	This is a new project for the 2018 Hazard Mitigation plan update.

City of Hewitt Mitigation Action Items

Hewitt	
ACTION: Per NFIP continued compliance, acquire homes located in the identified flood hazard area	
Hazard	Floods
Background	Portions of Hewitt can be vulnerable to flooding. Some older structures were built in the identified flood hazard area.
Benefits	Buildings will be removed permanently from the identified flood hazard area, thus preventing future damages due to floods.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$100,000 per structure
Responsible organization	Hewitt Office of Emergency Management, Emergency Management Coordinator
Target completion date	2018
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Other Information	Project carried over from 2013 due to lack of funding

Hewitt	
ACTION: Per NFIP continued compliance, elevate homes located in the identified flood hazard area	
Hazard	Floods
Background	Portions of Hewitt can be vulnerable to flooding. Some older structures were built in the identified flood hazard area with their first floor below Base Flood Elevation (BFE).
Benefits	Buildings will be elevated permanently above the BFE in the identified flood hazard area, thus preventing future damages due to floods.
New or Existing Structures?	Existing structures
Priority	Medium

Estimated cost	\$80,000 per structure
Responsible organization	Hewitt, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2018
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Other Information	Project carried over from 2013 and should be finished soon.

Hewitt	
ACTION: Encourage preventive measures to reduce stormwater runoff	
Hazard	Floods
Background	Stormwater runoff has a large impact on the flooding in the area. There are many ways to help the runoff from use of porous pavement, vegetative buffers, and etc. to help decrease urban flooding potential.
Benefits	By encouraging and education the public on the benefits of mitigation actions like porous pavement, vegetative buffers, and etc., there is a chance to decrease urban flooding. This will encourage
New or Existing Structures?	New structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Hewitt , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	No cost
Other Information	New project for 2018 plan

Hewitt	
ACTION: Build a dual-use community safe room	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community does not have many reinforced structures that can protect the citizens from severe storm events.
Benefits	A reinforced building for residents to go during severe storm events can save lives.
New or Existing Structures?	New structures
Priority	Medium
Estimated cost	\$1.6,000,000
Responsible organization	Hewitt, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over due to lack of funding.

Hewitt	
ACTION: Individual Safe Room Program	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	Local residents may place individual safe rooms inside their existing or new home for protection from severe storm events.
Benefits	A reinforced building within their own home for residents to go during severe storm events can save lives.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	\$2,500 for each individual safe room

Responsible organization	Hewitt, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over due to lack of funding

Hewitt	
ACTION: Amend local floodplain ordinance to require 24 inches of freeboard	
Hazard	Floods
Background	Currently new structures built in the floodplain require first floors to be elevated to at least Base Flood Elevation.
Benefits	Amended ordinance will require an additional 24 inches of height added to first floors to help prevent future flooding inside of homes.
New or Existing Structures?	New structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Hewitt , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2018
Funding sources	No cost
Other Information	Project carried over from 2013 as ordinance has not passed.

Hewitt	
ACTION: Amend local floodplain ordinance to prohibit any fill from flood plain areas.	
Hazard	Floods
Background	Portions of Hewitt can be vulnerable if the flood plain is not kept clear.

Benefits	By not allowing fill into flood plain areas, the flood plains can drain faster and have less damage to any nearby structures.
New or Existing Structures?	Existing and new structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Hewitt , Office of Emergency Management, Emergency Management Coordinator
Target completion date	Complete
Funding sources	No cost
Other Information	Project carried over from 2013 as ordinance has not passed.

Hewitt	
ACTION: Burn Bans	
Hazard	Wildfire
Background	Create and implement an ordinance that would ban the burning of outdoor brush during periods of drought or other wildfire favorable conditions.
Benefits	Prevention of wildfires can save lives and prevent property damage.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Hewitt, Office of Emergency Management, Emergency Management Coordinator
Target completion date	Ongoing
Funding sources	No Cost required
Other Information	Project carried over into 2018 plan as ordinance will be implemented as needed.

Hewitt	
ACTION: Community Outreach & Education	
Hazard	Wildfire
Background	The community can educate citizens on the dangers of wildfires and how to preserve a Wildland/Urban Interface around their homes.
Benefits	Educating residents on how to protect their homes against wildfires can save lives.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Hewitt , Office of Emergency Management, Emergency Management Coordinator
Target completion date	Ongoing
Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to increasing population growth and need to continuously educate residents.

Hewitt	
ACTION: Increase underground water storage	
Hazard	Wildfire, Drought, and flooding
Background	Drought can create a shortage of available water for general public use and for fighting wildfires.
Benefits	By increasing underground reservoirs, this not only provides a way to get rid of extra surface water to decrease chance of flooding but also provides a source during a drought. It can also help for fighting wildfires.

New or Existing Structures?	New Structures
Priority	Medium
Estimated cost	\$6,000,000
Responsible organization	Hewitt, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	Local Funds
Carried Over?	No
Other Information	New project for 2018 plan

Hewitt	
ACTION: Community Outreach & Education	
Hazard	Drought
Background	The community can educate citizens on the dangers of drought and how to conserve water around the home.
Benefits	Educating residents on how to save water can help conserve local water supplies for drinking or fighting wildfires.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Hewitt, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to increasing population growth and need to continuously educate residents.

Hewitt	
ACTION: Posting warning signage about hail at local parks and other outdoor venue	
Hazard	Hail
Background	Hail is a threat especially when people are outside.
Benefits	By posting signage in public areas, this educates residents on the dangers of hail when in outdoor spaces.
New or Existing Structures?	Existing structures
Priority	Low
Estimated cost	\$1,000
Responsible organization	Hewitt , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2019
Funding sources	No cost
Carried Over?	No
Other Information	New project for 2018 plan

Hewitt	
ACTION: Community Outreach & Education	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community can educate citizens on the dangers of severe storm events and how to take cover in their own homes.
Benefits	Educating residents on where to go during severe storm events can save lives.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$800
Responsible organization	Hewitt , Office of Emergency Management, Emergency Management Coordinator

Target completion date	2019
Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to increasing population growth and need to continuously educate residents.

Hewitt	
ACTION: Developing new water supplies	
Hazard	Drought
Background	Drought can create a shortage of available water for general public use and for fighting wildfires.
Benefits	Developing new water supplies, such as drilling new water wells, means that additional water supplies are available during periods of severe drought.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	\$2,500
Responsible organization	Hewitt, Office of Emergency Management, Emergency Management Coordinator
Target completion date	Complete
Funding sources	U.S. Dept of Agriculture Grants, Local Funds
Carried Over?	Yes
Other Information	Project carried over from 2013 due to lack of funding

Hewitt	
ACTION: Community Outreach & Education	
Hazard	Drought
Background	The community can educate citizens on the dangers of drought and how to conserve water around the home.

Benefits	Educating residents on how to save water can help conserve local water supplies for drinking or fighting wildfires.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Hewitt, Office of Emergency Management, Emergency Management Coordinator
Target completion date	Ongoing
Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over due to changing population and need to continually educate residents.

Hewitt	
ACTION: Implement their Drought Contingency Plan response stages.	
Hazard	Drought
Background	The local Drought Contingency Plan contains specific, quantified targets for water use restrictions. This includes drought response stages with triggers to begin and end at each stage.
Benefits	Each drought response stage will reduce the availability of water for certain events. Examples include not allowing the watering of lawns during the day or encouraging the use of xeriscape landscapes.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Hewitt , Office of Emergency Management, Emergency Management Coordinator
Target completion date	Completed
Funding sources	No cost
Other Information	Project from 2013 plan

Hewitt	
ACTION: Improving roof sheathing to prevent hail penetration.	
Hazard	Hail
Background	For new construction as well as retrofitting existing buildings, require roof sheathing techniques to minimize hail damage.
Benefits	Can prevent property damage to new and existing structures.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Hewitt , Office of Emergency Management, Emergency Management Coordinator
Target completion date	Completed
Funding sources	No cost
Other Information	Project from 2013 plan

Hewitt	
ACTION: Burying overhead power lines	
Hazard	Winter Storm
Background	Ice accumulation on tree branches from winter storms can knock down nearby power lines
Benefits	Allows power to remain on at critical facilities, enabling them to function during disasters.
New or Existing Structures?	Existing structures
Priority	Low
Estimated cost	\$15,000
Responsible organization	Hewitt, Office of Emergency Management, Emergency Management Coordinator

Target completion date	Ongoing Maintenance
Funding sources	FEMA Hazard Mitigation Grant Program
Carried Over?	Yes
Other Information	Project carried over due to lack of funding

Hewitt	
ACTION: Ordinance	
Hazard	Drought
Background	Multiple cities throughout the United States have implemented the following ordinance- No Outside Watering from 10 am to 6 pm between May 1 and October 31 of each year.
Benefits	This reduces water usage as during this time it takes more water to irrigate during the heat of the day and this is the hottest time of the year.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Hewitt , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	Local funds
Carried Over?	No
Other Information	This is a new project for the 2018 Hazard Mitigation plan update.

City of Lacy Lakeview Mitigation Action Items

Lacy Lakeview	
ACTION: Per NFIP continued compliance, acquire homes located in the identified flood hazard area	
Hazard	Floods
Background	Portions of Lacy Lakeview can be vulnerable to flooding. Some older structures were built in the identified flood hazard area.
Benefits	By permanently removing these older buildings in the flood hazard area, this will help to decrease the potential damages
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$100,000 per structure
Responsible organization	Lacy Lakeview Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over due to lack of funding.

Lacy Lakeview	
ACTION: Per NFIP continued compliance, elevate homes located in the identified flood hazard area	
Hazard	Floods
Background	Portions of Lacy Lakeview can be vulnerable to flooding. Some older structures were built in the identified flood hazard area with their first floor below Base Flood Elevation (BFE).
Benefits	Buildings will be elevated permanently above the BFE in the identified flood hazard area, thus preventing future damages due to floods.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$80,000 per structure
Responsible organization	Lacy Lakeview, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over due to lack of funding

Lacy Lakeview	
ACTION: Encourage preventive measures to reduce stormwater runoff	
Hazard	Floods
Background	Stormwater runoff has a large impact on the flooding in the area. There are many ways to help the runoff from use of porous pavement, vegetative buffers, and etc. to help decrease urban flooding potential.
Benefits	By encouraging and education the public on the benefits of mitigation actions like porous pavement, vegetative buffers, and etc., there is a chance to decrease urban flooding. This will encourage the whole community approach.

New or Existing Structures?	New structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Lacy Lakeview , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	No cost
Carried Over?	No
Other Information	This is a new project for the 2018 update

Lacy Lakeview	
ACTION: Build a dual-use community safe room	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community does not have many reinforced structures that can protect the citizens from severe storm events.
Benefits	A reinforced building for residents to go during severe storm events can save lives.
New or Existing Structures?	New structures
Priority	Medium
Estimated cost	\$1.6,000,000
Responsible organization	Lacy Lakeview, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over due to lack of funding.

Lacy Lakeview	
ACTION: Individual Safe Room Program	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	Local residents may place individual safe rooms inside their existing or new home for protection from severe storm events.
Benefits	A reinforced building within their own home for residents to go during severe storm events can save lives.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	\$2,500 for each individual safe room
Responsible organization	Lacy Lakeview, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over due to lack of funding.

Lacy Lakeview	
ACTION: Burn Bans	
Hazard	Wildfire
Background	Create and implement an ordinance that would ban the burning of outdoor brush during periods of drought or other wildfire favorable conditions.
Benefits	Prevention of wildfires can save lives and prevent property damage.
New or Existing Structures?	New and Existing structures
Priority	Medium

Estimated cost	No cost
Responsible organization	Lacy Lakeview, Office of Emergency Management, Emergency Management Coordinator
Target completion date	Ongoing
Funding sources	No Cost required

Lacy Lakeview	
ACTION: Community Outreach & Education	
Hazard	Wildfire
Background	The community can educate citizens on the dangers of wildfires and how to preserve a Wildland/Urban Interface around their
Benefits	Educating residents on how to protect their homes against wildfires can save lives.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Lacy Lakeview , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2019
Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over as burn ban is implemented based on conditions.

Lacy Lakeview	
ACTION: Increase underground water storage	
Hazard	Wildfire, Drought, and flooding
Background	Drought can create a shortage of available water for general public use and for fighting wildfires.

Benefits	By increasing underground reservoirs, this not only provides a way to get rid of extra surface water to decrease chance of flooding but also provides a source during a drought. It can also help for fighting wildfires
New or Existing Structures?	New Structures
Priority	Medium
Estimated cost	\$6,000,000
Responsible organization	Lacy Lakeview , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2020
Funding sources	Local Funds
Carried Over?	Yes
Other Information	Project carried over due to lack of funding.

Lacy Lakeview	
ACTION: Community Outreach & Education	
Hazard	Drought
Background	The community can educate citizens on the dangers of drought and how to conserve water around the home.
Benefits	Educating residents on how to save water can help conserve local water supplies for drinking or fighting wildfires.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Lacy Lakeview, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	Local funds
Carried Over?	Yes

Other Information	Project carried over from 2013 plan due to changing population and need to continue education for new residents.
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Lacy Lakeview	
ACTION: Posting warning signage about hail at local parks and other outdoor venue	
Hazard	Hail
Background	Hail is a threat especially when people are outside.
Benefits	By posting signage in public areas, this educates residents on the dangers of hail when in outdoor spaces.
New or Existing Structures?	Existing structures
Priority	Low
Estimated cost	\$1,000
Responsible organization	Lacy Lakeview , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	No cost
Carried Over?	No
Other Information	This is a new project for the 2018 plan

Lacy Lakeview	
ACTION: Community Outreach & Education	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community can educate citizens on the dangers of severe storm events and how to take cover in their own homes.
Benefits	Educating residents on where to go during severe storm events can save lives.
New or Existing Structures?	Existing structures
Priority	Medium

Estimated cost	\$800
Responsible organization	Lacy Lakeview , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2019
Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to changing population and need to continue education for new residents.

Lacy Lakeview	
ACTION: Ordinance	
Hazard	Drought
Background	Multiple cities throughout the United States have implemented the following ordinance- No Outside Watering from 10 am to 6 pm between May 1 and October 31 of each year.
Benefits	This reduces water usage as during this time it takes more water to irrigate during the heat of the day and this is the hottest time of the year.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Lacy Lakeview , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	Local funds
Carried Over?	No
Other Information	This is a new project for the 2018 Hazard Mitigation plan update.

City of Leroy Mitigation Action Items

Leroy	
ACTION: Acquire homes located in the identified flood hazard area	
Hazard	Floods
Background	Portions of Leroy can be vulnerable to flooding. Some older structures were built in the identified flood hazard area.
Benefits	By permanently removing these older buildings in the flood hazard area, this will help to decrease the potential damages.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$100,000 per structure
Responsible organization	Leroy Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over due to lack of funding

Leroy	
ACTION: Elevate homes located in the identified flood hazard area	
Hazard	Floods
Background	Portions of Lacy Lakeview can be vulnerable to flooding. Some older structures were built in the identified flood hazard area with their first floor below Base Flood Elevation (BFE).
Benefits	Buildings will be elevated permanently above the BFE in the identified
New or Existing Structures?	Existing structures
Priority	Medium

Estimated cost	\$80,000 per structure
Responsible organization	Leroy, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over due to lack of funding

Leroy	
ACTION: Encourage preventive measures to reduce stormwater runoff	
Hazard	Floods
Background	Stormwater runoff has a large impact on the flooding in the area. There are many ways to help the runoff from use of porous pavement, vegetative buffers, and etc. to help decrease urban flooding potential.
Benefits	By encouraging and education the public on the benefits of mitigation actions like porous pavement, vegetative buffers, and etc., there is a chance to decrease urban flooding. This will encourage the whole community approach.
New or Existing Structures?	New structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Leroy, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	No
Other Information	This is a new project for the 2018 update

Leroy	
ACTION: Individual Safe Room Program	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	Local residents may place individual safe rooms inside their existing or new home for protection from severe storm events.
Benefits	A reinforced building within their own home for residents to go during severe storm events can save lives.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	\$2,500 for each individual safe room
Responsible organization	Leroy, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2018
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to lack of staff to manage the project.

Leroy	
ACTION: Burn Bans	
Hazard	Wildfire
Background	Local residents would be instructed not to burn brush outdoors during periods of drought or other conditions that are prone to cause wildfires.
Benefits	Prevention of wildfires can save lives and prevent property damage.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Leroy, Office of Emergency Management, Emergency Management Coordinator

Target completion date	Ongoing
Funding sources	No Cost required
Carried Over?	Yes
Other Information	

Leroy	
ACTION: Community Outreach & Education	
Hazard	Wildfire
Background	The community can educate citizens on the dangers of wildfires and how to preserve a Wildland/Urban Interface around their homes.
Benefits	Educating residents on how to protect their homes against wildfires can save lives.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Leroy , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding Source	\$600
Carried Over?	Yes
Other Information	Project carried over due to changing population and need to continually educate residents

Leroy	
ACTION: Community Outreach & Education	
Hazard	Drought

Background	The community can educate citizens on the dangers of drought and how to conserve water around the home.
Benefits	Educating residents on how to save water can help conserve local water supplies for drinking or fighting wildfires.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Leroy, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over due to changing population and need to continually educate residents

Leroy	
ACTION: Posting warning signage about hail at local parks and other outdoor venue	
Hazard	Hail
Background	Hail is a threat especially when people are outside.
Benefits	By posting signage in public areas, this educates residents on the dangers of hail when in outdoor spaces.
New or Existing Structures?	Existing structures
Priority	Low
Estimated cost	\$1,000
Responsible organization	Leroy , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022

Funding sources	No cost
Carried Over?	No
Other Information	This is a new project for the 2018 plan

Leroy	
ACTION: Community Outreach & Education	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community can educate citizens on the dangers of severe storm events and how to take cover in their own homes.
Benefits	Educating residents on where to go during severe storm events can save lives.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$800
Responsible organization	Leroy , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2019
Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over due to changing population and need to continually educate residents

Leroy	
ACTION: Increase underground water storage	
Hazard	Wildfire, Drought, and flooding
Background	Drought can create a shortage of available water for general public use and for fighting wildfires.
Benefits	By increasing underground reservoirs, this not only provides a way to get rid of extra surface water to decrease chance of flooding but also provides a source during a drought. It can also help for fighting wildfires.
New or Existing Structures?	New Structures
Priority	Medium
Estimated cost	\$6,000,000
Responsible organization	Leroy , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	No cost
Carried Over?	No
Other Information	This is a new project for the 2018 plan

Leroy	
ACTION: Ordinance	
Hazard	Drought
Background	Multiple cities throughout the United States have implemented the following ordinance- No Outside Watering from 10 am to 6 pm between May 1 and October 31 of each year.
Benefits	This reduces water usage as during this time it takes more water to irrigate during the heat of the day and this is the hottest time of the year.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost

Responsible organization	Leroy , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	Local funds
Carried Over?	No
Other Information	This is a new project for the 2018 Hazard Mitigation plan update.

City of Lorena Mitigation Action Items

Lorena	
ACTION: Per NFIP continued compliance, acquire homes located in the identified flood hazard area	
Hazard	Floods
Background	Portions of Lorena can be vulnerable to flooding. Some older structures were built in the identified flood hazard area.
Benefits	By permanently removing these older buildings in the flood hazard area, this will help to decrease the potential damages.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$150,000 per structure
Responsible organization	Lorena Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to lack of funding

Lorena	
ACTION: Per NFIP continued compliance, elevate homes located in the identified flood hazard area	
Hazard	Floods
Background	Portions of Lorena can be vulnerable to flooding. Some older structures were built in the identified flood hazard area with their first floor below Base Flood Elevation (BFE).
Benefits	Buildings will be elevated permanently above the BFE in the identified flood hazard area, thus preventing future damages due to floods.

New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$100,000 per structure
Responsible organization	Lorena, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to lack of funding.

Lorena	
ACTION: Amend local floodplain ordinance to require 24 inches of freeboard	
Hazard	Floods
Background	Currently new structures built in the floodplain require first floors to be elevated to at least Base Flood Elevation.
Benefits	Amended ordinance will require an additional 24 inches of height added to first floors to help prevent future flooding inside of homes.
New or Existing Structures?	New structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Lorena , Office of Emergency Management, Emergency Management Coordinator
Target completion date	COMPLETED
Funding sources	No cost
Carried Over?	No

Lorena	
ACTION: Amend local floodplain ordinance to prohibit any fill from flood plain areas.	
Hazard	Floods
Background	Portions of Lorena can be vulnerable if the flood plain is not kept clear.
Benefits	By not allowing fill into flood plain areas, the flood plains can drain faster and have less damage to any nearby structures.
New or Existing Structures?	Existing and new structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Lorena , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	No cost
Carried Over?	Yes
Other Information	Project carried over from 2013 as ordinance was not passed.

Lorena	
ACTION: Encourage preventive measures to reduce stormwater runoff	
Hazard	Floods
Background	Stormwater runoff has a large impact on the flooding in the area. There are many ways to help the runoff from use of porous pavement, vegetative buffers, and etc. to help decrease urban flooding potential.
Benefits	By encouraging and education the public on the benefits of mitigation actions like porous pavement, vegetative buffers, and etc., there is a chance to decrease urban flooding. This will encourage
New or Existing Structures?	New structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Lorena , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	No cost
Carried Over?	No
Other Information	This is a new project for the 2018 plan

Lorena	
ACTION: Build a dual-use community safe room	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community does not have many reinforced structures that can protect the citizens from severe storm events.
Benefits	A reinforced building for residents to go during severe storm events can save lives.
New or Existing Structures?	New structures
Priority	Medium
Estimated cost	\$1,000,000

Responsible organization	Lorena, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over due to lack of funding

Lorena	
ACTION: Individual Safe Room Program	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	Local residents may place individual safe rooms inside their existing or new home for protection from severe storm events.
Benefits	A reinforced building within their own home for residents to go during severe storm events can save lives.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	\$6,000 for each individual safe room
Responsible organization	Lorena, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over due to lack of staff to oversee and manage the project.

Lorena	
ACTION: Burn Bans	
Hazard	Wildfire
Background	Create and implement an ordinance that would ban the burning of outdoor brush during periods of drought or other wildfire favorable conditions.
Benefits	Prevention of wildfires can save lives and prevent property damage.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Lorena, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	No Cost required
Carried Over?	Yes
Other Information	Project carried over from 2013 plan as ordinance has not been passed.

Lorena	
ACTION: Community Outreach & Education	
Hazard	Wildfire
Background	The community can educate citizens on the dangers of wildfires and how to preserve a Wildland/Urban Interface around their homes.
Benefits	Educating residents on how to protect their homes against wildfires can save lives.
New or Existing Structures?	Existing structures
Priority	Medium

Estimated cost	No cost
Responsible organization	Lorena Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding Sources	Local Funds
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to changing population and need to continuously educate citizens.

Lorena	
ACTION: Implement their Drought Contingency Plan response stages.	
Hazard	Drought
Background	The local Drought Contingency Plan contains specific, quantified targets for water use restrictions. This includes drought response stages with triggers to begin and end at each stage.
Benefits	Each drought response stage will reduce the availability of water for certain events. Examples include not allowing the watering of lawns during the day or encouraging the use of xeriscape landscapes.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Lorena Office of Emergency Management, Emergency Management Coordinator
Target completion date	COMPLETED
Funding sources	No cost
Carried Over?	No

Lorena	
ACTION: Increase underground water storage	
Hazard	Wildfire, Drought, and flooding
Background	Drought can create a shortage of available water for general public use and for fighting wildfires.
Benefits	By increasing underground reservoirs, this not only provides a way to get rid of extra surface water to decrease chance of flooding but also provides a source during a drought. It can also help for fighting wildfires
New or Existing Structures?	New Structures
Priority	Medium
Estimated cost	\$6,000,000
Responsible organization	Lorena Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	No cost
Carried Over?	No
Other Information	This is a new project for the 2018 update

Lorena	
ACTION: Community Outreach & Education	
Hazard	Drought
Background	The community can educate citizens on the dangers of drought and how to conserve water around the home.
Benefits	Educating residents on how to save water can help conserve local water supplies for drinking or fighting wildfires.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Lorena, Office of Emergency Management, Emergency Management Coordinator

Target completion date	2021
Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to changing population and need to continually educate citizens.

Lorena	
ACTION: Posting warning signage about hail at local parks and other outdoor venue	
Hazard	Hail
Background	Hail is a threat especially when people are outside.
Benefits	By posting signage in public areas, this educates residents on the dangers of hail when in outdoor spaces.
New or Existing Structures?	Existing structures
Priority	Low
Estimated cost	\$1,000
Responsible organization	Lorena , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	FEMA Hazard Mitigation Grant Program
Carried Over?	No
Other Information	This is a new project for the 2018 update.

Lorena	
ACTION: Community Outreach & Education	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community can educate citizens on the dangers of severe storm events and how to take cover in their own homes.
Benefits	Educating residents on where to go during severe storm events can save lives.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$800
Responsible organization	Lorena , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2019
Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to changing population and need to continually educate citizens.

Lorena	
ACTION: Burying overhead power lines	
Hazard	Winter Storm
Background	Ice accumulation on tree branches from winter storms can knock down nearby power lines
Benefits	Allows power to remain on at critical facilities, enabling them to function during disasters.
New or Existing Structures?	Existing structures
Priority	Low
Estimated cost	\$15,000
Responsible organization	Lorena , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program
Carried Over?	Yes
Other Information	Project carried over due to lack of funding.

Lorena	
ACTION: Improving roof sheathing to prevent hail penetration.	
Hazard	Hail
Background	For new construction as well as retrofitting existing buildings, require roof sheathing techniques to minimize hail damage.
Benefits	Can prevent property damage to new and existing structures.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Lorena , Office of Emergency Management, Emergency Management Coordinator

Target completion date	2023
Funding sources	No cost
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to lack of funding.

Lorena	
ACTION: Ordinance	
Hazard	Drought
Background	Multiple cities throughout the United States have implemented the following ordinance- No Outside Watering from 10 am to 6 pm between May 1 and October 31 of each year.
Benefits	This reduces water usage as during this time it takes more water to irrigate during the heat of the day and this is the hottest time of the year.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Lorena , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	Local funds
Carried Over?	No
Other Information	This is a new project for the 2018 Hazard Mitigation plan update.

City of Mart Mitigation Action Items

Mart	
ACTION: Per NFIP continued compliance, acquire homes located in the identified flood hazard area	
Hazard	Floods,
Background	Portions of Mart can be vulnerable to flooding. Some older structures were built in the identified flood hazard area.
Benefits	By permanently removing these older buildings in the flood hazard area, this will help to decrease the potential damages..
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$100,000 per structure
Responsible organization	Mart Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried over?	Yes
Other Information	Project carried over due to lack of funding

Mart	
ACTION: Per NFIP continued compliance, elevate homes located in the identified flood hazard area	
Hazard	Floods
Background	Portions of Mart can be vulnerable to flooding. Some older structures were built in the identified flood hazard area with their first floor below Base Flood Elevation (BFE).
Benefits	Buildings will be elevated permanently above the BFE in the identified flood hazard area, thus preventing future damages due to floods.
New or Existing Structures?	Existing structures

Priority	Medium
Estimated cost	\$80,000 per structure
Responsible organization	Mart, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried over?	Yes
Other Information	Project carried over due to lack of funding

Mart	
ACTION: Encourage preventive measures to reduce stormwater runoff	
Hazard	Floods, thunderstorms
Background	Stormwater runoff has a large impact on the flooding in the area. There are many ways to help the runoff from use of porous pavement, vegetative buffers, and etc. to help decrease urban flooding potential.
Benefits	By encouraging and education the public on the benefits of mitigation actions like porous pavement, vegetative buffers, and etc., there is a chance to decrease urban flooding. This will encourage the whole community approach.
New or Existing Structures?	New structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Mart , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	No cost
Carried Over?	No
Other Information	This is a new project for the 2018 update

Mart

ACTION: Build a dual-use community safe room	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community does not have many reinforced structures that can protect the citizens from severe storm events.
Benefits	A reinforced building for residents to go during severe storm events can save lives.
New or Existing Structures?	New structures
Priority	Medium
Estimated cost	\$1.6,000,000
Responsible	Mart, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried over?	Yes
Other Information	Project carried over due to lack of funding

Mart	
ACTION: Community Outreach & Education	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community can educate citizens on the dangers of severe storm events and how to take cover in their own homes.
Benefits	Educating residents on where to go during severe storm events can save lives.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$800

Responsible organization	Mart, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2019
Funding sources	Local funds
Carried over?	Yes
Other Information	Project carried over due to lack of funding

Mart	
ACTION: Individual Safe Room Program	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	Local residents may place individual safe rooms inside their existing or new home for protection from severe storm events.
Benefits	A reinforced building within their own home for residents to go during severe storm events can save lives.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	\$2,500 for each individual safe room
Responsible organization	Mart, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried over?	Yes
Other Information	Project carried over due to lack of funding

Mart	
ACTION: Burn Bans	
Hazard	Wildfire

Background	Create and implement an ordinance that would ban the burning of outdoor brush during periods of drought or other wildfire favorable conditions.
Benefits	Prevention of wildfires can save lives and prevent property damage.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Mart, Office of Emergency Management, Emergency Management Coordinator
Target completion date	Ongoing
Funding sources	No Cost required
Carried Over?	Yes
Other Information	Project carried over from 2013 plan as burn ban is implemented on a case by case basis due to changing factors like drought conditions.

Mart	
ACTION: Community Outreach & Education	
Hazard	Wildfire
Background	The community can educate citizens on the dangers of wildfires and how to preserve a Wildland/Urban Interface around their homes.
Benefits	Educating residents on how to protect their homes against wildfires can save lives.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Mart , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2020
Funding sources	Local funds
Carried over?	Yes

Other Information	Project carried over due to lack of funding
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Mart	
ACTION: Increase underground water storage	
Hazard	Wildfire, Drought, and flooding
Background	Drought can create a shortage of available water for general public use and for fighting wildfires.
Benefits	By increasing underground reservoirs, this not only provides a way to get rid of extra surface water to decrease chance of flooding but also provides a source during a drought. It can also help for fighting wildfires.
New or Existing Structures?	New Structures
Priority	Medium
Estimated cost	\$6,000,000
Responsible organization	Mart, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	Local Funds
Carried over?	Yes
Other Information	Project carried over due to lack of funding

Mart	
ACTION: Posting warning signage about hail at local parks and other outdoor venue	
Hazard	Hail
Background	Hail is a threat especially when people are outside.
Benefits	By posting signage in public areas, this educates residents on the dangers of hail when in outdoor spaces.
New or Existing Structures?	Existing structures
Priority	Low
Estimated cost	\$1,000

Responsible organization	Mart, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2019
Funding sources	FEMA Hazard Mitigation Grant Program
Carried Over?	No
Other Information	This is a new project for the 2018 update

Mart	
ACTION: Community Outreach & Education	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community can educate citizens on the dangers of severe storm events and how to take cover in their own homes.
Benefits	Educating residents on where to go during severe storm events can save lives.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$800
Responsible organization	Mart, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2019
Funding sources	Local funds
Carried over?	Yes
Other Information	Project carried over due to lack of funding

Mart	
ACTION: Ordinance	
Hazard	Drought
Background	Multiple cities throughout the United States have implemented the following ordinance- No Outside Watering from 10 am to 6 pm between May 1 and October 31 of each year.
Benefits	This reduces water usage as during this time it takes more water to irrigate during the heat of the day and this is the hottest time of the year.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Mart , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	Local funds
Carried Over?	No
Other Information	This is a new project for the 2018 Hazard Mitigation plan update.

City of McGregor Mitigation Action Items

McGregor	
ACTION: Per NFIP continued compliance, acquire homes located in the identified flood hazard area	
Hazard	Floods
Background	Portions of McGregor can be vulnerable to flooding. Some older structures were built in the identified flood hazard area.
Benefits	Buildings will be removed permanently from the identified flood hazard area, thus preventing future damages due to floods.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$100,000 per structure
Responsible organization	McGregor Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to lack of funding

McGregor	
ACTION: Per NFIP continued compliance, elevate homes located in the identified flood hazard area	
Hazard	Floods
Background	Portions of McGregor can be vulnerable to flooding. Some older structures were built in the identified flood hazard area with their first floor below Base Flood Elevation (BFE).
Benefits	Buildings will be elevated permanently above the BFE in the identified flood hazard area, thus preventing future damages due to floods.

New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$80,000 per structure
Responsible organization	McGregor, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried over?	Yes
Other Information	Project carried over due to lack of funding

McGregor	
ACTION: Encourage preventive measures to reduce stormwater runoff	
Hazard	Floods
Background	Stormwater runoff has a large impact on the flooding in the area. There are many ways to help the runoff from use of porous pavement, vegetative buffers, and etc. to help decrease urban flooding potential.
Benefits	By encouraging and education the public on the benefits of mitigation actions like porous pavement, vegetative buffers, and etc., there is a chance to decrease urban flooding. This will encourage the whole community approach.
New or Existing Structures?	New structures
Priority	Medium
Estimated cost	No cost
Responsible organization	McGregor , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	No cost
Carried Over?	No

Other Information	This is a new project for the 2018 plan.
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McGregor	
ACTION: Build a dual-use community safe room	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community does not have many reinforced structures that can protect the citizens from severe storm events.
Benefits	A reinforced building for residents to go during severe storm events can save lives.
New or Existing Structures?	New structures
Priority	Medium
Estimated cost	\$1.6,000,000
Responsible organization	McGregor, Office of Emergency Management, Emergency Management Coordinator
Target completion date	N/A
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	No
Other Information	No longer want to pursue this project

McGregor	
ACTION: Individual Safe Room Program	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	Local residents may place individual safe rooms inside their existing or new home for protection from severe storm events.
Benefits	A reinforced building within their own home for residents to go during severe storm events can save lives.

New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	\$5,000 for each individual safe room
Responsible organization	McGregor, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over due to lack of funding.

McGregor	
ACTION: Burn Bans	
Hazard	Wildfire
Background	Create and implement an ordinance that would ban the burning of outdoor brush during periods of drought or other wildfire favorable conditions.
Benefits	Prevention of wildfires can save lives and prevent property damage.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	McGregor, Office of Emergency Management, Emergency Management Coordinator
Target completion date	Completed
Funding sources	No Cost required
Carried Over?	No

McGregor	
ACTION: Community Outreach & Education	

Hazard	Wildfire
Background	The community can educate citizens on the dangers of wildfires and how to preserve a Wildland/Urban Interface around their homes.
Benefits	Educating residents on how to protect their homes against wildfires can save lives.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$300
Responsible organization	McGregor , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding Sources	Local Funds
Carried Over?	Yes
Other Information	Project carried over due to changing population and need to continually educate citizens.

McGregor	
ACTION: Increase underground water storage	
Hazard	Wildfire, Drought, and flooding
Background	Drought can create a shortage of available water for general public use and for fighting wildfires.
Benefits	By increasing underground reservoirs, this not only provides a way to get rid of extra surface water to decrease chance of flooding but also provides a source during a drought. It can also help for fighting wildfires.
New or Existing Structures?	New Structures
Priority	Medium
Estimated cost	\$6,000,000
Responsible organization	McGregor, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022

Funding sources	Local funds
Carried Over?	No
Other Information	This is a new project for the 2018 update

McGregor	
ACTION: Community Outreach & Education	
Hazard	Drought
Background	The community can educate citizens on the dangers of drought and how to conserve water around the home.
Benefits	Educating residents on how to save water can help conserve local water supplies for drinking or fighting wildfires.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$500
Responsible organization	McGregor, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2019
Funding sources	FEMA Hazard Mitigation Grant Program
Carried Over?	Yes
Other Information	Project carried over due to changing population and need to continually educate citizens.

McGregor	
ACTION: Posting warning signage about hail at local parks and other outdoor venue	
Hazard	Hail
Background	Hail is a threat especially when people are outside.
Benefits	By posting signage in public areas, this educates residents on the dangers of hail when in outdoor spaces.

New or Existing Structures?	Existing structures
Priority	Low
Estimated cost	\$1,000
Responsible organization	McGregor , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	No cost
Carried Over?	No
Other Information	This is a new project for the 2018 update

McGregor	
ACTION: Community Outreach & Education	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community can educate citizens on the dangers of severe storm events and how to take cover in their own homes.
Benefits	Educating residents on where to go during severe storm events can save lives.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$800
Responsible organization	McGregor , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2019
Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over due to changing population and need to continually educate citizens.

McGregor	
ACTION: Ordinance	
Hazard	Drought
Background	Multiple cities throughout the United States have implemented the following ordinance- No Outside Watering from 10 am to 6 pm between May 1 and October 31 of each year.
Benefits	This reduces water usage as during this time it takes more water to irrigate during the heat of the day and this is the hottest time of the year.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Mcgregor , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	Local funds
Carried Over?	No
Other Information	This is a new project for the 2018 Hazard Mitigation plan update.

City of Robinson Mitigation Action Items

Robinson	
ACTION: Per NFIP continued compliance, acquire homes located in the identified flood hazard area	
Hazard	Floods
Background	Portions of Robinson can be vulnerable to flooding. Some older structures were built in the identified flood hazard area.
Benefits	By permanently removing these older buildings in the flood hazard area, this will help to decrease the potential damages.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$100,000 per structure
Responsible organization	Robinson Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over due to lack of funding.

Robinson	
ACTION: Per NFIP continued compliance, elevate homes located in the identified flood hazard area	
Hazard	Floods
Background	Portions of Robinson can be vulnerable to flooding. Some older structures were built in the identified flood hazard area with their first floor below Base Flood Elevation (BFE).
Benefits	Buildings will be elevated permanently above the BFE in the identified flood hazard area, thus preventing future damages due to floods.
New or Existing Structures?	Existing structures

Priority	Medium
Estimated cost	\$80,000 per structure
Responsible organization	Robinson, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over due to lack of funding.

Robinson	
ACTION: Encourage preventive measures to reduce stormwater runoff	
Hazard	Floods
Background	Stormwater runoff has a large impact on the flooding in the area. There are many ways to help the runoff from use of porous pavement, vegetative buffers, and etc. to help decrease urban flooding potential.
Benefits	By encouraging and education the public on the benefits of mitigation actions like porous pavement, vegetative buffers, and etc., there is a chance to decrease urban flooding. This will encourage the whole community approach.
New or Existing Structures?	New structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Robinson , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	No cost
Carried Over?	No
Other Information	This is a new project for the 2018 update.

Robinson	
ACTION: Build a dual-use community safe room	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community does not have many reinforced structures that can protect the citizens from severe storm events.
Benefits	A reinforced building for residents to go during severe storm events can save lives.
New or Existing Structures?	New structures
Priority	Medium
Estimated cost	\$1.6,000,000
Responsible organization	Robinson, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over due to lack of funding.

Robinson	
ACTION: Individual Safe Room Program	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	Local residents may place individual safe rooms inside their existing or new home for protection from severe storm events.
Benefits	A reinforced building within their own home for residents to go during severe storm events can save lives.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	\$2,500 for each individual safe room

Responsible organization	Robinson, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2019
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over due to lack of funding.

Robinson	
ACTION: Burn Bans	
Hazard	Wildfire
Background	Local residents would be instructed not to burn brush outdoors during periods of drought or other conditions that are prone to cause wildfires.
Benefits	Prevention of wildfires can save lives and prevent property damage.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Robinson, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	No Cost required
Carried Over?	Yes
Other Information	Project carried over from 2013 plan as burn bans are implemented on a case by case basis.

Robinson	
ACTION: Community Outreach & Education	
Hazard	Wildfire
Background	The community can educate citizens on the dangers of wildfires and how to preserve a Wildland/Urban Interface around their homes.
Benefits	Educating residents on how to protect their homes against wildfires can save lives.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Robinson , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2020
Funding Sources	Local Funds
Carried Over?	No
Other Information	Project carried over from 2013 plan due to changing population and need to continually educate citizens.

Robinson	
ACTION: Increase underground water storage	
Hazard	Wildfire, Drought, and flooding
Background	Drought can create a shortage of available water for general public use and for fighting wildfires.
Benefits	By increasing underground reservoirs, this not only provides a way to get rid of extra surface water to decrease chance of flooding but also provides a source during a drought. It can also help for fighting wildfires.
New or Existing Structures?	New Structures
Priority	Medium

Estimated cost	\$6,000,000
Responsible organization	Robinson , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	Local Funds
Carried Over?	No
Other Information	This is a new project for the 2018 plan.

Robinson	
ACTION: Community Outreach & Education	
Hazard	Drought
Background	The community can educate citizens on the dangers of drought and how to conserve water around the home.
Benefits	Educating residents on how to save water can help conserve local water supplies for drinking or fighting wildfires.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$600
Responsible organization	Robinson, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to lack of funding.

Robinson	
ACTION: Posting warning signage about hail at local parks and other outdoor venue	

Hazard	Hail
Background	Hail is a threat especially when people are outside.
Benefits	By posting signage in public areas, this educates residents on the dangers of hail when in outdoor spaces.
New or Existing Structures?	Existing structures
Priority	Low
Estimated cost	\$1,000
Responsible organization	Robinson , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	Local funds
Carried Over?	No
Other Information	This is a new project for the 2018 plan.

Robinson	
ACTION: Community Outreach & Education	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community can educate citizens on the dangers of severe storm events and how to take cover in their own homes.
Benefits	Educating residents on where to go during severe storm events can save lives.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$800
Responsible organization	Robinson , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2019

Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to lack of funding.

Robinson	
ACTION: Ordinance	
Hazard	Drought
Background	Multiple cities throughout the United States have implemented the following ordinance- No Outside Watering from 10 am to 6 pm between May 1 and October 31 of each year.
Benefits	This reduces water usage as during this time it takes more water to irrigate during the heat of the day and this is the hottest time of the year.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Robinson , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	Local funds
Carried Over?	No
Other Information	This is a new project for the 2018 Hazard Mitigation plan update.

City of Ross Mitigation Action Items

Ross	
ACTION: Per NFIP continued compliance, acquire homes located in the identified flood hazard area	
Hazard	Floods
Background	Portions of Ross can be vulnerable to flooding. Some older structures were built in the identified flood hazard area.
Benefits	By permanently removing these older buildings in the flood hazard area, this will help to decrease the potential damages.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$100,000 per structure
Responsible organization	Ross Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over due to lack of funding.

Ross	
ACTION: Per NFIP continued compliance, elevate homes located in the identified flood hazard area	
Hazard	Floods
Background	Portions of Robinson can be vulnerable to flooding. Some older structures were built in the identified flood hazard area with their first floor below Base Flood Elevation (BFE).
Benefits	Buildings will be elevated permanently above the BFE in the identified flood hazard area, thus preventing future damages due to floods.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$80,000 per structure
Responsible organization	Ross, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over from 2103 plan due to lack of funding

Ross	
ACTION: Encourage preventive measures to reduce stormwater runoff	
Hazard	Floods
Background	Stormwater runoff has a large impact on the flooding in the area. There are many ways to help the runoff from use of porous pavement, vegetative buffers, and etc. to help decrease urban flooding potential.
Benefits	By encouraging and education the public on the benefits of mitigation actions like porous pavement, vegetative buffers, and etc., there is a chance to decrease urban flooding. This will encourage the whole community approach.
New or Existing Structures?	New structures

Priority	Medium
Estimated cost	No cost
Responsible organization	Ross , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	No cost
Carried Over?	No
Other Information	This is a new project for the 2018 update

Ross	
ACTION: Build a dual-use community safe room	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community does not have many reinforced structures that can protect the citizens from severe storm events.
Benefits	A reinforced building for residents to go during severe storm events can save lives.
New or Existing Structures?	New structures
Priority	Medium
Estimated cost	\$800,000
Responsible organization	Ross, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over from 2103 plan due to lack of funding

Ross	
ACTION: Individual Safe Room Program	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	Local residents may place individual safe rooms inside their existing or new home for protection from severe storm events.
Benefits	A reinforced building within their own home for residents to go during severe storm events can save lives.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	\$2,500 for each individual safe room
Responsible organization	Ross, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding Sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance Grants
Carried Over?	Yes
Other Information	Project carried over from 2103 plan due to lack of funding

Ross	
ACTION: Burn Bans	
Hazard	Wildfire
Background	Local residents would be instructed not to burn brush outdoors during periods of drought or other conditions that are prone to cause wildfires.
Benefits	Prevention of wildfires can save lives and prevent property damage.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Ross, Office of Emergency Management, Emergency Management Coordinator

Target completion date	2020
Funding sources	No Cost required

Ross	
ACTION: Community Outreach & Education	
Hazard	Wildfire
Background	The community can educate citizens on the dangers of wildfires and how to preserve a Wildland/Urban Interface around their homes.
Benefits	Educating residents on how to protect their homes against wildfires can save lives.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Ross , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2018
Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over due to changing population and need to continually educate citizens

Ross	
ACTION: Increase underground water storage	
Hazard	Wildfire, Drought, and flooding
Background	Drought can create a shortage of available water for general public use and for fighting wildfires.
Benefits	By increasing underground reservoirs, this not only provides a way to get rid of extra surface water to decrease chance of flooding but also provides a source during a drought. It can also help for fighting wildfires.

New or Existing Structures?	New Structures
Priority	Medium
Estimated cost	\$6,000,000
Responsible organization	Ross , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	Local Funds
Carried Over?	No
Other Information	This is a new project for the 2018 update

Ross	
ACTION: Posting warning signage about hail at local parks and other outdoor venue	
Hazard	Hail
Background	Hail is a threat especially when people are outside.
Benefits	By posting signage in public areas, this educates residents on the dangers of hail when in outdoor spaces.
New or Existing Structures?	Existing structures
Priority	Low
Estimated cost	\$1,000
Responsible organization	Ross , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2019
Funding sources	FEMA Hazard Mitigation Grant Program
Carried Over?	No
Other Information	This is a new project for the 2018 update

Ross	
ACTION: Community Outreach & Education	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community can educate citizens on the dangers of severe storm events and how to take cover in their own homes.
Benefits	Educating residents on where to go during severe storm events can save lives.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$800
Responsible organization	Ross , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2019
Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over due to changing population and need to continually educate citizens

Ross	
ACTION: Community Outreach & Education	
Hazard	Drought
Background	The community can educate citizens on the dangers of drought and how to conserve water around the home.
Benefits	Educating residents on how to save water can help conserve local water supplies for drinking or fighting wildfires.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Ross , Office of Emergency Management, Emergency Management Coordinator

Target completion date	2022
Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over due to changing population and need to continually educate citizens

Ross	
ACTION: Ordinance	
Hazard	Drought
Background	Multiple cities throughout the United States have implemented the following ordinance- No Outside Watering from 10 am to 6 pm between May 1 and October 31 of each year.
Benefits	This reduces water usage as during this time it takes more water to irrigate during the heat of the day and this is the hottest time of the year.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Ross , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	Local funds
Carried Over?	No
Other Information	This is a new project for the 2018 Hazard Mitigation plan update.

City of Waco Mitigation Action Items

Waco	
ACTION: Per the National Flood Insurance Program (NFIP) continued compliance, acquire homes located in the identified flood hazard area	
Hazard	Floods
Background	Portions of the City of Waco can be vulnerable to flooding. Some older structures were built in the identified flood hazard area.
Benefits	By permanently removing these older buildings in the flood hazard area, this will help to decrease the potential damages.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$100,000 per structure
Responsible organization	Waco , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over from the 2013 plan due to lack of funding.

Waco	
ACTION: Per NFIP continued compliance, elevate homes located in the identified flood hazard area	
Hazard	Floods
Background	Portions of the City of Waco can be vulnerable to flooding. Some older structures were built in the identified flood hazard area with their first floor below Base Flood Elevation (BFE).
Benefits	Buildings will be elevated permanently above the BFE in the identified flood hazard area, thus preventing future damages due to floods.

New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$80,000 per structure
Responsible organization	Waco , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to lack of funding

Waco	
ACTION: Acquire homes located in the identified flood hazard area downstream of Lake Waco Dam	
Hazard	Dam Failure
Background	Portions of the City of Waco are downstream of Lake Waco on the Bosque River and can be vulnerable to flooding. Some older structures were built in the identified flood hazard area.
Benefits	Buildings will be removed permanently from the identified flood hazard area, thus preventing future damages due to floods or dam failure.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$100,000 per structure
Responsible organization	Waco, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes

Other Information	Project carried over from 2013 plan due to lack of funding
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Waco	
ACTION: Prevent any new structures from being located in the identified flood hazard area downstream of Lake Waco Dam	
Hazard	Dam Failure
Background	Portions of the City of Waco are downstream of Lake Waco on the Bosque River and can be vulnerable to flooding if the dam failed. Some older structures were built in the identified flood hazard area.
Benefits	New buildings and structures will not be allowed to be built downstream of Lake Waco in the identified flood hazard area by amending the local floodplain ordinance.
New or Existing Structures?	New structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Waco , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	No costs
Carried Over?	Yes
Other Information	Project carried over as the ordinance has not been passed yet. Still working on identifying updated flood hazard area.

Waco	
ACTION: Build a dual-use community safe room	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community does not have many reinforced structures that can protect the citizens from severe storm events.
Benefits	A reinforced building for residents to go during severe storm events can save lives.
New or Existing Structures?	New structures

Priority	Medium
Estimated cost	\$1.6,000,000
Responsible organization	Waco, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over from the 2013 plan due to lack of funding.

Waco	
ACTION: Implement a tree limb removal program	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The removal of tree limbs from nearby power lines can help prevent them from being knocked down during severe storms.
Benefits	Keeps power on to critical facilities during severe storms.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	\$8,000
Responsible organization	Waco, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over from the 2013 plan due to lack of funding.

Waco	
ACTION: Community Outreach & Education	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community can educate citizens on the dangers of severe storm events and how to take cover in their own homes.
Benefits	Educating residents on where to go during severe storm events can save lives.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$800
Responsible organization	Waco, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2019
Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to changing population and need to continue education for new residents.

Waco	
ACTION: Individual Safe Room Program	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	Local residents may place individual safe rooms inside their existing or new home for protection from severe storm events.
Benefits	A reinforced building within their own home for residents to go during severe storm events can save lives.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	\$2,500 for each individual safe room
Responsible organization	Waco, Office of Emergency Management, Emergency Management Coordinator

Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over from the 2013 plan due to lack of funding.

Waco	
ACTION: Burn Bans	
Hazard	Wildfire
Background	Local residents would be instructed not to burn brush outdoors during periods of drought or other conditions that are prone to cause wildfires.
Benefits	Prevention of wildfires can save lives and prevent property damage.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Waco, Office of Emergency Management, Emergency Management Coordinator
Target completion date	Complete
Funding sources	No Cost required
Carried Over?	No
Other Information	Project has been completed

Waco	
ACTION: Community Outreach & Education	
Hazard	Wildfire

Background	The community can educate citizens on the dangers of wildfires and how to preserve a Wildland/Urban Interface around their homes.
Benefits	Educating residents on how to protect their homes against wildfires can save lives.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Waco, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	Local funds
Other Information	Project carried over from 2013 plan due to changing population and need to continue education for new residents.

Waco	
ACTION: Increase underground water storage	
Hazard	Wildfire, Drought, and flooding
Background	Drought can create a shortage of available water for general public use and for fighting wildfires.
Benefits	By increasing underground reservoirs, this not only provides a way to get rid of extra surface water to decrease chance of flooding but also provides a source during a drought. It can also help for fighting wildfires.
New or Existing Structures?	New Structures
Priority	Medium
Estimated cost	\$6,000,000
Responsible organization	Waco , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	Local Funds
Other Information	New Project

Waco	
ACTION: Community Outreach & Education	
Hazard	Drought
Background	The community can educate citizens on the dangers of drought and how to conserve water around the home.
Benefits	Educating residents on how to save water can help conserve local water supplies for drinking or fighting wildfires.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Waco , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	Local funds
Other Information	Project carried over from 2013 plan due to changing population and need to continue education for new residents.

Waco	
ACTION: Posting warning signage about hail at local parks and other outdoor venue	
Hazard	Hail
Background	Hail is a threat especially when people are outside.
Benefits	By posting signage in public areas, this educates residents on the dangers of hail when in outdoor spaces.
New or Existing Structures?	Existing structures
Priority	Low
Estimated cost	\$1,000
Responsible organization	Waco , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	No cost
Other Information	New Project

Waco	
ACTION: Community Outreach & Education	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community can educate citizens on the dangers of severe storm events and how to take cover in their own homes.
Benefits	Educating residents on where to go during severe storm events can save lives.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$800
Responsible organization	Waco , Office of Emergency Management, Emergency Management Coordinator

Target completion date	2019
Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to changing population and need to continue education for new residents.

Waco	
ACTION: Encourage preventive measures to reduce stormwater runoff	
Hazard	Floods
Background	Stormwater runoff has a large impact on the flooding in the area. There are many ways to help the runoff from use of porous pavement, vegetative buffers, and etc. to help decrease urban flooding potential.
Benefits	By encouraging and education the public on the benefits of mitigation actions like porous pavement, vegetative buffers, and etc., there is a chance to decrease urban flooding. This will encourage the whole
New or Existing Structures?	New structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Waco , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	No cost
Carried Over?	No
Other Information	New project for the 2018 plan

Waco	
ACTION: Ordinance	
Hazard	Drought
Background	Multiple cities throughout the United States have implemented the following ordinance- No Outside Watering from 10 am to 6 pm between May 1 and October 31 of each year.
Benefits	This reduces water usage as during this time it takes more water to irrigate during the heat of the day and this is the hottest time of the year.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Waco, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	Local funds
Carried Over?	No
Other Information	This is a new project for the 2018 Hazard Mitigation plan update.

Waco	
ACTION: Installing backup generator power to pre-determined emergency shelter sites	
Hazard	Severe Weather (Cold or Heat)
Background	Following the 2021 February Winter Storm, large sections of the City of Waco were without power; in the event of a total loss of power, the city would not be able to run an effective shelter system should one be needed.
Benefits	By installing backup generators at critical sheltering facilities, the City of Waco would significantly improve our resiliency and protect the lives of our residents in times of severe weather and power outages.

New or Existing Structures?	Existing
Priority	High
Estimated cost	Minimum \$150,000
Responsible organization	Waco , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	HMPG,BRIC and Local
Carried Over?	No
Other Information	New project for the 2021 plan

Waco	
ACTION: Installing backup generator power to the City of Waco water treatment facility	
Hazard	Severe Weather (Cold or Heat)
Background	Following the 2021 February Winter Storm, large sections of the City of Waco were without power, including the City of Waco's main water plant. Without this plant, it is highly likely that the entire water distribution system for the city of Waco would be lost.
Benefits	By installing backup generators at the City of Waco main water plant, the city would be able to protect and continue its water treatment and distribution activities in the event of a prolonged power outage.
New or Existing Structures?	Existing
Priority	High
Estimated cost	Minimum \$150,000
Responsible organization	Waco , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022

Funding sources	HMPG,BRIC and Local
Carried Over?	No
Other Information	New project for the 2021 plan

Waco	
ACTION: Installing back-up generators for critical facilities.	
Hazard	All hazards emergency power needs
Background	Following the 2021 February Winter Storm, large sections of the City of Waco were without power, installing backup generators at key facilities would ensure no loss of function for critically needed facilities.
Benefits	By installing backup generators at the City of Waco main water plant, the city would be able to protect and continue its water treatment and distribution activities in the event of a prolonged power outage.
New or Existing Structures?	Existing
Priority	High
Estimated cost	Minimum \$150,000
Responsible organization	Waco , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	HMPG,BRIC and Local
Carried Over?	No
Other Information	New project for the 2021 plan

City of West Mitigation Action Items

West	
ACTION: Per NFIP continued compliance, acquire homes located in the identified flood hazard area	
Hazard	Floods
Background	Portions of West can be vulnerable to flooding. Some older structures were built in the identified flood hazard area.
Benefits	By permanently removing these older buildings in the flood hazard area, this will help to decrease the potential damages.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$100,000 per structure
Responsible organization	West Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over due to lack of funding.

West	
ACTION: Amend local floodplain ordinance to require 24 inches of freeboard	
Hazard	Floods

Background	Currently new structures built in the floodplain require first floors to be elevated to at least Base Flood Elevation.
Benefits	Amended ordinance will require an additional 24 inches of height added to first floors to help prevent future flooding inside of homes.
New or Existing Structures?	New structures
Priority	Medium
Estimated cost	No cost
Responsible organization	West , Office of Emergency Management, Emergency Management Coordinator
Target completion date	COMPLETE
Funding sources	No cost
Carried Over?	No
Other Information	Project from 2013 plan and is now complete.

West	
ACTION: Amend local floodplain ordinance to prohibit any fill from flood plain areas.	
Hazard	Floods
Background	Portions of West can be vulnerable if the flood plain is not kept clear.
Benefits	By not allowing fill into flood plain areas, the flood plains can drain faster and have less damage to any nearby structures.
New or Existing Structures?	Existing and new structures
Priority	Medium
Estimated cost	No cost
Responsible organization	West , Office of Emergency Management, Emergency Management Coordinator
Target completion date	COMPLETE
Funding sources	No cost

Carried Over?	No
Other Information	Project from 2013 plan and is now complete.

West	
ACTION: Per NFIP continued compliance, elevate homes located in the identified flood hazard area	
Hazard	Floods
Background	Portions of West can be vulnerable to flooding. Some older structures were built in the identified flood hazard area with their first floor below Base Flood Elevation (BFE).
Benefits	Buildings will be elevated permanently above the BFE in the identified flood hazard area, thus preventing future damages due to floods.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$80,000 per structure
Responsible organization	West, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over due to lack of funding.

West	
ACTION: Encourage preventive measures to reduce stormwater runoff	
Hazard	Floods

Background	Stormwater runoff has a large impact on the flooding in the area. There are many ways to help the runoff from use of porous pavement, vegetative buffers, and etc. to help decrease urban flooding potential.
Benefits	By encouraging and education the public on the benefits of mitigation actions like porous pavement, vegetative buffers, and etc., there is a chance to decrease urban flooding. This will encourage the whole
New or Existing Structures?	New structures
Priority	Medium
Estimated cost	No cost
Responsible organization	West , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	No cost
Carried Over?	No
Other Information	New project for the 2018 plan

West	
ACTION: Build a dual-use community safe room	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community does not have many reinforced structures that can protect the citizens from severe storm events.
Benefits	A reinforced building for residents to go during severe storm events can save lives.
New or Existing Structures?	New structures
Priority	Medium
Estimated cost	\$1.6,000,000
Responsible organization	West, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023

Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over due to lack of funding

West	
ACTION: Individual Safe Room Program	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	Local residents may place individual safe rooms inside their existing or new home for protection from severe storm events.
Benefits	A reinforced building within their own home for residents to go during severe storm events can save lives.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	\$2,500 for each individual safe room
Responsible organization	West, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over due to lack of funding

West	
ACTION: Burn Bans	
Hazard	Wildfire
Background	Local residents would be instructed not to burn brush outdoors during periods of drought or other conditions that are prone to cause wildfires.
Benefits	Prevention of wildfires can save lives and prevent property damage.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	West, Office of Emergency Management, Emergency Management Coordinator
Target completion date	Complete
Funding sources	No Cost required
Carried Over?	No
Other Information	Ordinance was passed

West	
ACTION: Community Outreach & Education	
Hazard	Wildfire
Background	The community can educate citizens on the dangers of wildfires and how to preserve a Wildland/Urban Interface around their homes.
Benefits	Educating residents on how to protect their homes against wildfires can save lives.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	West , Office of Emergency Management, Emergency Management Coordinator

Target completion date	2020
Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to changing population and need to continue education for new residents.

West	
ACTION: Increase underground water storage	
Hazard	Wildfire, Drought, and flooding
Background	Drought can create a shortage of available water for general public use and for fighting wildfires.
Benefits	By increasing underground reservoirs, this not only provides a way to get rid of extra surface water to decrease chance of flooding but also provides a source during a drought. It can also help for fighting wildfires.
New or Existing Structures?	New Structures
Priority	Medium
Estimated cost	\$6,000,000
Responsible organization	West, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	Local funds
Carried Over?	No
Other Information	This is a new project for the 2018 plan

West	
ACTION: Community Outreach & Education	
Hazard	Drought
Background	The community can educate citizens on the dangers of drought and how to conserve water around the home.
Benefits	Educating residents on how to save water can help conserve local water supplies for drinking or fighting wildfires.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	West, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	Local funds
Carried over?	Yes
Other Information	Project carried over from 2013 plan due to changing population and need to continue education for new residents.

West	
ACTION: Developing new water supplies	
Hazard	Drought
Background	Drought can create a shortage of available water for general public use and for fighting wildfires.
Benefits	Developing new water supplies, such as drilling new water wells, means that additional water supplies are available during periods of severe drought.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	\$1,200

Responsible organization	West, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2019
Funding sources	U.S. Dept of Agriculture Grants, Local Funds
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to running out of time and construction issues.

West	
ACTION: Implement their Drought Contingency Plan response stages.	
Hazard	Drought
Background	The local Drought Contingency Plan contains specific, quantified targets for water use restrictions. This includes drought response stages with triggers to begin and end at each stage.
Benefits	Each drought response stage will reduce the availability of water for certain events. Examples include not allowing the watering of lawns during the day or encouraging the use of xeriscape landscapes. .
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	West , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	No cost
Carried Over?	Yes
Other Information	The plan has not be fully developed

West	
ACTION: Posting warning signage about hail at local parks and other outdoor venue	
Hazard	Hail
Background	Hail is a threat especially when people are outside.
Benefits	By posting signage in public areas, this educates residents on the dangers of hail when in outdoor spaces.
New or Existing Structures?	Existing structures
Priority	Low
Estimated cost	\$1,000
Responsible organization	West, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2019
Funding sources	FEMA Hazard Mitigation Grant
Carried Over?	No
Other Information	This is a new project for the 2018 plan

West	
ACTION: Community Outreach & Education	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community can educate citizens on the dangers of severe storm events and how to take cover in their own homes.
Benefits	Educating residents on where to go during severe storm events can save lives.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$800
Responsible organization	West, Office of Emergency Management, Emergency Management Coordinator

Target completion date	2019
Funding sources	Local funds
Carried Over?	Yes
Other Information	This project has been carried over from the 2013 plan due to changing population and need to continually educate residents

West	
ACTION: Installing hail resistant roofing and siding to critical facilities	
Hazard	Hail
Background	For new construction as well as retrofitting existing buildings, require hail resistant roofing and siding to critical facilities to minimize hail damage.
Benefits	Can prevent property damage to new and existing structures.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$2,000
Responsible organization	West , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	No cost
Carried Over?	Yes
Other Information	Project carried over from 2013 plan because not all critical facilities were covered.

West	
ACTION: Burying power lines	
Hazard	Winter Storm
Background	Exposed power lines are vulnerable to winter storms through ice accumulation or falling tree branches.
Benefits	Allows power to remain on at critical facilities, enabling them to function during disasters.

New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	\$20,000
Responsible organization	West, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant
Other Information	Project carried over due to medium priority. Other projects took a higher priority.

West	
ACTION: Ordinance	
Hazard	Drought
Background	Multiple cities throughout the United States have implemented the following ordinance- No Outside Watering from 10 am to 6 pm between May 1 and October 31 of each year.
Benefits	This reduces water usage as during this time it takes more water to irrigate during the heat of the day and this is the hottest time of the year.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	West , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	Local funds
Carried Over?	No
Other Information	This is a new project for the 2018 Hazard Mitigation plan update.

City of Woodway Mitigation Action Items

Woodway	
ACTION: Per NFIP continued compliance, acquire homes located in the identified flood hazard area	
Hazard	Floods
Background	Portions of Woodway can be vulnerable to flooding. Some older structures were built in the identified flood hazard area.
Benefits	By permanently removing these older buildings in the flood hazard area, this will help to decrease the potential damages.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$200000 per structure
Responsible organization	Woodway Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Project carried over?	Yes
Other Information	Project carried over due to lack of funding

Woodway	
ACTION: Amend local floodplain ordinance to require 24 inches of freeboard	
Hazard	Floods
Background	Currently new structures built in the floodplain require first floors to be elevated to at least Base Flood Elevation.
Benefits	Amended ordinance will require an additional 24 inches of height added to first floors to help prevent future flooding inside of homes.
New or Existing Structures?	New structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Woodway , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2018
Funding sources	No cost
Carried Over?	No
Other Information	Project completed in 2018

Woodway	
ACTION: Amend local floodplain ordinance to prohibit any fill from flood plain areas.	
Hazard	Floods
Background	Portions of McLennan County can be vulnerable if the flood plain is not kept clear.
Benefits	By not allowing fill into flood plain areas, the flood plains can drain faster and have less damage to any nearby structures.
New or Existing Structures?	Existing and new structures
Priority	Medium

Estimated cost	No cost
Responsible organization	Woodway , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2018
Funding sources	No cost
Carried Over?	No
Other Information	Project completed in 2018

Woodway	
ACTION: Encourage preventive measures to reduce stormwater runoff	
Hazard	Floods
Background	Stormwater runoff has a large impact on the flooding in the area. There are many ways to help the runoff from use of porous pavement, vegetative buffers, and etc. to help decrease urban flooding potential.
Benefits	By encouraging and education the public on the benefits of mitigation actions like porous pavement, vegetative buffers, and etc., there is a chance to decrease urban flooding. This will encourage the whole community approach.
New or Existing Structures?	New structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Woodway, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	No cost
Carried Over?	No
Other Information	This is a new project for the 2018 update

Woodway	
ACTION: Build a dual-use community safe room	

Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community does not have many reinforced structures that can protect the citizens from severe storm events.
Benefits	A reinforced building for residents to go during severe storm events can save lives.
New or Existing Structures?	New structures
Priority	Medium
Estimated cost	\$1,000,000
Responsible organization	Woodway, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants
Carried Over?	Yes
Other Information	Project carried over from 2013 plan due to lack of funding

Woodway	
ACTION: Individual Safe Room Program	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	Local residents may place individual safe rooms inside their existing or new home for protection from severe storm events.
Benefits	A reinforced building within their own home for residents to go during severe storm events can save lives.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	\$5,000 for each individual safe room
Responsible organization	Woodway, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program & Flood Mitigation Assistance grants

Carried Over?	Yes
Other Information	Project carried over due to lack of funding

Woodway	
ACTION: Burn Bans	
Hazard	Wildfire
Background	Local residents would be instructed not to burn brush outdoors during periods of drought or other conditions that are prone to cause wildfires.
Benefits	Prevention of wildfires can save lives and prevent property damage.
New or Existing Structures?	New and Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Woodway, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	No Cost required
Carried over?	Yes
Other Information	Project carried over as burn bans are implemented based on drought conditions

Woodway	
ACTION: Community Outreach & Education	
Hazard	Wildfire
Background	The community can educate citizens on the dangers of wildfires and how to preserve a Wildland/Urban Interface around their homes.

Benefits	Educating residents on how to protect their homes against wildfires can save lives.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Woodway , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over due to changing population and need to continuously educate residents

Woodway	
ACTION: Increase underground water storage	
Hazard	Wildfire, Drought, and flooding
Background	Drought can create a shortage of available water for general public use and for fighting wildfires.
Benefits	By increasing underground reservoirs, this not only provides a way to get rid of extra surface water to decrease chance of flooding but also provides a source during a drought. It can also help for fighting wildfires.
New or Existing Structures?	New Structures
Priority	Medium
Estimated cost	\$6,000,000
Responsible organization	Woodway, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2022
Funding sources	Local funds

Carried over?	Yes
Other information	Project carried over due to lack of funding

Woodway	
ACTION: Community Outreach & Education	
Hazard	Drought
Background	The community can educate citizens on the dangers of drought and how to conserve water around the home.
Benefits	Educating residents on how to save water can help conserve local water supplies for drinking or fighting wildfires.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Woodway , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2019
Funding sources	No cost
Carried Over?	Yes
Other Information	Project carried over due to new residents moving in and need to continuously educate the public

Woodway	
ACTION: Posting warning signage about hail at local parks and other outdoor venue	
Hazard	Hail
Background	Hail is a threat especially when people are outside.
Benefits	By posting signage in public areas, this educates residents on the dangers of hail when in outdoor spaces.
New or Existing Structures?	Existing structures
Priority	Low

Estimated cost	\$1,000
Responsible organization	Woodway, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2021
Funding sources	No cost
Carried Over?	No
Other Information	New project for the 2018 update

Woodway	
ACTION: Community Outreach & Education	
Hazard	Tornado, Thunderstorm, Winter Storm, Hail
Background	The community can educate citizens on the dangers of severe storm events and how to take cover in their own homes.
Benefits	Educating residents on where to go during severe storm events can save lives.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	\$800
Responsible organization	Woodway, Office of Emergency Management, Emergency Management Coordinator
Target completion date	2019
Funding sources	Local funds
Carried Over?	Yes
Other Information	Project carried over due to new residents moving in and need to continuously educate the public

Woodway	
ACTION: Implement their Drought Contingency Plan response stages.	
Hazard	Drought

Background	The local Drought Contingency Plan contains specific, quantified targets for water use restrictions. This includes drought response stages with triggers to begin and end at each stage.
Benefits	Each drought response stage will reduce the availability of water for certain events. Examples include not allowing the watering of lawns during the day or encouraging the use of xeriscape landscapes.
New or Existing Structures?	Existing structures
Priority	Medium
Estimated cost	No cost
Responsible organization	Woodway , Office of Emergency Management, Emergency Management Coordinator
Target completion date	Completed
Funding sources	No cost
Carried over?	No

Woodway	
ACTION: Burying overhead power lines for critical infrastructure	
Hazard	Winter Storm
Background	Exposed power lines are vulnerable to winter storms through ice accumulation or falling tree branches.
Benefits	Allows power to remain on at critical facilities, enabling them to function during disasters.
New or Existing Structures?	Existing structures
Priority	Low
Estimated cost	\$50,000
Responsible organization	Woodway , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	FEMA Hazard Mitigation Grant Program

Carried Over?	Yes
Other Information	Project carried over due to not completing all lines.

Woodway	
ACTION: Developing new water supplies	
Hazard	Drought
Background	Drought can create a shortage of available water for general public use and for fighting wildfires.
Benefits	Developing new water supplies, such as drilling new water wells, means that additional water supplies are available during periods of severe drought.
New or Existing Structures?	Existing and new structures
Priority	Medium
Estimated cost	\$1000000
Responsible organization	Woodway , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	U.S. Dept of Agriculture Grants, Local Funds
Carried Over?	Yes
Other Information	Project carried over due to lack of funding

Woodway	
ACTION: Ordinance	
Hazard	Drought
Background	Multiple cities throughout the United States have implemented the following ordinance- No Outside Watering from 10 am to 6 pm between May 1 and October 31 of each year.
Benefits	This reduces water usage as during this time it takes more water to irrigate during the heat of the day and this is the hottest time of the year.
New or Existing Structures?	Existing structures
Priority	Medium

Estimated cost	No cost
Responsible organization	Woodway , Office of Emergency Management, Emergency Management Coordinator
Target completion date	2023
Funding sources	Local funds
Carried Over?	No
Other Information	This is a new project for the 2018 Hazard Mitigation plan update.

SECTION FIFTEEN: PLAN MAINTENANCE

IMPLEMENTATION

This section discusses how this Hazard Mitigation Plan will be implemented by McLennan County and participating jurisdictions. It also addresses how the plan will be evaluated and improved over time and how the public will continue to be involved in the hazard mitigation planning process.

The County and each participating City will be responsible for implementing its own mitigation actions contained in Section 14. Each action has been assigned to a local government office that is responsible for implementing each specific action. When the governing body of each participating jurisdiction has adopted the Mitigation Action Plan for its jurisdiction, copies of the governing body resolutions will be contained in Appendix C (pending approval).

A funding source has been listed for each identified action. This source may be used when the jurisdiction begins to seek funds to implement the action. Participating jurisdictions will integrate implementation of their mitigation actions through other, already existing planning mechanisms such as capital improvement plans, long-range growth plans, master storm water and drainage plans, and regional planning efforts. Jurisdictions will ensure that the actions contained in the plan are reflected in these other planning efforts. These other planning efforts will be used to advance the mitigation strategies of the jurisdictions.

Each jurisdiction will conduct periodic reviews of their comprehensive and land use plans and policies and analyze the need for any amendments in light of the approved hazard mitigation plan. They will look to integrate data on natural events

that occur throughout the region as well as the state to improve the plan. The local planning mechanisms will also focus on meeting with the appropriate stakeholders on a yearly basis to improve the evaluations and additions to the overall plan. Participating jurisdictions will ensure that comprehensive or capital improvement planning in the future will also be integrated into this hazard mitigation plan to reduce the long-term risk to life and property from all hazards. Within one year of formal adoption of the hazard mitigation plan, existing planning mechanisms will be reviewed by each jurisdiction and incorporated into the plan, as necessary. The process to be used to integrate any plans into this mitigation plan will be for the local jurisdictions to amend their portion of the mitigation plan by including any action items from other planning mechanisms that are relevant to mitigation. Likewise, any mitigation actions that are relevant to comprehensive planning will be incorporated from the mitigation plan into those local comprehensive plans.

For this new update, the City of Waco has included a capital improvement project (CIP) to add another outdoor warning siren based upon the tornado hazard and growing population. Our social media pages are also more active about sharing information on the hazards that impact our area including sharing severe weather warnings from the natural weather service as well as nearby lake releases to mitigate the potential flooding.

Periodic revisions and updates of the plan are required to ensure that the goals, objectives, and mitigation actions are kept current. More importantly, revisions may be necessary to ensure that the plan is in full compliance with federal regulations and state statutes. This portion of the plan outlines the procedures for completing such revisions and updates.

Hazard mitigation team members from each jurisdiction are responsible for continually monitoring those components of the hazard mitigation plan that pertain to their jurisdiction. Table 15-1 below lists each jurisdictions representative and title.

Table 15-1: Representatives from Participating Jurisdictions

Jurisdiction - Agency	Name	Title
McLennan County	Elizabeth Thomas	EMC
City of Bellmead	William Hlavenka	EMC
City of Beverly Hills	Debra Bruce	EMC
City of Crawford	Brian Bolfig	EMC
City of Gholson	Daniel Buttry	EMC
City of Hallsburg	Mike Glockzin	EMC

City of Hewitt	Katie Allgood	EMC
City of Lacy-Lakeview	Jennifer Watkins	EMC
City of Leroy	Scott Garner	Mayor
City of Lorena	Jim Menefee	EMC
City of Mart	Trevor Baize	EMC
City of McGregor	Van Smith	EMC

City of Robinson	Phillip Prasifka	EMC
City of Ross	James Jaska	Mayor
City of Waco	Elizabeth Thomas	EMC
City of West	Harold Pfleiderer	Fire Chief/ Fire Marshall
City of Woodway	Bret Crook	Public Safety Director

On an annual basis, participating jurisdictions will notify the McLennan County Office of Emergency Management (OEM) of any needed changes in the plan based upon their monitoring activities. Each jurisdiction will be responsible for evaluating the plan and providing the updated at the county wide EMC meeting that is held twice a year. Each jurisdiction will be responsible for conducting a form of outreach to the public about the plan and reporting the results at the same meeting. Project status updates will also be presented at these same meetings.

This mitigation plan will be formally reviewed and updated within every five years to reflect any significant changes in the County and participating jurisdictions that might affect the plan. The previous plan was not incorporated into other planning mechanisms.

Procedure for Revisions and Updates

- Three years out from plan expiration, the McLennan County OEM will begin writing the plan update and will submit the draft plan to TDEM.
- As part of the monitoring process, team members will assess any changes in risk; determine whether implementation of mitigation actions is on schedule or if there are any implementation problems, such as technical, political, legal or coordination issues; and reflect changes in land development or programs that affect mitigation priorities or actions.
- Two years out from plan expiration, the revised draft plan will be submitted to TDEM, and eventually FEMA for review and approval.
- One year out from plan expiration, the revised plan will be Approved Pending Adoption by FEMA and will then be re-adopted by all of the participating jurisdictions.

The five-year review will be conducted under the auspices of the McLennan County OEM. Increased development, increased exposure to certain hazards, the development of new mitigation capabilities or techniques, and revisions to federal or state legislation are examples of changes that may affect the currency of the plan. The review also will give community officials an opportunity to

evaluate successful actions and to explore the possibility of documenting losses avoided because of actions taken. The plan also will need to be revised to reflect lessons learned following a disaster declaration or to address specific circumstances arising from changing conditions surrounding disaster events. Criteria to be included in the evaluation will include:

- The goals and objectives address current and expected conditions;
- The nature, magnitude, and/or type of risks has changed;
- The current resources are appropriate for implementing the plan;
- If there are any implementation problems, such as technical, political, legal, or coordination issues with other agencies;
- If the outcomes have occurred as expected; and,
- The agencies and other partners participated as originally proposed.

Based on the review, the plan will be updated or revised at least every five years. As part of the plan review under the auspices of the OEM, participating jurisdictions will be asked to: review each goal and objective to determine their continued relevance; review the risk assessment portion of the plan to determine if the information should be updated or modified; report on the status of each of their mitigation actions; report on which implementation processes worked well, any difficulties encountered, how coordination efforts are proceeding, and which mitigation actions should be revised; and evaluate the effectiveness of their mitigation action plans and recommend changes or amendments. The results will be summarized in a formal report issued by the OEM that will include an evaluation of the effectiveness and appropriateness of the plan, and will recommend required or desirable changes.

Plan Amendments

At any time, minor technical changes may be made to the plan to keep it up to date. However, any changes to the mitigation actions or major changes in the overall direction of the plan or the policies contained within it must be subject to formal adoption by the participating jurisdictions. As long as the plans of existing jurisdictions are not affected, additional jurisdictions may be added to the plan without requiring the existing jurisdictions to re-adopt the plan.

After initial adoption, amendments to the plan must be approved by the governing body of the participating county, city or and/or the OEM. Upon ratification, the amendment will be submitted to the Texas Division of Emergency Management.

Continued Public Involvement

Public input was an integral part of the preparation of this plan and will continue to be essential as the plan grows and changes. As with any officially adopted

plan or ordinance, a significant change to this plan shall require an opportunity for the public to make its views known.

This Hazard Mitigation Action Plan will be posted continuously on the website of the McLennan County Office of Emergency Management, where the public is invited to provide ongoing feedback. The public will be notified that the plan is available on the website through local media outlets, such as the Waco Tribune Herald newspaper.

Copies of this Hazard Mitigation Action Plan will also be kept in each jurisdiction and at the McLennan County Office of Emergency Management, located at 721 N 4th St., Waco, TX 76701, for public inspection and review.

Appendix A

McLennan County Hazard Mitigation Team

Jurisdiction - Agency	Name	Title	Role
McLennan County	Elizabeth Thomas	EMC	Lead the Hazard Mitigation Team
McLennan County	Ryan Dirker	AEMC	Provided input about local hazard vulnerabilities and created new mitigation actions and reviewed the draft plan.
City of Bellmead	William Hlavenka	Fire Chief/EMC/ Fire Marshall	Provided input about local hazard vulnerabilities and created new mitigation actions and reviewed the draft plan.
City of Beverly Hills	Debra Bruce	EMC	Provided input about local hazard vulnerabilities and created new mitigation actions and reviewed the draft plan.

City of Crawford	Brian Bolfig	EMC	Provided input about local hazard vulnerabilities and created new mitigation actions and reviewed the draft plan.
City of Gholson	Daniel Buttry	EMC	Provided input about local hazard vulnerabilities and created new mitigation actions and reviewed the draft plan.
City of Hallsburg	Mike Glockzin	EMC	Provided input about local hazard vulnerabilities and created new mitigation actions and reviewed the draft plan.
City of Hewitt	Katie Allgood	EMC / ACM	Provided input about local hazard vulnerabilities and created new mitigation actions and reviewed the draft plan.
City of Lacy-Lakeview	Jennifer Watkins	EMC	Provided input about local hazard vulnerabilities and created new mitigation actions and reviewed the draft plan.
City of Leroy	Scott Garner	Mayor	Provided input about local hazard vulnerabilities and created new mitigation actions and reviewed the draft plan.

City of Lorena	Tom Dickson	Fire Chief/ EMC	Provided input about local hazard vulnerabilities and created new mitigation actions and reviewed the draft plan.
City of Mart	Trevor Baize	EMC	Provided input about local hazard vulnerabilities and created new mitigation actions and reviewed the draft plan.
City of McGregor	Van Smith	EMC	Provided input about local hazard vulnerabilities and created new mitigation actions and reviewed the draft plan.

City of Robinsion	Phillip Prasifka	Police Chief	Provided input about local hazard vulnerabilities and reviewed the draft plan.
City of Ross	Jim Jaska	Mayor	Provided input about local hazard vulnerabilities and reviewed the draft plan.
City of Waco	Elizabeth Thomas	EMC	Lead the Hazard Mitigation Team
City of Waco	Ryan Dirker	AEMC	Provided input about local hazard vulnerabilities and created new mitigation actions and reviewed the draft plan.
City of West	Harold Pfeiderer	EMC/ Fire Marshall	Provided input about local hazard vulnerabilities and created new mitigation actions and reviewed the draft plan.
City of Woodway	Bret Crook	Director of Public Safety	Provided input about local hazard vulnerabilities and created new mitigation actions and reviewed the draft plan.

Appendix B

Critical Facilities for all participating jurisdictions

LOCATION	FACILITY	TYPE	VALUE (\$1,000)
McLennan	China Spring Fire Dept	Fire Station	534
McLennan	West City Fire Dept	Fire Station	534
McLennan	Elm Mott Fire Dept	Fire Station	534
McLennan	Leroy Volunteer Fire Dept	Fire Station	534
McLennan	Valley Mills Fire Dept	Fire Station	534
McLennan	Speegleville Fire Dept	Fire Station	534
McLennan	Waco Fire Dept	Fire Station	534
McLennan	Waco Fire Dept	Fire Station	534
McLennan	Waco Fire Dept	Fire Station	534
McLennan	Chalk Bluff Volunteer Fire Dpt	Fire Station	534
McLennan	Waco Fire Maintenance Shop	Fire Station	534
McLennan	Bellmead Fire Dept	Fire Station	534
McLennan	Waco Fire Training Ctr	Fire Station	534
McLennan	Lacy-Lakeview Fire Dept	Fire Station	534
McLennan	Waco Fire Dept	Fire Station	534
McLennan	Waco Fire Dept	Fire Station	534
McLennan	Fire Dept	Fire Station	534
McLennan	Bellmead Fire Dept Adm	Fire Station	534
McLennan	Crawford Non-Emergency Fire	Fire Station	534
McLennan	Crawford Fire Dept	Fire Station	534
McLennan	Hewitt Volunteer Fire Dept	Fire Station	534
McLennan	Hewitt City Police Dept	Fire Station	534
McLennan	Waco Fire Dept	Fire Station	534
McLennan	Waco Fire Dept	Fire Station	534
McLennan	Woodway Fire Dept	Fire Station	534
McLennan	Waco Fire Dept	Fire Station	534
McLennan	Robinson Fire Dept	Fire Station	534
McLennan	Waco Fire Dept	Fire Station	534
McLennan	Beverly Hills Fire Dept	Fire Station	534
McLennan	Downsville Volunteer Fire Dept	Fire Station	534
McLennan	Lorena Fire Dept	Fire Station	534
McLennan	Riesel Fire Dept	Fire Station	534
McLennan	Mart Fire Department	Fire Station	534
McLennan	Mc Gregor Fire Dept	Fire Station	534
McLennan	West City Police Station	Police Station	1,246
McLennan	Waco Police Drug Enforcement	Police Station	1,246
McLennan	Bellmead Police Community Ofc	Police Station	1,246
McLennan	Sheriff's Dept	Police Station	1,246

LOCATION	FACILITY	TYPE	VALUE (\$1,000)
McLennan	Police Dept	Police Station	1,246
McLennan	Waco Police Family Violence	Police Station	1,246
McLennan	Mc Lennan Criminal Court	Police Station	1,246
McLennan	Bellmead Police Dept	Police Station	1,246
McLennan	Lacy-Lakeview Police Dept	Police Station	1,246
McLennan	Mc Lennan County Sheriff	Police Station	1,246
McLennan	Waco Police Dept	Police Station	1,246
McLennan	Waco Police Community Svc	Police Station	1,246
McLennan	Mc Lennan County Constable	Police Station	1,246
McLennan	Hewitt City Police Dept	Police Station	1,246
McLennan	Crimes Against Child Unit Waco	Police Station	1,246
McLennan	Woodway Police Dept	Police Station	1,246
McLennan	Mc Lennan County Constable	Police Station	1,246
McLennan	Robinson Police Dept	Police Station	1,246
McLennan	Mc Lennan County Sheriff's	Police Station	1,246
McLennan	Beverly Hills Police Dept	Police Station	1,246
McLennan	Waco ISD Safety/Police Dept	Police Station	1,246
McLennan	Lorena Police Dept	Police Station	1,246
McLennan	Mc Gregor City Police	Police Station	1,246
McLennan	Police Dept	Police Station	1,246
McLennan	Waco City Of	Potable Water	29,637
McLennan	Waco City Of-WTP-Mt Carmel-MCL	Potable Water	29,637

Source: HAZUS-MH

Appendix C: Resolutions approving the Plan

Appendix D: Emergency Action Plans

The following information is taken from the Emergency Action Plans for high hazard dams controlled by McLennan County. These include dams located in the Cow Bayou Watershed, Castleman Creek and Tehuacana Creek areas.

Table 1: List of High Hazard Dams in McLennan County

COW BAYOU WS SCS SITE 10 DAM	CASTLEMAN CREEK WS SCS SITE 1 DAM	TEHUACANA CREEK WS SCS SITE 14 DAM
COW BAYOU WS SCS SITE 26 DAM	CASTLEMAN CREEK WS SCS SITE 2 DAM	TEHUACANA CREEK WS SCS SITE 15 DAM
COW BAYOU WS SCS SITE 29 DAM	CASTLEMAN CREEK WS SCS SITE 3 DAM	TEHUACANA CREEK WS SCS SITE 17 DAM
	CASTLEMAN CREEK WS SCS SITE 6 DAM	TEHUACANA CREEK WS SCS SITE 18 DAM
		TEHUACANA CREEK WS SCS SITE 20 DAM
		TEHUACANA CREEK WS SCS SITE 21 DAM
		TEHUACANA CREEK WS SCS SITE 22 DAM
		TEHUACANA CREEK WS SCS SITE 23 DAM
		TEHUACANA CREEK WS SCS SITE 24 DAM
		TEHUACANA CREEK WS SCS SITE 25 DAM
		TEHUACANA CREEK WS SCS SITE 26 DAM

PROJECT DESCRIPTION - CBW - SITE 10

National Inventory of Dams: TX04081 Possible

Infrastructure Damage: Spring Valley Road (FM-2113) and Box Ranch Road.

Sponsors: McLennan County (County)

OWNERSHIP AND LOCATION

Dam property owner: Lance High, 254-857-8007, 254-776-7283

Site 10 Dam is approximately 6 miles northeast of Lorena, in McLennan County, Texas.

A vicinity and precinct map for the dam and surrounding area is found in Tab B. Flows into North Cow Bayou.

Property owners are identified in the Tab G.

The hazard potential classification is "high".

ENGINEERING DETAILS

Latitude and longitude of the dam are 31.400223 W and -97.301198 N.

Type of Dam: Earthen Berm

Drainage Area: 1,819 acres

Principal Spillway: 30" x 30"

Inflow - 4 ports 8" x 8" x 3'

Principal Spillway Capacity: N/A cfs

Auxiliary Spillway Max Capacity: 2,555 cfs

Maximum Storage Volume: 836 acre feet

Elevations (Mean Sea Level): 672 - 652 msl

Principal Spillway Crest: 657.07 (msl)

Auxiliary Spillway Crest: 667.3 (msl)

Top of Dam: 672.6 (msl)

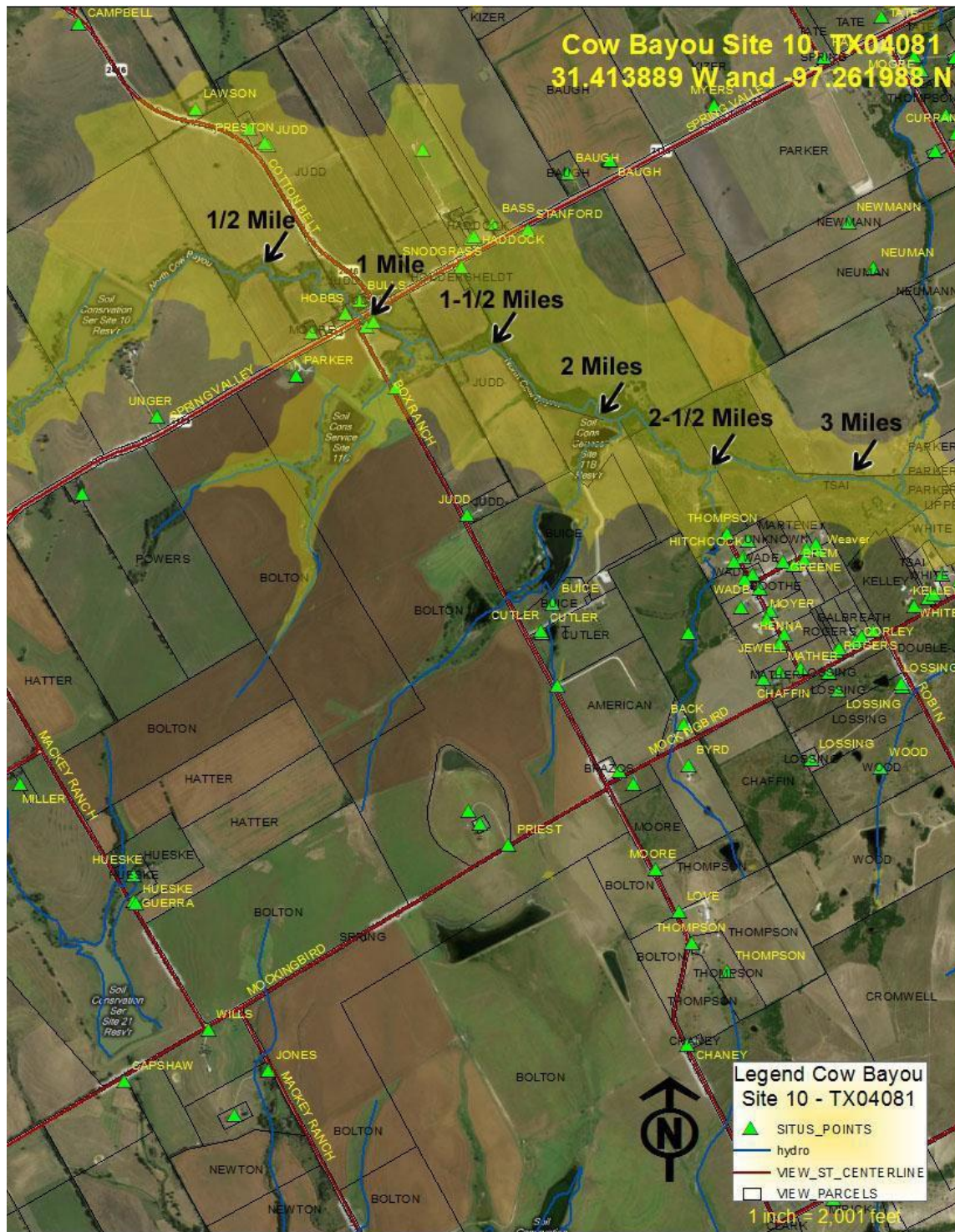
Breach Qmax for Hazard Classification = 17,521 cfs

The gate valve on the dam is normally closed. The service and emergency spillways drain into North Cow Bayou. Infrastructure damage is possible

Figure 1: Location of Cow Bayou 10 Dam



Figure 2: Location of Cow Bayou 10 Dam Inundation Area



PROJECT DESCRIPTION - CBW - SITE 26

National Inventory of Dams: TX04088 Possible

Infrastructure Damage: Forest Creek Lane, Crescent Creek Lane and I-35

Sponsors: McLennan County (County)

OWNERSHIP AND LOCATION

Dam property owner: Gordon Robinson, 254-756-4411, ext. 302

Site 26 Dam is approximately 1.5 miles north of Bruceville, Texas, in McLennan County, Texas.

A vicinity and precinct map for the dam and surrounding area is found in Tab B.

Flows into dry branch then into the South Fork Cow Bayou.

Property owners are identified in the Tab G.

The hazard potential classification is “high”.

ENGINEERING DETAILS

Latitude and longitude of the dam are 31.343222 W and -97.228817 N.

Type of Dam: Earthen Berm

Drainage Area: 435 acres

Principal Spillway: 5" x 4.6' inlet

Inflow - 0 ports

Principal Spillway Capacity: N/A cfs

Auxiliary Spillway Max Capacity: 1,087 cfs

Maximum Storage Volume: 200 acre feet

Elevations (Mean Sea Level): 588 – 554 msl

Principal Spillway Crest: 571.6 (msl)

Auxiliary Spillway Crest: 582.5 (msl)

Top of Dam: 588 (msl) Breach Qmax for Hazard Classification: 44,274

The gate valve on the dam is normally closed. The service and emergency spillways drain into North Cow Bayou. Infrastructure damage is possible for Forest Creek Lane, Crescent Creek Lane and I-35.

Figure 3: Location of Cow Bayou 26 Dam

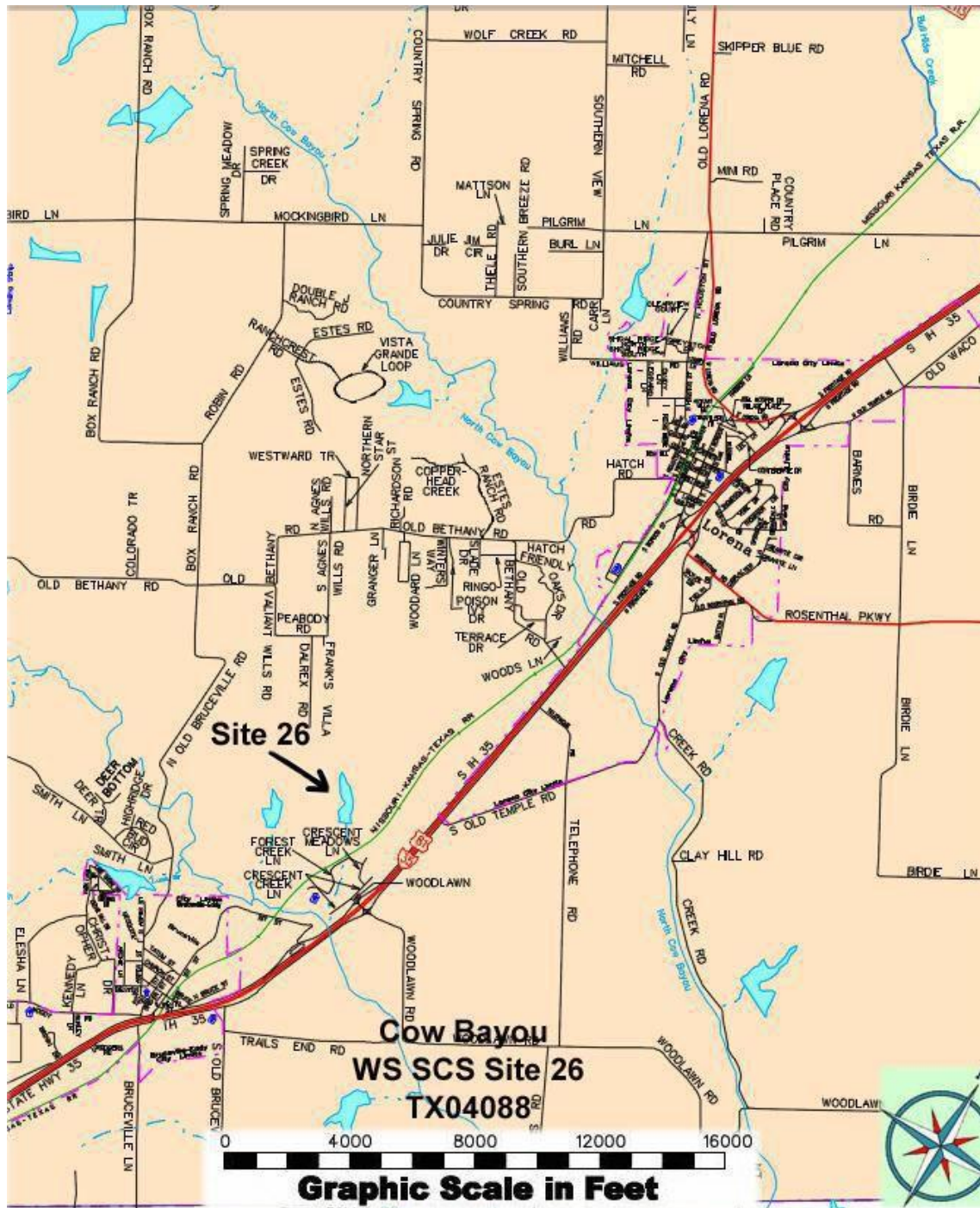
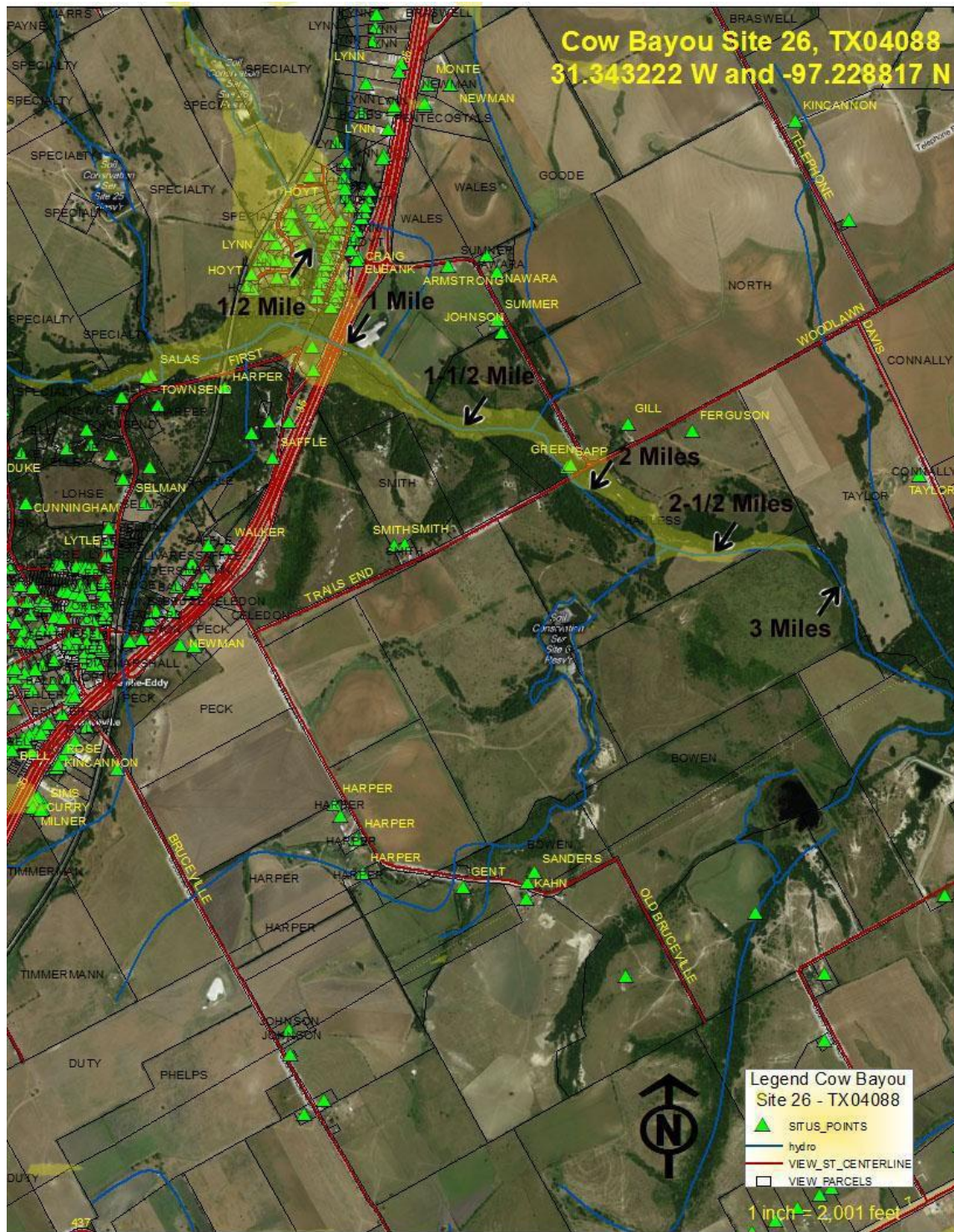


Figure 4: Location of Cow Bayou 26 Dam Inundation Area



PROJECT DESCRIPTION - CBW - SITE 29

National Inventory of Dams: TX04090 Possible

Infrastructure Damage: Creek Road and Woodlawn Road

Sponsors: McLennan County (County)

OWNERSHIP AND LOCATION

Dam property owner: Robert Braswell, 254-744-9310

Site 29 Dam is approximately 3 miles southeast of Lorena, Texas, in McLennan County, Texas.

A vicinity and precinct map for the dam and surrounding area is found in Tab B. Flows into North Cow Bayou.

Property owners are identified in the Tab G.

The hazard potential classification is "high".

ENGINEERING DETAILS

Latitude and longitude of the dam are 31.400223 W and -97.301198 N.

Type of Dam: Earthen Berm

Drainage Area: 1,298 acres

Principal Spillway: 24" x 48" inlet

Inflow - 1 ports 24" x 48" x 14'

Principal Spillway Capacity: N/A cfs

Auxiliary Spillway Max Capacity: 2,457 cfs

Maximum Storage Volume: 590.6 acre feet

Elevations (Mean Sea Level): 513.9 - 482 msl

Principal Spillway Crest: 499.6 (msl)

Auxiliary Spillway Crest: 510.0 (msl)

Top of Dam: 513.9 (msl)

Breach Qmax for Hazard Classification: 39,348

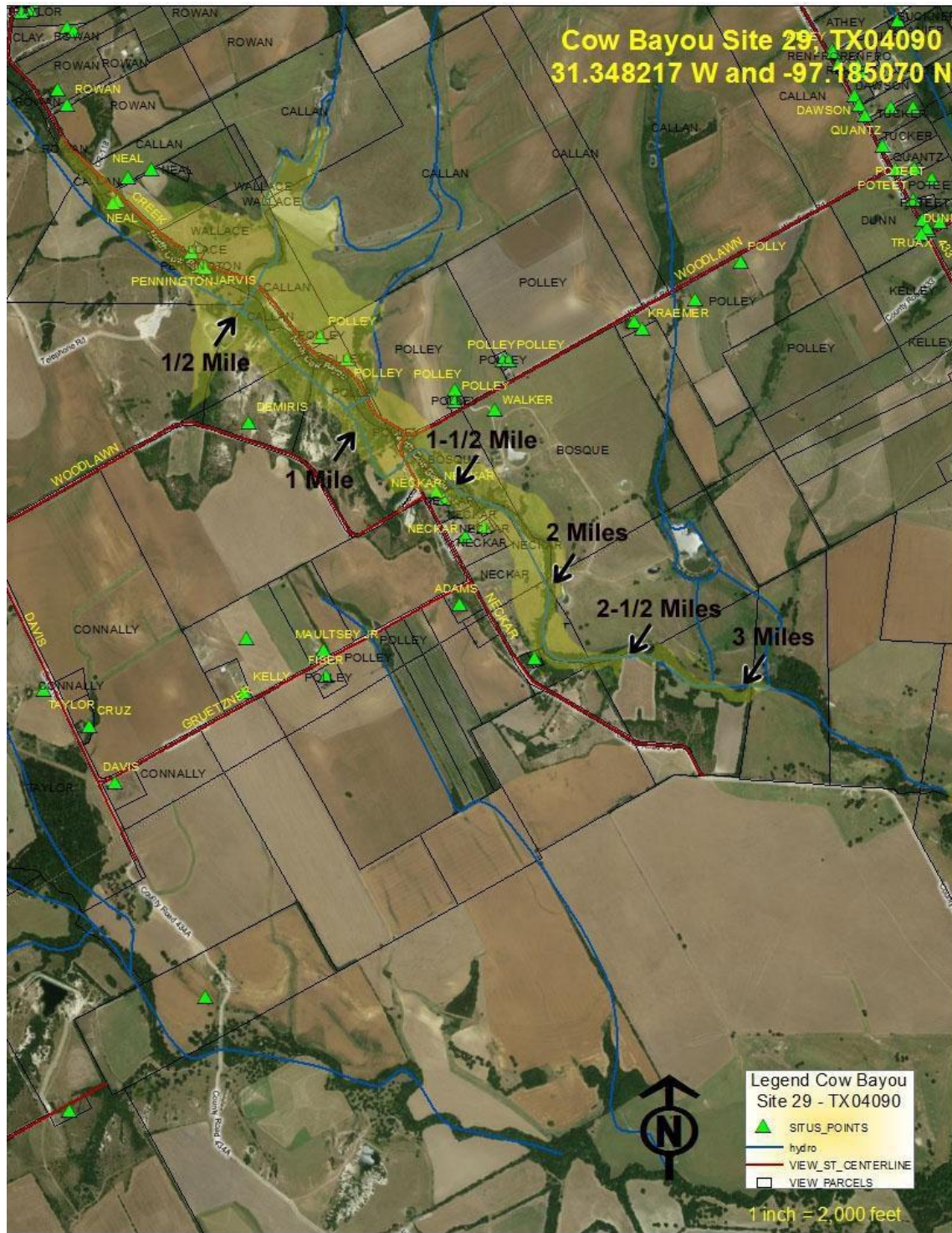
The gate valve on the dam is normally closed. The service and emergency spillways drain into North Cow Bayou. Infrastructure damage is possible to Creek Road and Woodlawn Road.

Cow Bayou
WS SGS Site 29
TX04090

0 4000 8000 12000 16000

Graphic Scale in Feet

Figure 6: Location of Cow Bayou 29 Dam Inundation Area



PROJECT DESCRIPTION - CCWID - SITE 1

National Inventory of Dams: TX04091 Possible

Infrastructure Damage: Hillside Drive, Hwy 77 and S. Old Robinson Road

Sponsor

1. Castleman Creek Water Improvement District No. 1 (CCWID)
2. McLennan County (County)

OWNERSHIP AND LOCATION

Dam property owner: Don Lewis 254-776-0764, Wk. 254-756-1300

Site 1 Dam is approximately 7 miles south of Waco, south of Moonlight Drive and west of Hillside in McLennan County, Texas.

A vicinity and precinct map for the dam and surrounding area is found in Tab B. Flows into Castleman Creek.

Property owners are identified in the Tab G.

The hazard potential classification is "high".

ENGINEERING DETAILS

Latitude and longitude of the dam are 31.431673 W and -97.129688 N.

Type of Dam: Earthen Berm

Drainage Area: 8006 acres

Principal Spillway: 3' x 3' x 15' inlet

Inflow – 6 ports, 5" x 10" x 15' & 8 ports 6" x 10" x 15'

Principal Spillway Capacity: 209 cfs

Auxiliary Spillway Max Capacity: 2,785 cfs

Maximum Storage Volume: 4,288 acre feet

Elevations (Mean Sea Level): 487 - 444 msl

Principal Spillway Crest: 459.6 (msl)

Auxiliary Spillway Crest: 480 (msl)

Top of Dam: 480 (msl)

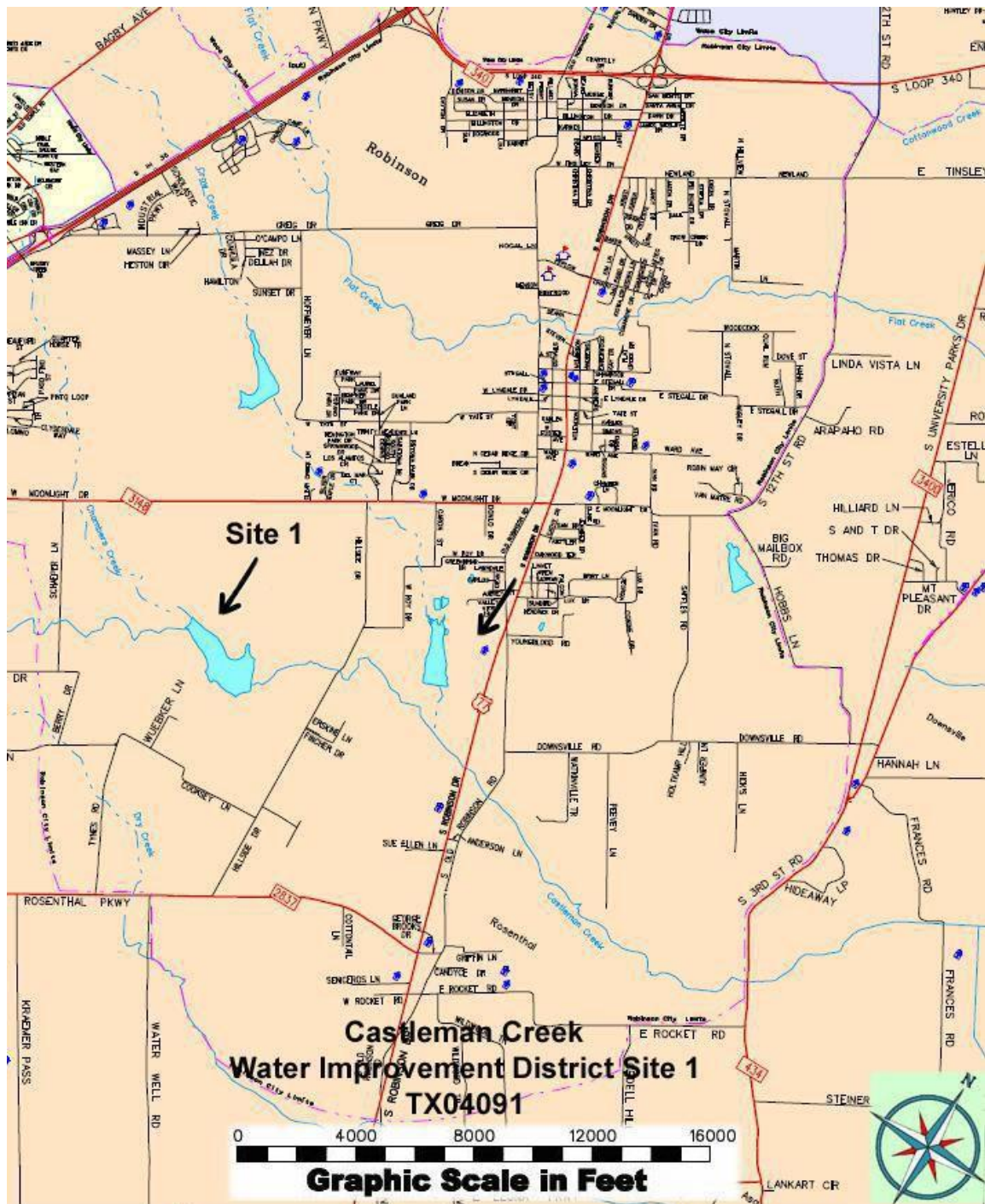
The gate valve on the dam is normally closed. The service and emergency spillways drain down into downstream of Castleman Creek. Infrastructure damage is possible to Hillside Drive, Hwy 77 and S. Old Robinson Road

Emergency Action Plan -

Castleman Creek Water Improvement District - Site 1.

CCWID Site 1

Figure 7: Location of Castleman Creek Site 1 Dam



CCWID Site 1, TX04091
31.431673 W and -97.129688 N

Legend Castleman Creek
Site 1 - TX04091

- ▲ SITU_POINTS
- hydro
- VIEW_ST_CENTERLINE
- VIEW_PARCELS

1 inch = 2,000 feet

Emergency Action Plan - Castleman Creek Water Improvement District - Site

PROJECT DESCRIPTION - CCWID - SITE 2

National Inventory of Dams: TX04092 Possible

Infrastructure Damage: West Tate Street, Silver Maple Drive and West Moonlight Drive, Hillside Drive and possibly West Roy Drive.

Sponsor

1. Castleman Creek Water Improvement District No. 1 (CCWID)
2. McLennan County (County)

OWNERSHIP AND LOCATION

Dam property owner: Elnor NV, Inc., 909-215-6399, 254-338-2585
Site 2 Dam is approximately 5 miles south of Waco and 2 miles west of Robinson.
A vicinity and precinct map for the dam and surrounding area is found in Tab B.
Flows into Crow Creek then into Site 3 reservoir.
Property owners are identified in the Tab G.
The hazard potential classification is “high”.

ENGINEERING DETAILS

Latitude and longitude of the dam are 31.454849 W and -97.143388 N.
Type of Dam: Earthen Berm
Drainage Area: 434 acres
Principal Spillway: N/A
Inflow – 1 port, 2' x 4' x 11'
Principal Spillway Capacity: 34 cfs
Auxiliary Spillway Max Capacity: 1,086 cfs
Maximum Storage Volume: 827 acre feet
Elevations (Mean Sea Level): 420 - 487 msl
Principal Spillway Crest: 500.6 (msl)
Auxiliary Spillway Crest: 513 (msl)
Top of Dam: 517.7 (msl)

The gate valve on the dam is normally closed. The service and emergency spillways drain into the downstream of Crow Creek then downstream into CCWID Site 3.
Infrastructure damage is possible to West Tate Street, Silver Maple Drive and West Moonlight Drive, Hillside Drive and possibly West Roy Drive.

Figure 9: Location of Castleman Creek Site 2 Dam

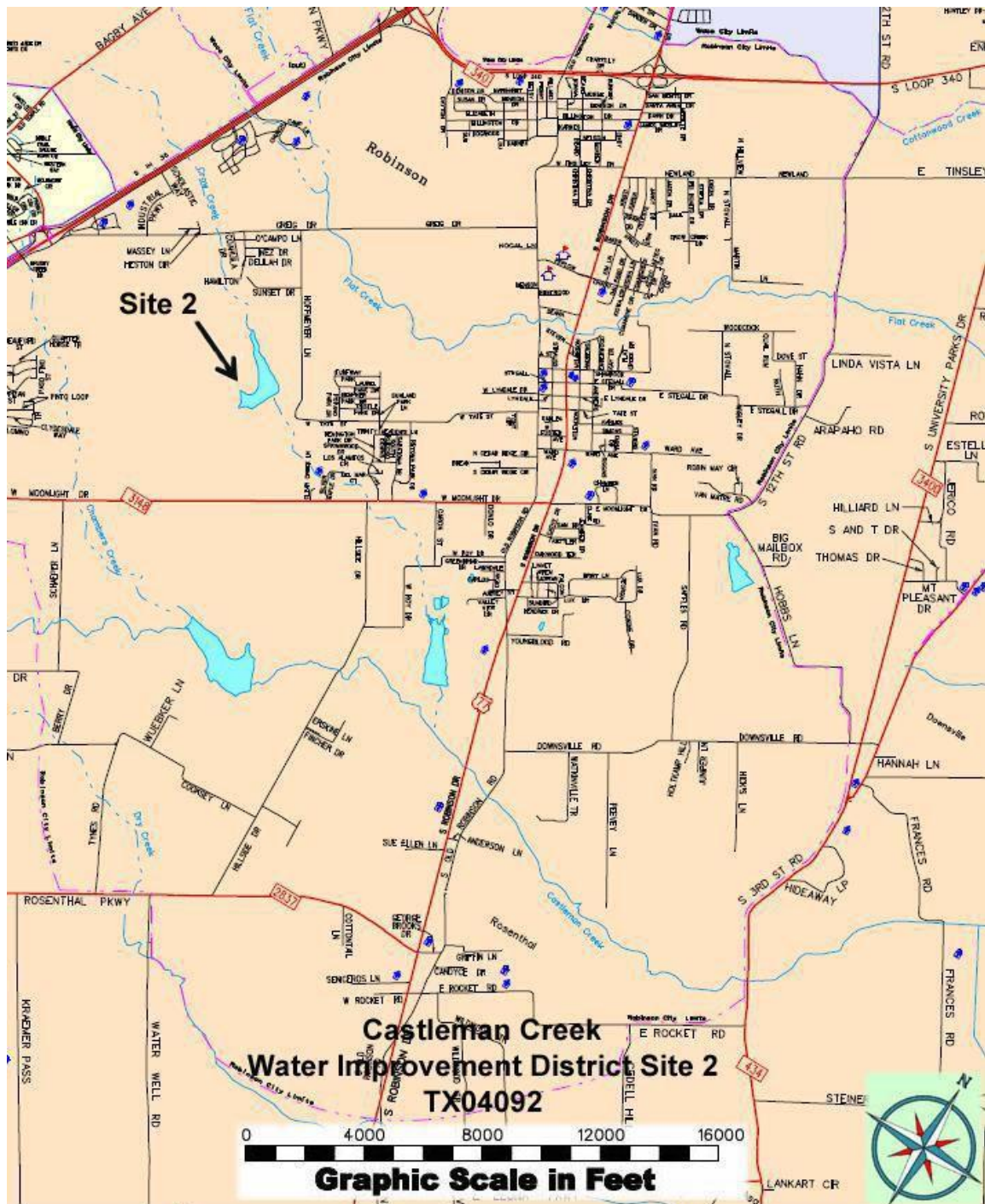
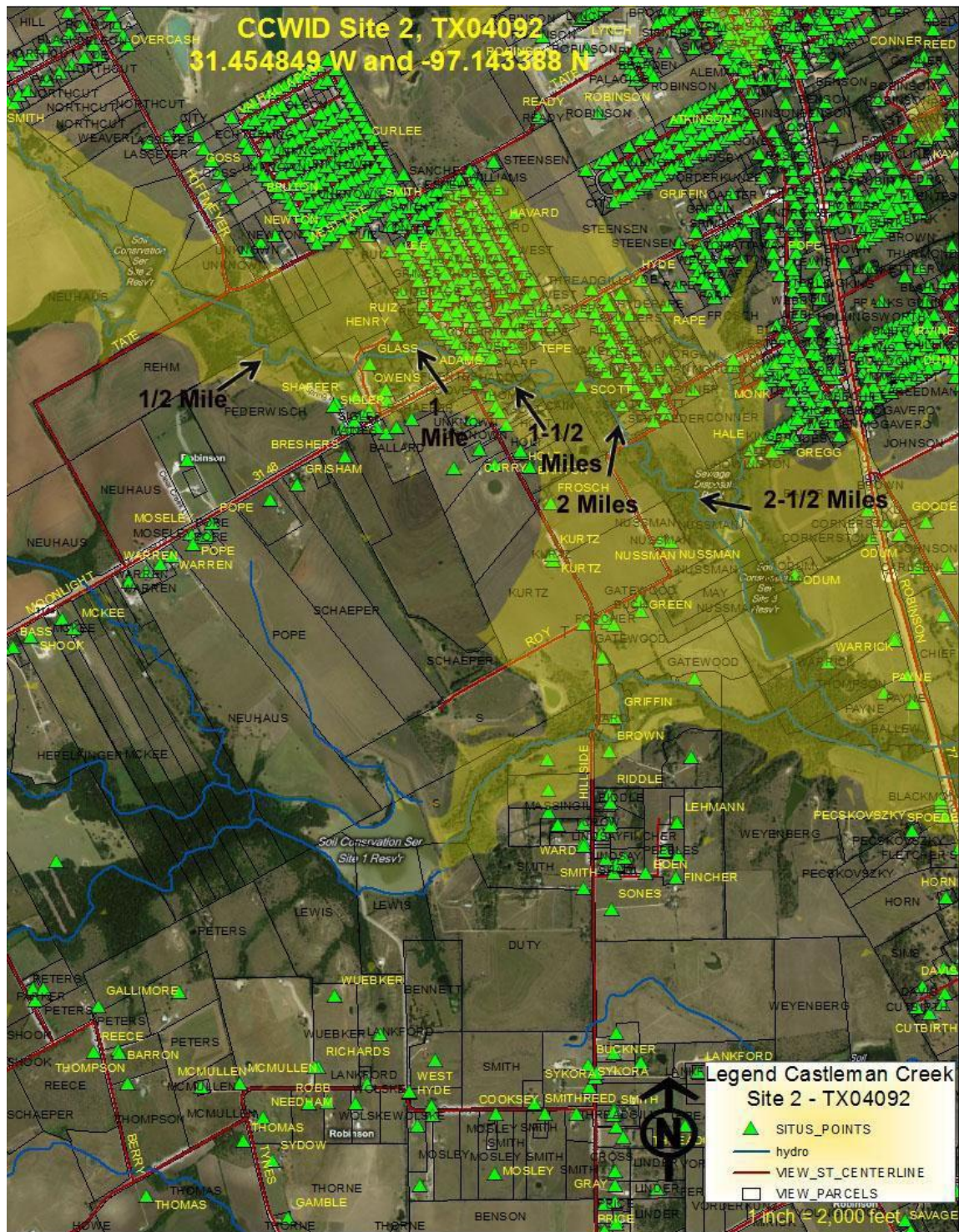


Figure 10: Location of Castleman Creek Site 2 Dam Inundation Area



PROJECT DESCRIPTION - CCWID - SITE 3

National Inventory of Dams: TX04095 Possible

Infrastructure Damage: Hwy. 77 and S. Old Robinson Road

Sponsor

1. Castleman Creek Water Improvement District No. 1 (CCWID)
2. McLennan County (County)

OWNERSHIP AND LOCATION

Dam property owner: Mike Warwick, (254) 662-5390

Site 3 Dam is approximately 3 miles south of Waco.

A vicinity and precinct map for the dam and surrounding area is found in Tab B.

Flows into dry branch then into Castleman Creek.

Property owners are identified in the Tab G.

The hazard potential classification is "high".

ENGINEERING DETAILS

Latitude and longitude of the dam are 31.439321 W and -97.112626 N.

Type of Dam: Earthen Berm

Drainage Area: 1,363 acres

Principal Spillway: N/A

Inflow – 1 port, 24" x 72" x 10'

Principal Spillway Capacity: 70 cfs

Auxiliary Spillway Max Capacity: 2,355 cfs

Maximum Storage Volume: 573 acre feet

Elevations (Mean Sea Level): 452.9 – 427.6 msl

Principal Spillway Crest: 437 (msl)

Auxiliary Spillway Crest: 449 (msl)

Top of Dam: 452.1 (msl)

The gate valve on the dam is normally closed. The service and emergency spillways drain into dry branch then into downstream of Castleman Creek. Infrastructure damage is possible to Hwy. 77 and S. Old Robinson Road.

Figure 11: Location of Castleman Creek Site 3 Dam

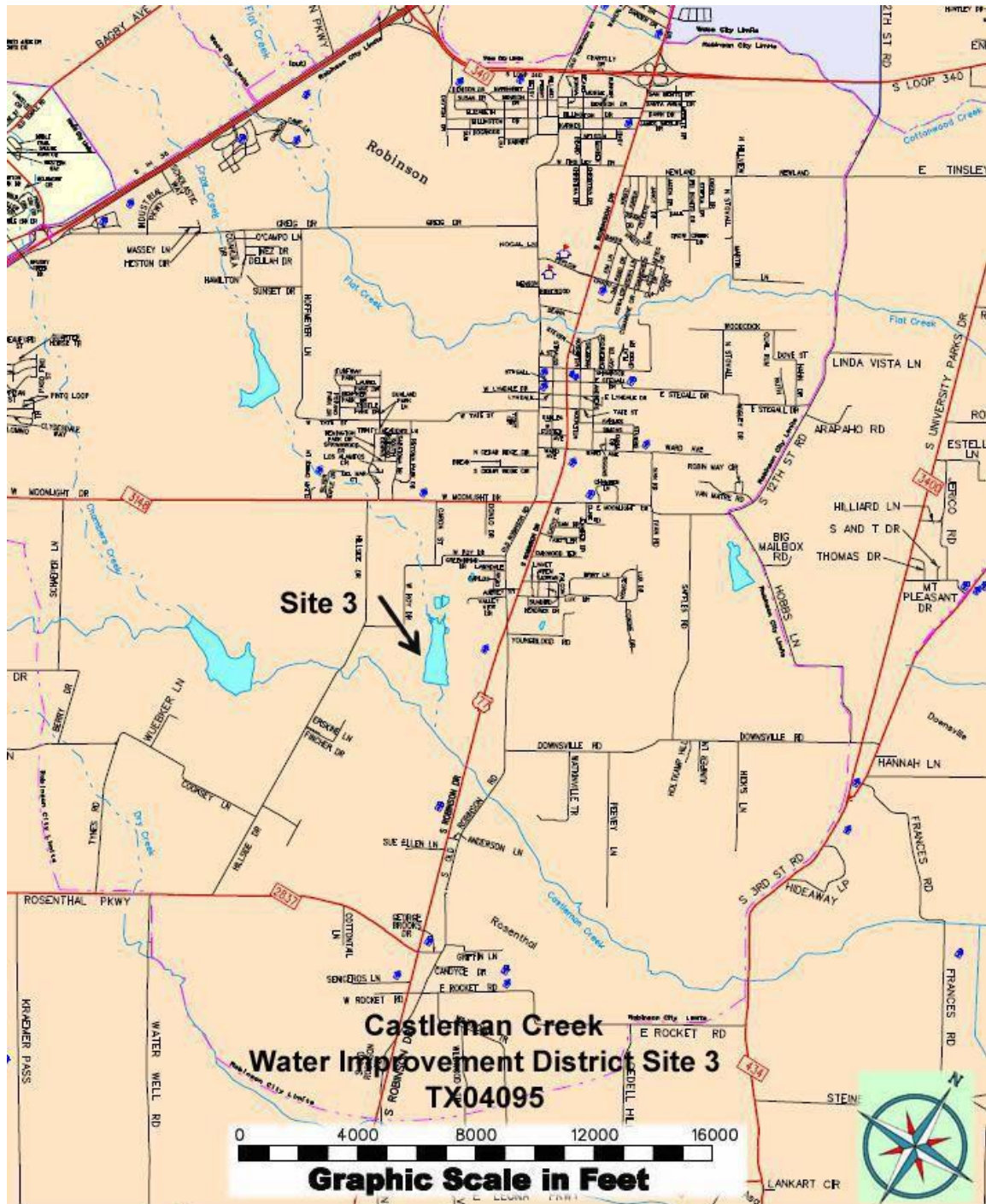
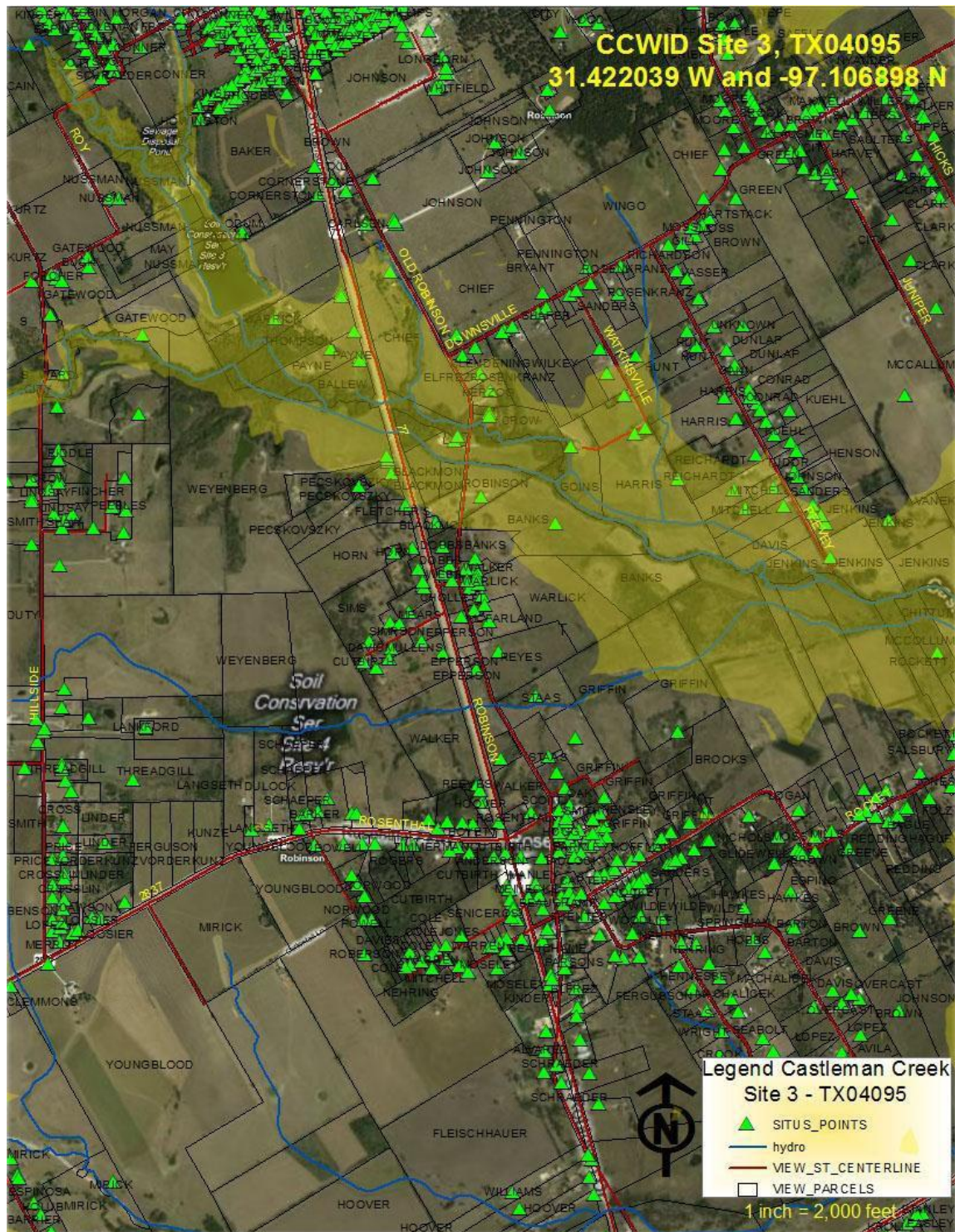


Figure 12: Location of Castleman Creek Site 3 Dam Inundation Area



Emergency Action Plan - Castleman Creek Water Improvement District -
Site 6

PROJECT DESCRIPTION - CCWID - SITE 6
National Inventory of Dams: TX04096 Possible
Infrastructure Damage: Hobbs Lane

Sponsor

1. Castleman Creek Water Improvement District No. 1 (CCWID)
2. McLennan County (County)

OWNERSHIP AND LOCATION

Dam property owner: James Lauderdale, (254) 662-3694

Site 6 Dam is approximately 6 miles south of Waco.

A vicinity and precinct map for the dam and surrounding area is found in Tab B.

An Unnamed Tributary flows into Site 6 then flows into Castleman Creek.

Property owners are identified in the Tab G.

The hazard potential classification is "high".

ENGINEERING DETAILS

Latitude and longitude of the dam are 31.461556 W and -97.088383 N.

Type of Dam: Earthen Berm

Drainage Area: 922 acres

Principal Spillway: N/A

Inflow – 1 port, 2' x 4' x 8'

Principal Spillway Capacity: 28 cfs

Auxiliary Spillway Max Capacity: 1,083 cfs

Maximum Storage Volume: 438 acre feet

Elevations (Mean Sea Level): 436.8 – 420.8 msl

Principal Spillway Crest: 420.8 (msl)

Auxiliary Spillway Crest: 433.5 (msl)

Top of Dam: 436.8 (msl)

The gate valve on the dam is normally closed. The service and emergency spillways drain into the downstream of Castleman Creek. Infrastructure minor damage is possible to a few downstream structures.

Figure 13: Location of Castleman Creek Site 6 Dam

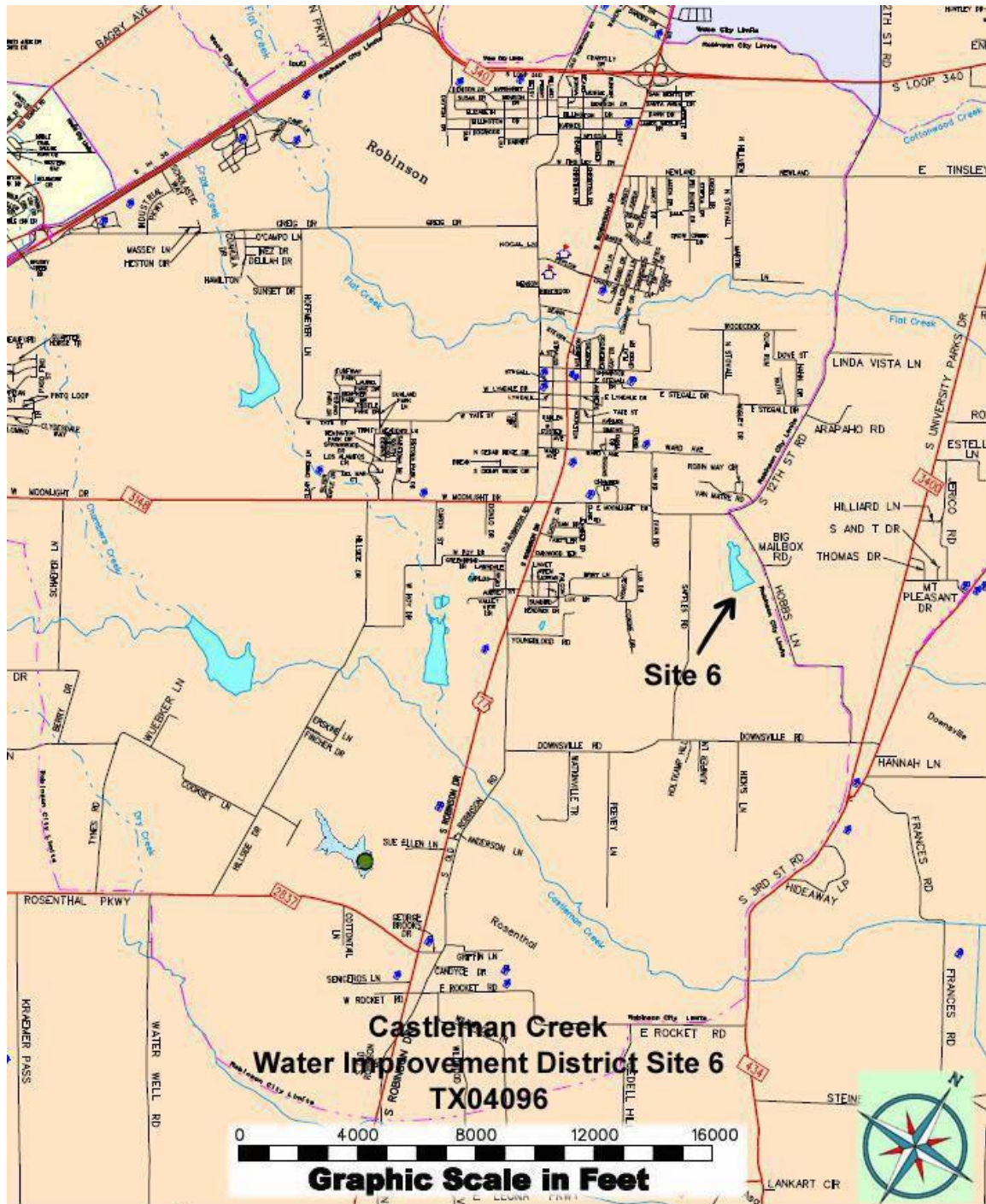
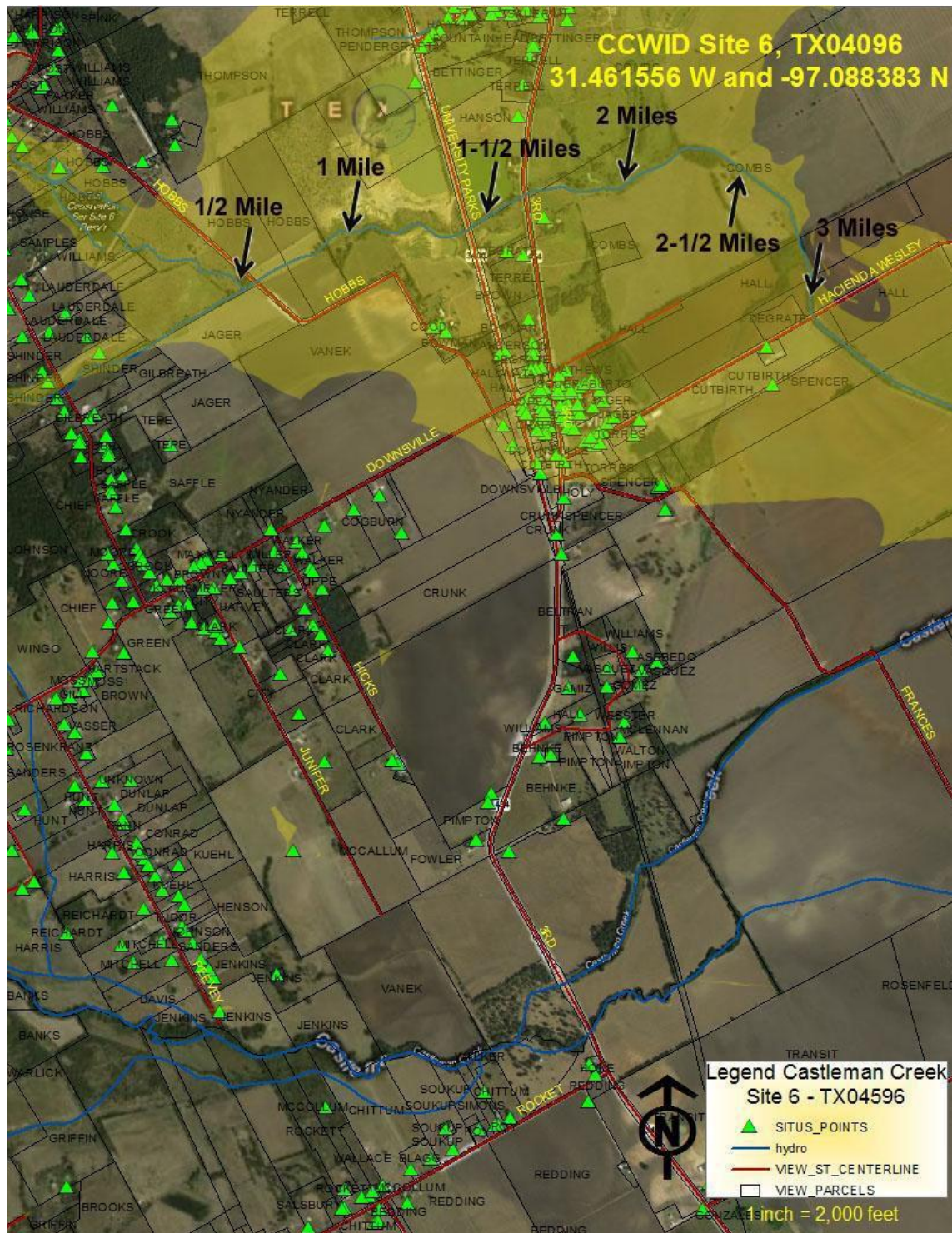


Figure 14: Location of Castleman Creek Site 6 Dam Inundation Area



Emergency Action Plan - Tehuacana Creek Water Improvement District -
Site 14

PROJECT DESCRIPTION - TCWID - SITE 14

National Inventory of Dams: TX 04103

Potential infrastructure damage: Pleasant Hill Road

Sponsors

1. Hill and McLennan Counties Tehuacana Creek Water Improvement District No. 1 (TCWID)
2. McLennan County (County)

OWNERSHIP AND LOCATION

Dam property owner: Robert Birdwell, 254-863-5941

Jay Paris, 254-863-5245

Site 14 Dam is approximately 11 miles northeast of Waco and just east of TSTC Campus in McLennan County, Texas.

A vicinity and precinct map for the dam and surrounding area is found in Tab B.

Wildcat Creek flows into Tehuacana Creek.

Property owners are identified in the Tab G.

The hazard potential classification is high.

ENGINEERING DETAILS

Latitude and longitude of the dam are 31.654508 W and -97.020790 N.

Type of Dam: Earthen Berm

Drainage Area: 1,862 acres

Principal Spillway: Inflow - 1 ports, 24" x 48" x 14'

Principal Spillway Capacity: not available

Auxiliary Spillway Type and Max Capacity: 3,538 cfs

Maximum Storage Volume: 950 acre feet

Elevations (Mean Sea Level): 468 - 432 msl

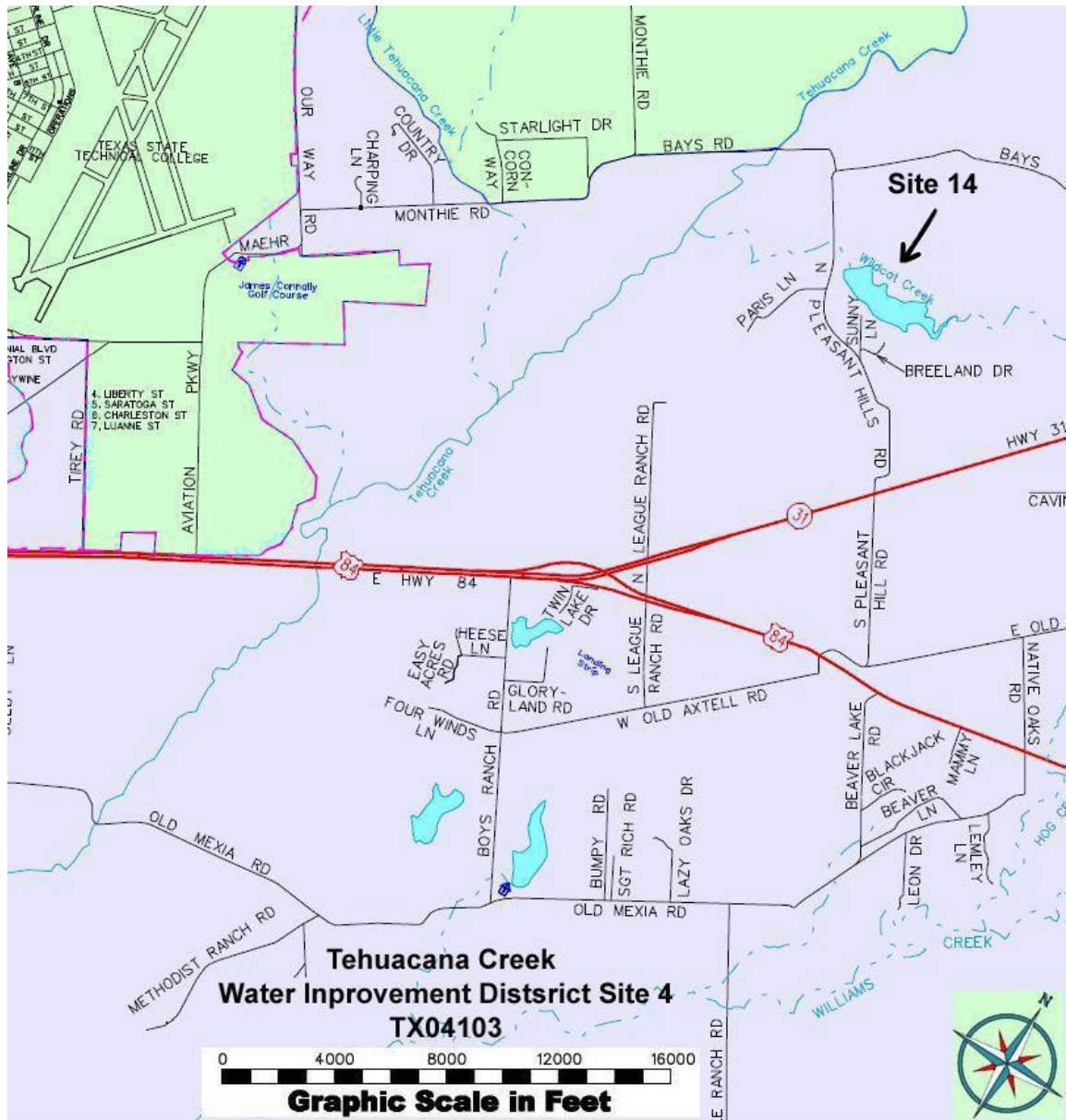
Principal Spillway Crest: 447.8 (msl)

Auxiliary Spillway Crest: 462.5 (msl)

Top of Dam: 468 (msl)

The gate valve on the dam is normally closed. The service and emergency spillways drain into Wildcat Creek down into the channel Tehuacana Creek. Infrastructure damage is possible for Pleasant Hill Road.

Figure 15: Location of Tehuacana Creek Site 14 Dam



TCWID Site 14, TX04103
31.654508 W and -97.020790 N

1 Mile
 1-1/2 Miles
 2 Miles

Legend - TCWID Site 14, TX04103

- VIEW_ST_CENTERLINE
- VIEW_OWNER_PARCELS
- SITUS_POINTS - 911 ADDRESSES
- hydro

1 inch = 2,000 feet

PROJECT DESCRIPTION - TCWIC – SITE 15

NATIONAL INVENTORY OF DAMS: TX04104

Possible infrastructure damage: Mazanec Road

1. Sponsors

Hill and McLennan Counties Tehuacana Creek Water Improvement District No. 1
(TCWID)

McLennan County (County)

2. OWNERSHIP AND LOCATION

Dam property owner: Mark Mazanec; Home - 254-799-2794, Office – 254-799-0291
Site 15 Dam is approximately 11 miles from north, north east of Waco in McLennan
County, Texas.

A vicinity and precinct map for the dam and surrounding area is found in Tab B. Post
Oak Creek flows into Little Tehuacana Creek then flows into Tehuacana Creek.

Property owners are identified in the Tab G.

The hazard potential classification is high.

ENGINEERING DETAILS

The Latitude and Longitude of the dam are 31.666650 W, -97.051365 N.

Type of Dam: Earthen Berm

Drainage Area: 3,680 acres

Principal Spillway: 230' x 30'

Inflow - 12 ports, 2' 6" x 8'4" x 8'9"

Principal Spillway Capacity: 120 cfs

Auxiliary Spillway Type and Max Capacity: 6,106 cfs

Maximum Storage Volume: 2,131 acre feet

Elevations (Mean Sea Level): 441.47 – 471.2

Principal Spillway Crest: 452.2

Auxiliary Spillway Crest: 466.5

Top of Dam: 471.2

The gate valve on the dam is normally closed. The service and emergency spillways
drain into the downstream channel of Little Tehuacana Creek then into Tehuacana
Creek. Infrastructure damage to Mazanec Road is possible.

Figure 17: Location of Tehuacana Creek Site 15 Dam

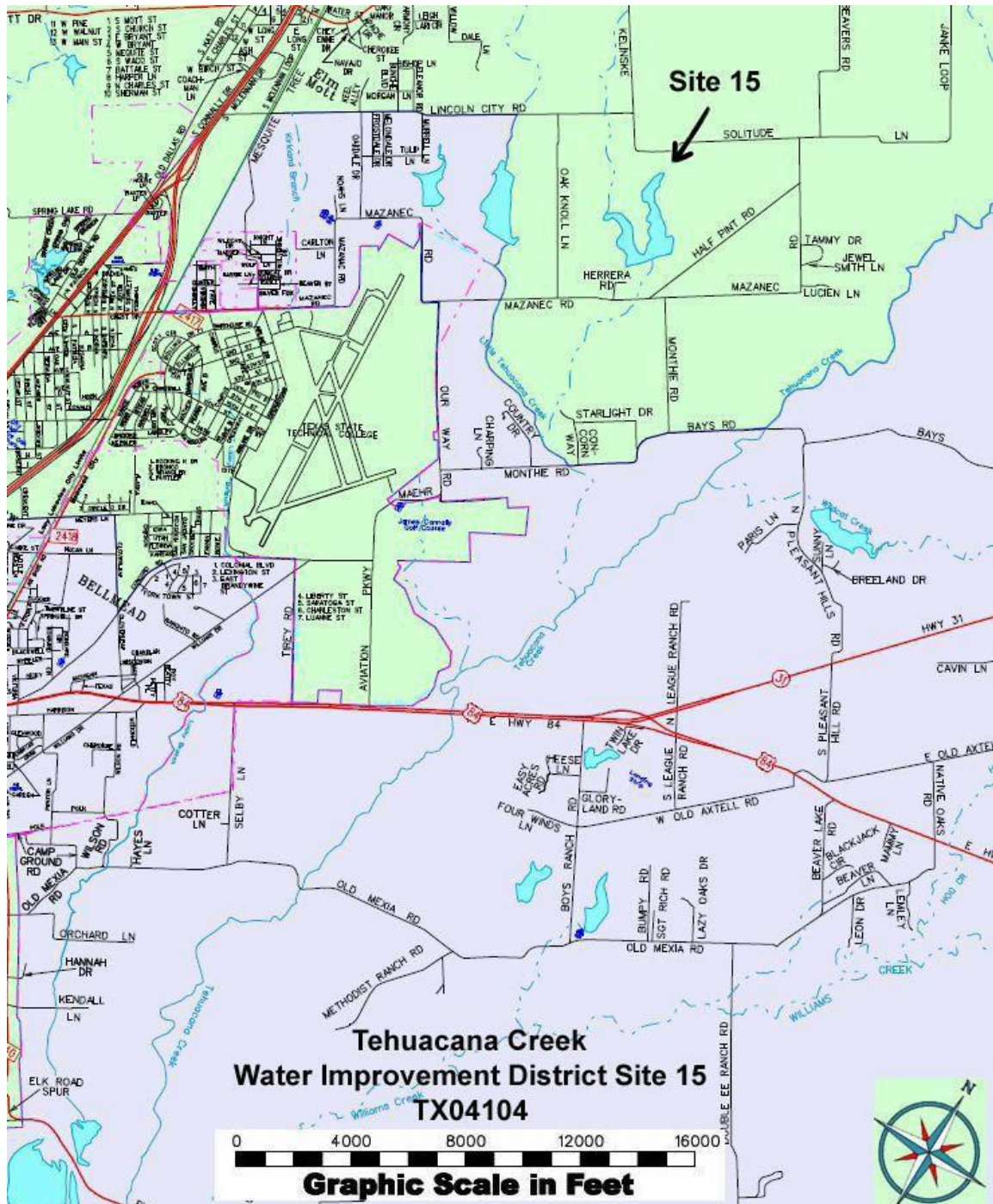
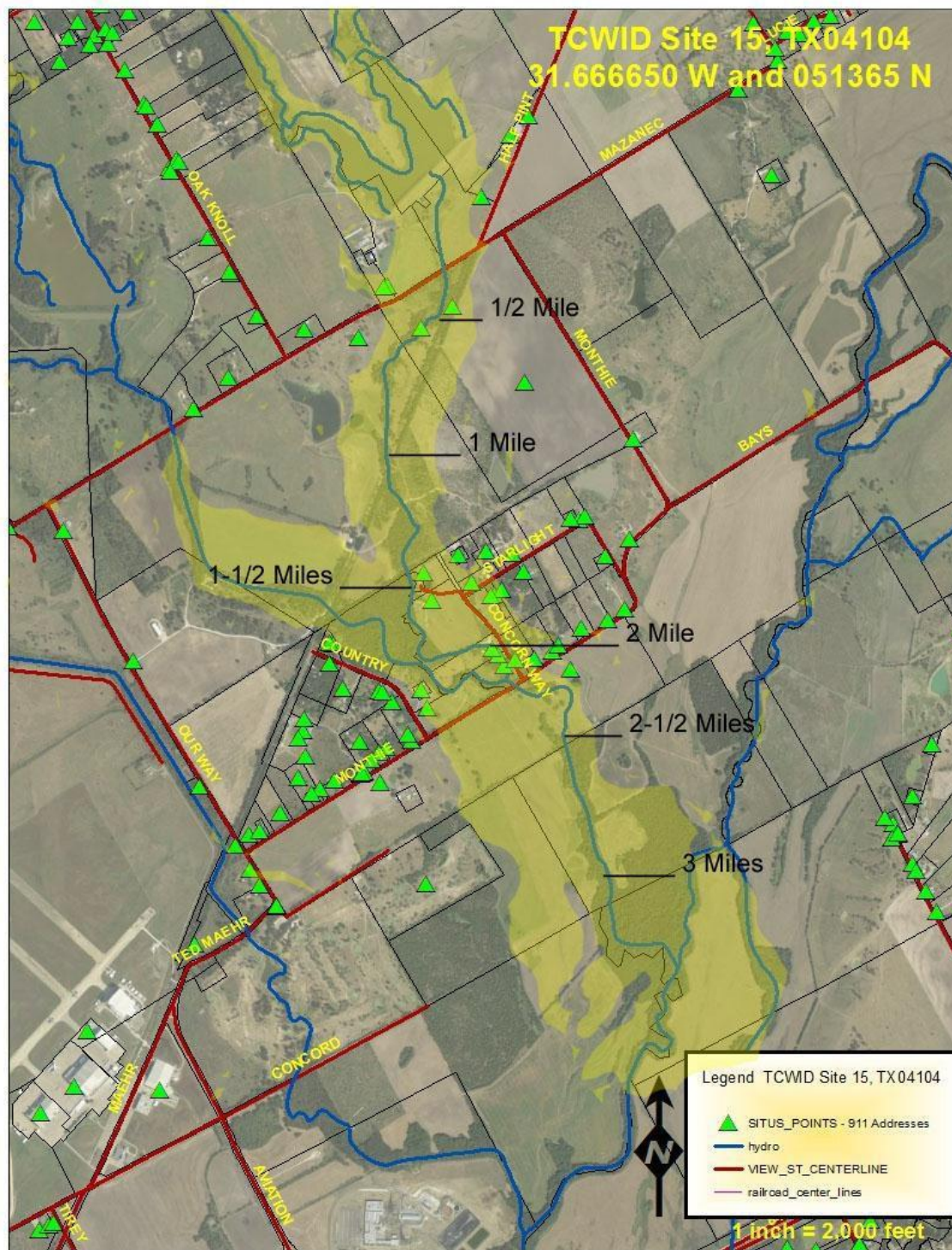


Figure 18: Location of Tehuacana Creek Site 15 Dam Inundation Area



PROJECT DESCRIPTION - TCWID - SITE 17

National Inventory of Dams: TX 04103

Sponsors

1. Hill and McLennan Counties Tehuacana Creek Water Improvement District No. 1 (TCWID)
2. McLennan County (County)

OWNERSHIP AND LOCATION

Dam property owner: Sam Ellison, 254-756-4222

Site 17 Dam is approximately 11 miles north of Waco and just north east of TSTC Campus in McLennan County, Texas.

A vicinity and precinct map for the dam and surrounding area is found in Tab B. Little Tehuacana Creek flows into Tehuacana Creek.

Property owners are identified in the Tab G.

The hazard potential classification is high.

ENGINEERING DETAILS

Latitude and Longitude of the dam are 31.661758 W and -97.065367 N).

Type of Dam: Earthen Berm

Drainage Area: 8608 acres

Principal Spillway: 36" x 120" x 10' 6"

Inflow - 2 ports, 1' x 2' x 9"

Principal Spillway Capacity: 195 cfs

Auxiliary Spillway Max Capacity: 14,526 cfs

Maximum Storage Volume: 3,066 acre feet

Elevations (Mean Sea Level): 472-436 msl

Principal Spillway Crest: 448.7 (msl)

Auxiliary Spillway Crest: 465.5 (msl)

Top of Dam: 471.3 (msl)

The gate valve on the dam is normally closed. The service and emergency spillways drain into Little Tehuacana Creek down into the channel Tehuacana Creek.

Infrastructure damage to Mazanec Road is possible.

Figure 19: Location of Tehuacana Creek Site 17 Dam

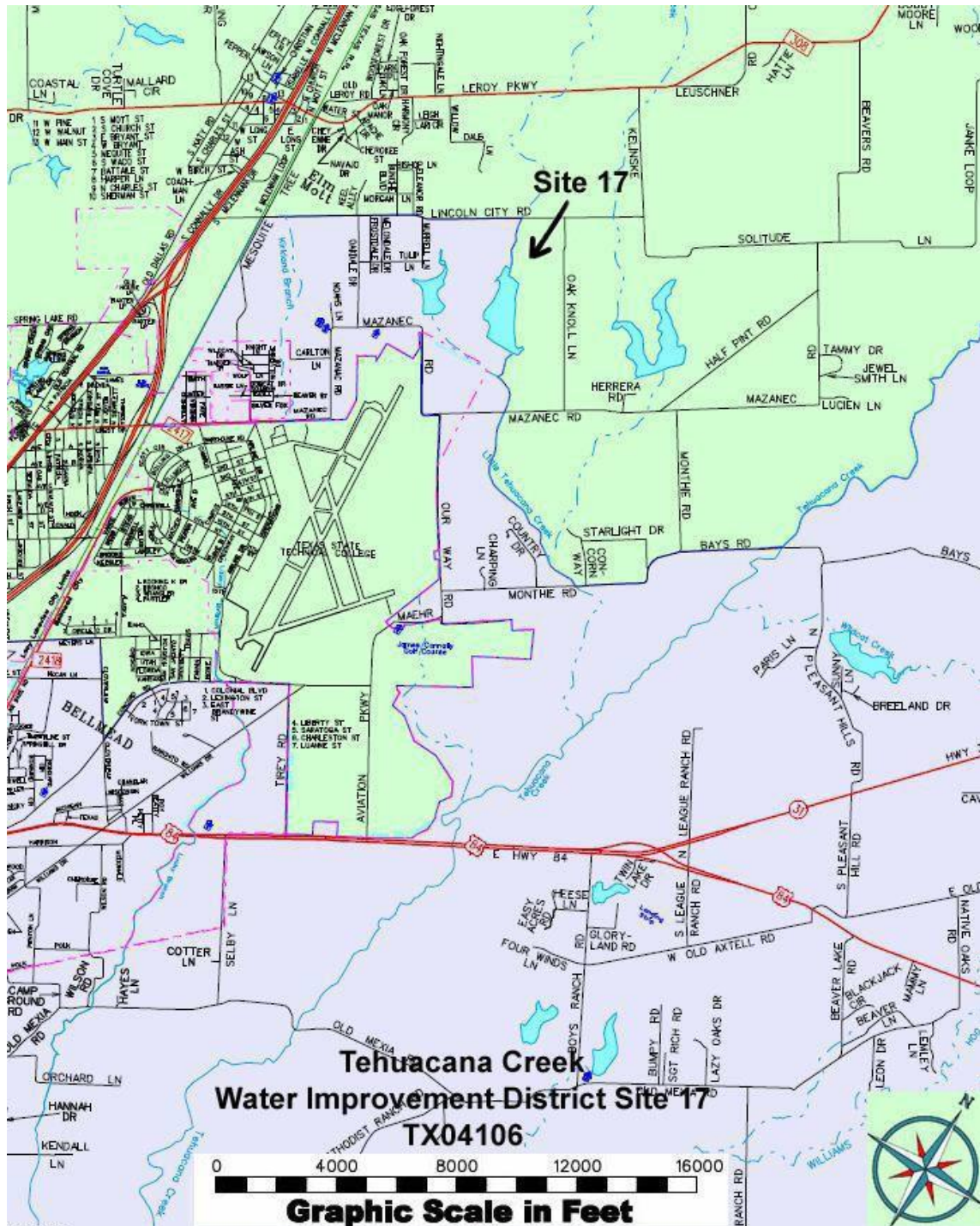
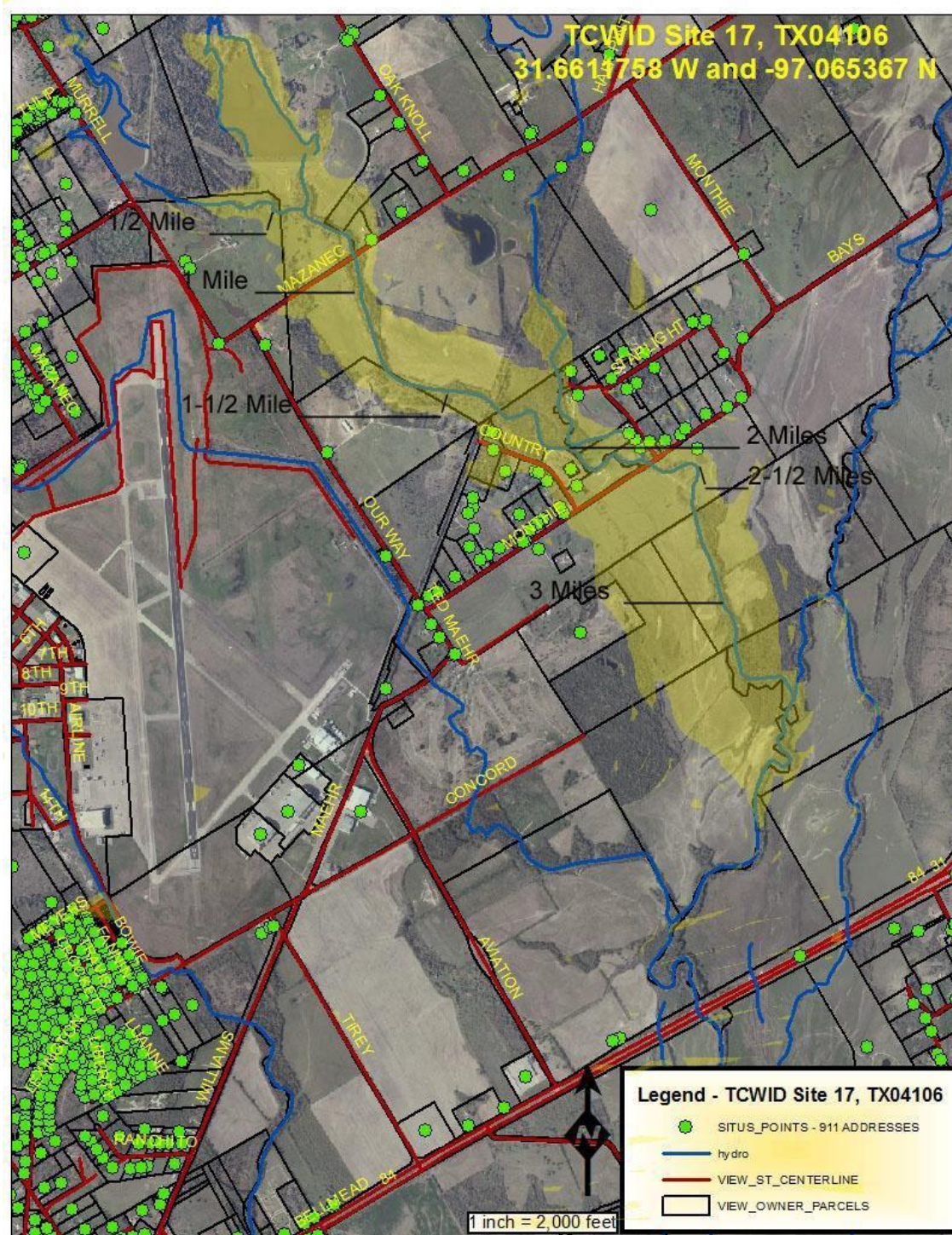


Figure 20: Location of Tehuacana Creek Site 17 Dam Inundation Area



Emergency Action Plan - Tehuacana Creek Water Improvement District -
Site 18

PROJECT DESCRIPTION - TCWID - SITE 18
National Inventory of Dams: TX04107
Potential Infrastructure: Mazanec Road

Sponsors

1. Hill and McLennan Counties Tehuacana Creek Water Improvement District No. 1 (TCWID)
2. McLennan County (County)

OWNERSHIP AND LOCATION

Dam property owner: **Patrick Kallus, 254-799-4532**

Site 18 Dam is approximately 10 miles north of Waco and just north east of TSTC Campus in McLennan County, Texas.

A vicinity and precinct map for the dam and surrounding area is found in Tab B.

Dry Branch flows into Little Tehuacana Creek.

Property owners are identified in the Tab G.

The hazard potential classification is high.

ENGINEERING DETAILS

Latitude and Longitude of the dam are 31.661431 W and -97.074966 N.

Type of Dam: Earthen Berm

Drainage Area: 1,536 acres

Principal Spillway: 26' x 45" x 20'

Inflow - 2 ports, 4" x 18"

Principal Spillway Capacity: 43 cfs

Auxiliary Spillway Max Capacity: 1,740 cfs

Maximum Storage Volume: 819 acre feet

Elevations (Mean Sea Level): 480 - 448 msl

Principal Spillway Crest: 452.5 (msl)

Auxiliary Spillway Crest: 475.5 (msl)

Top of Dam: 479.2 (msl)

The gate valve on the dam is normally closed. The service and emergency spillways drain into a dry branch into Little Tehuacana. Infrastructure damage is possible for Mazanec Road

Figure 21: Location of Tehuacana Creek Site 18 Dam

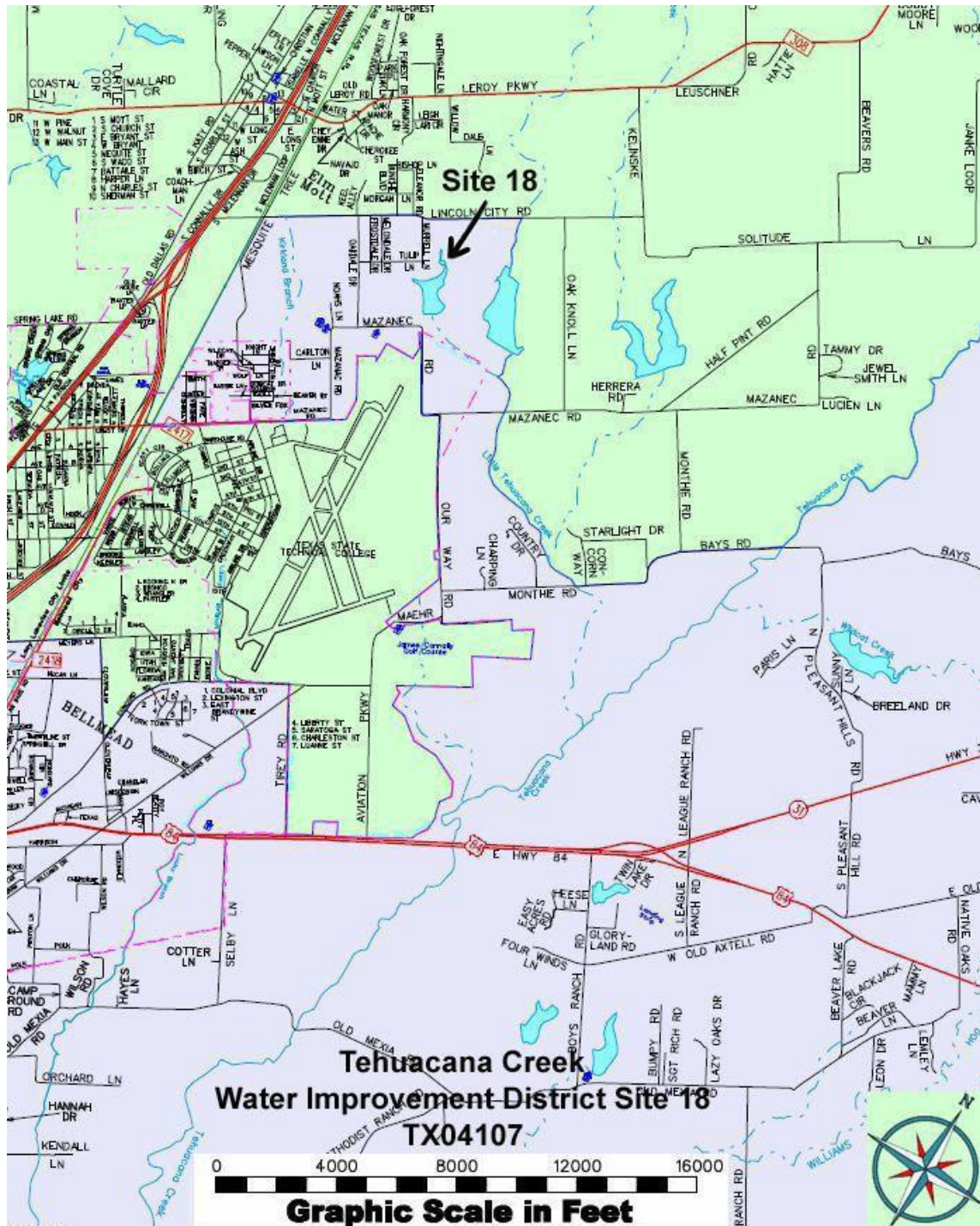
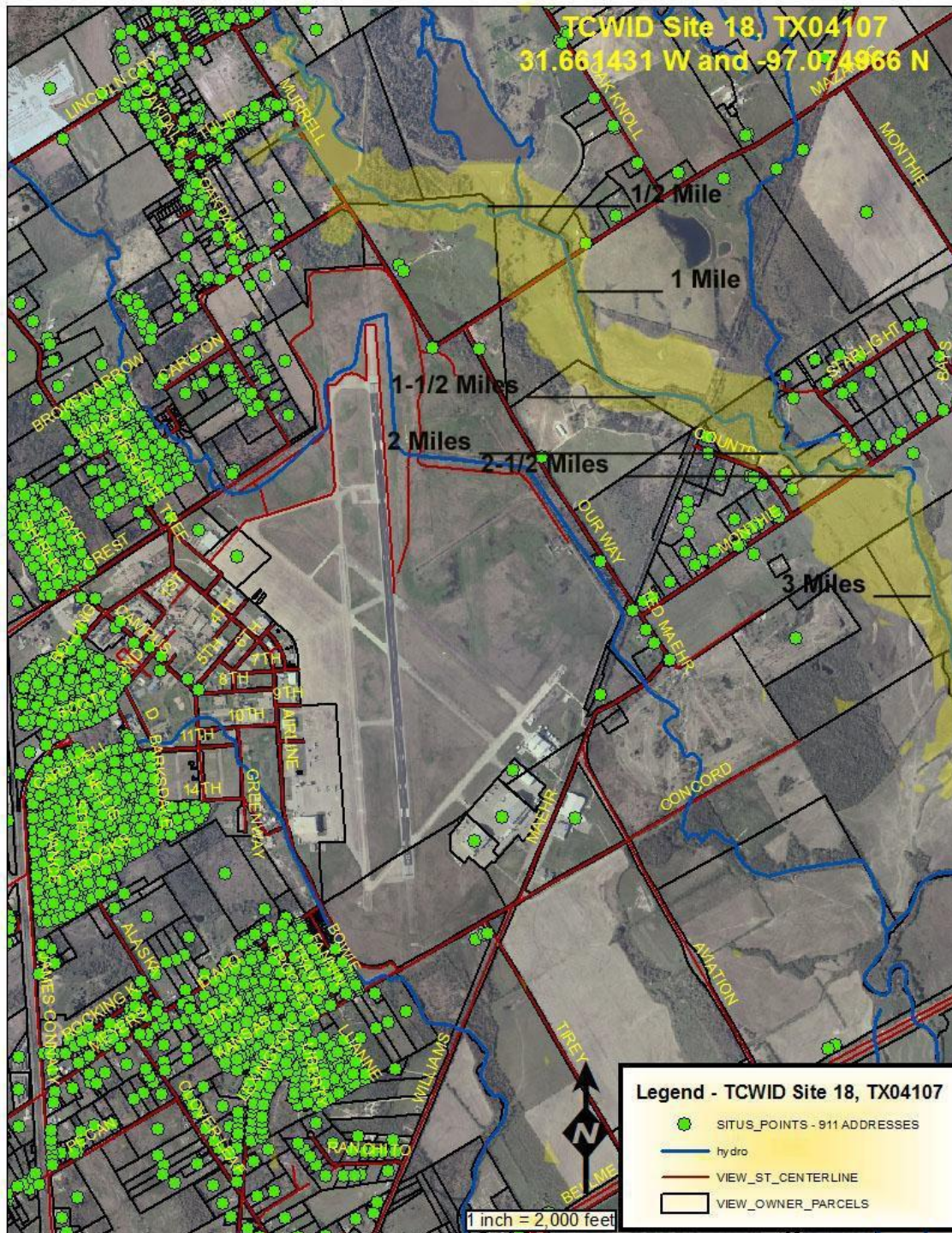


Figure 22: Location of Tehuacana Creek Site 18 Dam Inundation Area



PROJECT DESCRIPTION - TCWID - SITE 20
National Inventory of Dams: TX 04122
Potential Infrastructure: Hurst Road
Sponsors

1. Hill and McLennan Counties Tehuacana Creek Water Improvement District No. 1 (TCWID)
2. McLennan County (County)

OWNERSHIP AND LOCATION

Dam property owner: Rex Lee 254-863-0313, 863-0041

Site 20 Dam is approximately 18 miles northeast of Waco in McLennan County, Texas.

A vicinity and precinct map for the dam and surrounding area is found in Tab B. Flows into Williams Creek.

Property owners are identified in the Tab G.

The hazard potential classification is high.

ENGINEERING DETAILS

Latitude and Longitude of the dam are 31.686389 W and -96.929242 N.

Type of Dam: Earthen Berm

Drainage Area: 1,165 acres

Principal Spillway: 24' x 48' x 11'

Inflow – 0 ports

Principal Spillway Capacity: n/a

Auxiliary Spillway Max Capacity: 2,290 cfs

Maximum Storage Volume: 514 acre feet

Elevations (Mean Sea Level): 524-500 msl

Principal Spillway Crest: 512.3 (msl)

Auxiliary Spillway Crest: 521.0 (msl)

Top of Dam: 523.8 (msl)

The gate valve on the dam is normally closed. The service and emergency spillways drain into dry branch into downstream channel Williams Creek.

Figure 23: Location of Tehuacana Creek Site 20 Dam

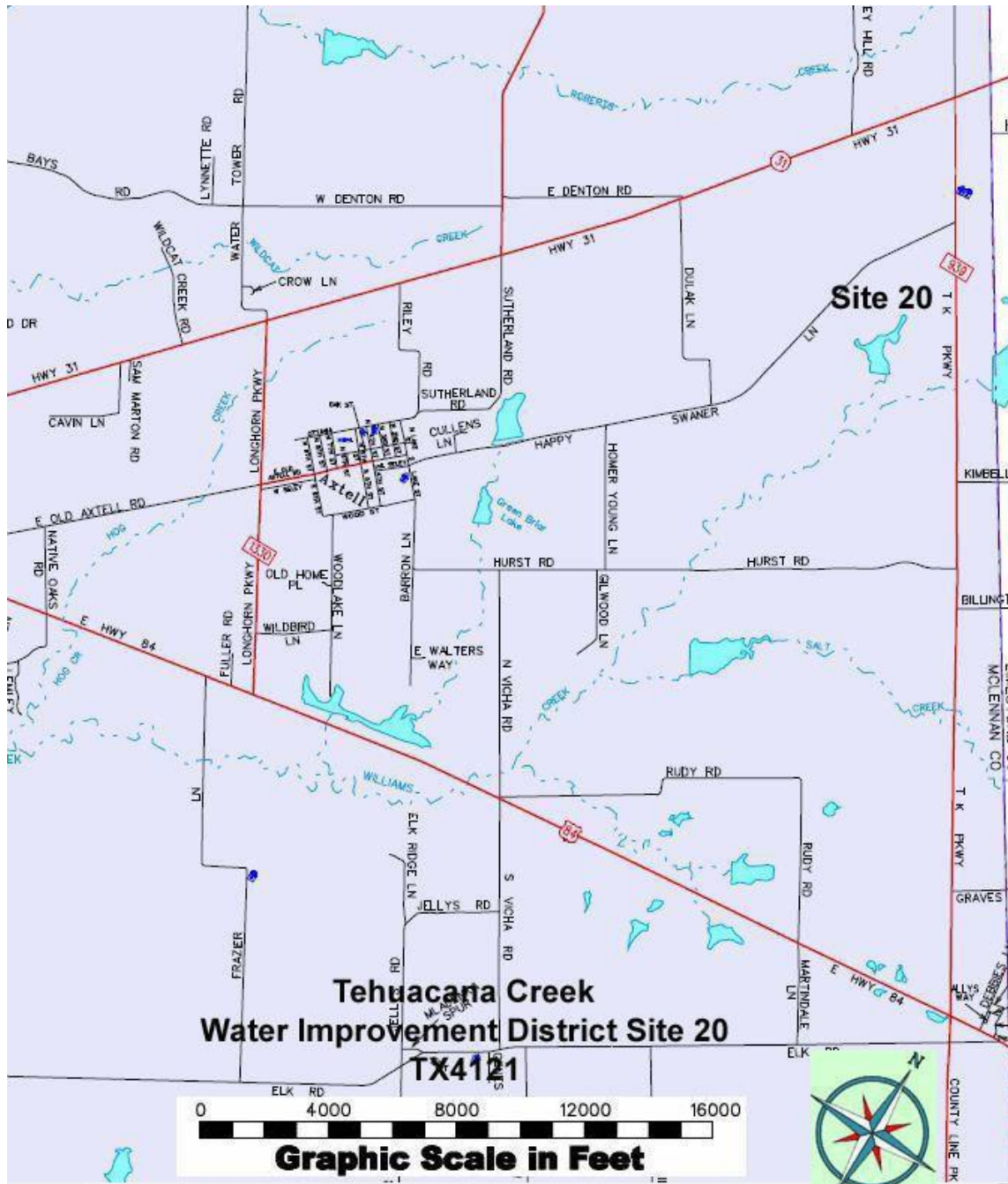
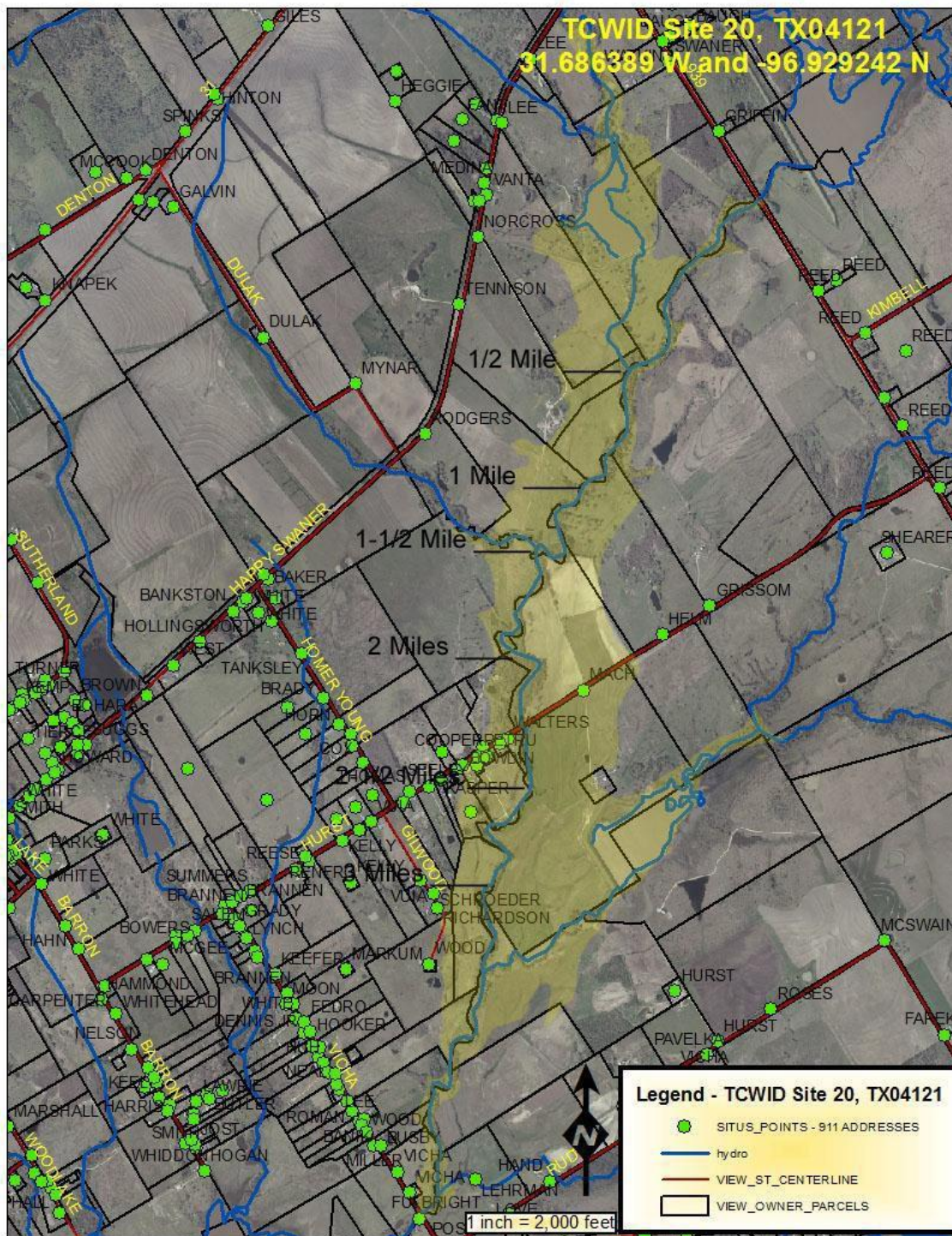


Figure 24: Location of Tehuacana Creek Site 20 Dam Inundation Area



Emergency Action Plan - Tehuacana Creek Water Improvement District -
Site 21

PROJECT DESCRIPTION - TCWID - SITE 21

National Inventory of Dams: TX 04122

Sponsors

1. Hill and McLennan Counties Tehuacana Creek Water Improvement District No. 1 (TCWID)
2. McLennan County (County)

OWNERSHIP AND LOCATION

Dam property owner: John Mach; Home - 254-863-0850

Site 21 Dam is approximately 17 miles northeast of Waco in McLennan County, Texas.

A vicinity and precinct map for the dam and surrounding area is found in Tab B. Salt Creek flows into Williams Creek.

Property owners are identified in the Tab G.

The hazard potential classification is high.

ENGINEERING DETAILS

Latitude and Longitude of the dam are 31.655907 W and -96.931650 N.

Type of Dam: Earthen Berm

Drainage Area: 5,158 acres

Principal Spillway: 3.0' x 600" x 10'

Inflow - 4 ports, 10" x 10"; 2 right, 2 left Initial elev. 484.7

Principal Spillway Capacity: 220' of 24" i.d.

Auxiliary Spillway Type and Max Capacity: 5,064 cfs

Maximum Storage Volume: 2,513 acre feet

Elevations (Mean Sea Level): 480 – 508 msl

Principal Spillway Crest: 488.4 (msl)

Auxiliary Spillway Crest: 502.0 (msl)

Top of Dam: 506.6 (msl)

The gate valve on the dam is normally closed. The service and emergency spillways drain into Salt Creek down into downstream channel of Little Tehuacana Creek then into Tehuacana Creek.

Figure 25: Location of Tehuacana Creek Site 21 Dam

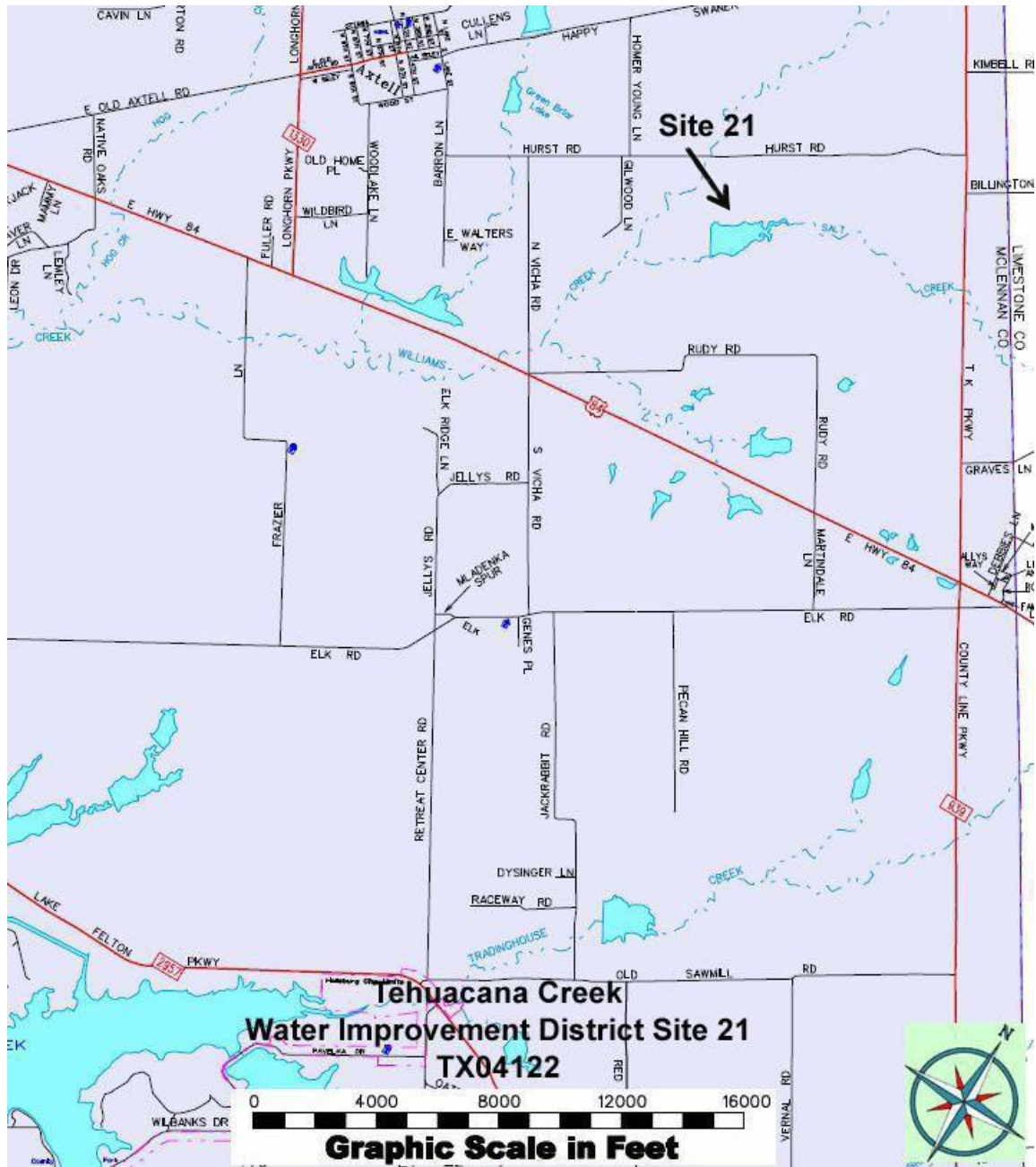
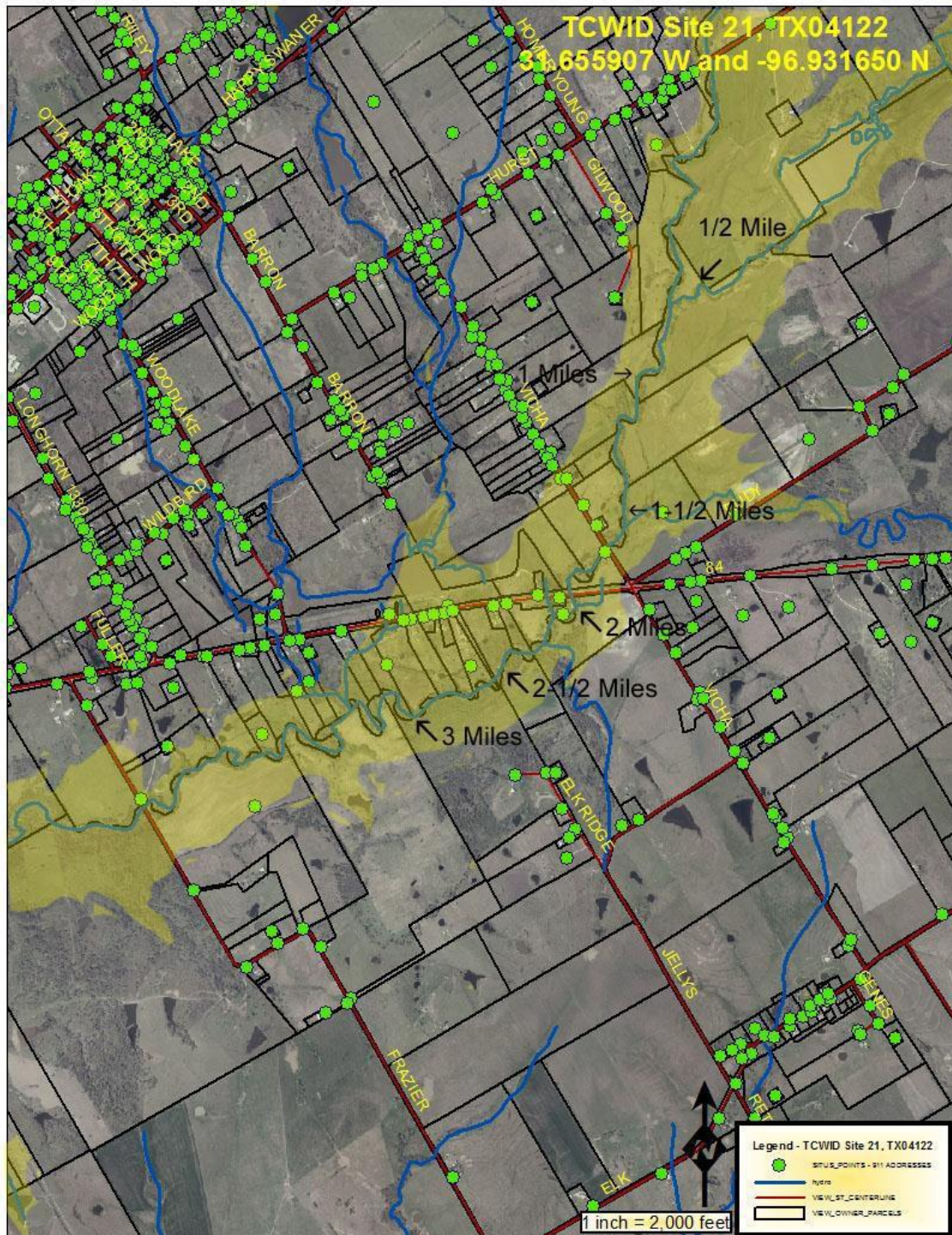


Figure 26: Location of Tehuacana Creek Site 21 Dam Inundation Area



Emergency Action Plan - Tehuacana Creek Water Improvement District -
Site 22

PROJECT DESCRIPTION - TCWID - SITE 22
National Inventory of Dams: TX04123

Sponsors

1. Hill and McLennan Counties Tehuacana Creek Water Improvement District No. 1 (TCWID)
2. McLennan County (County)

OWNERSHIP AND LOCATION

Dam property owner: M Nazarian, 817-336-4454, Tenant on site is David Hurst, 254-863-5366.

Site 22 Dam is approximately 16 miles northeast of Waco in McLennan County, Texas.

A vicinity and precinct map for the dam and surrounding area is found in Tab B.

Dry branch flows into Williams Creek.

Property owners are identified in the Tab G.

The hazard potential classification is high.

ENGINEERING DETAILS

Latitude and Longitude of the dam are 31.643021 W and -96.918144 N.

Type of Dam: Earthen Berm

Drainage Area: 1,248 acres

Principal Spillway: 24' x 48' x 9'

Inflow - 0 ports

Principal Spillway Capacity: N/A.

Auxiliary Spillway Max Capacity: 2,500 cfs

Maximum Storage Volume: 637.5 acre feet

Elevations (Mean Sea Level): 516 - 488 msl

Principal Spillway Crest: 500.2 (msl)

Auxiliary Spillway Crest: 511.0 (msl)

Top of Dam: 514.2 (msl)

The gate valve on the dam is normally closed. The service and emergency spillways drain into a dry branch down into downstream channel of Williams Creek.

Figure 27: Location of Tehuacana Creek Site 22 Dam

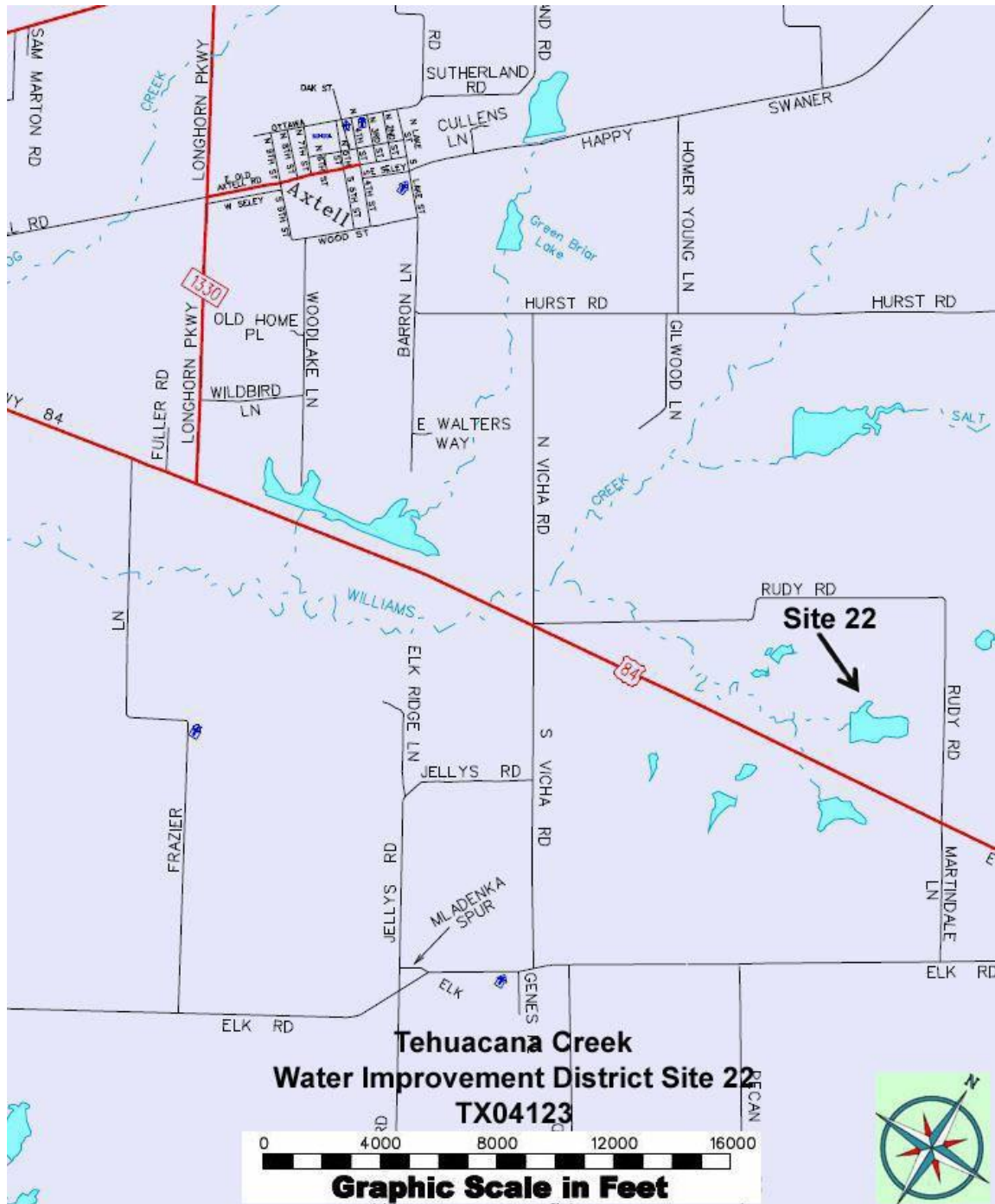
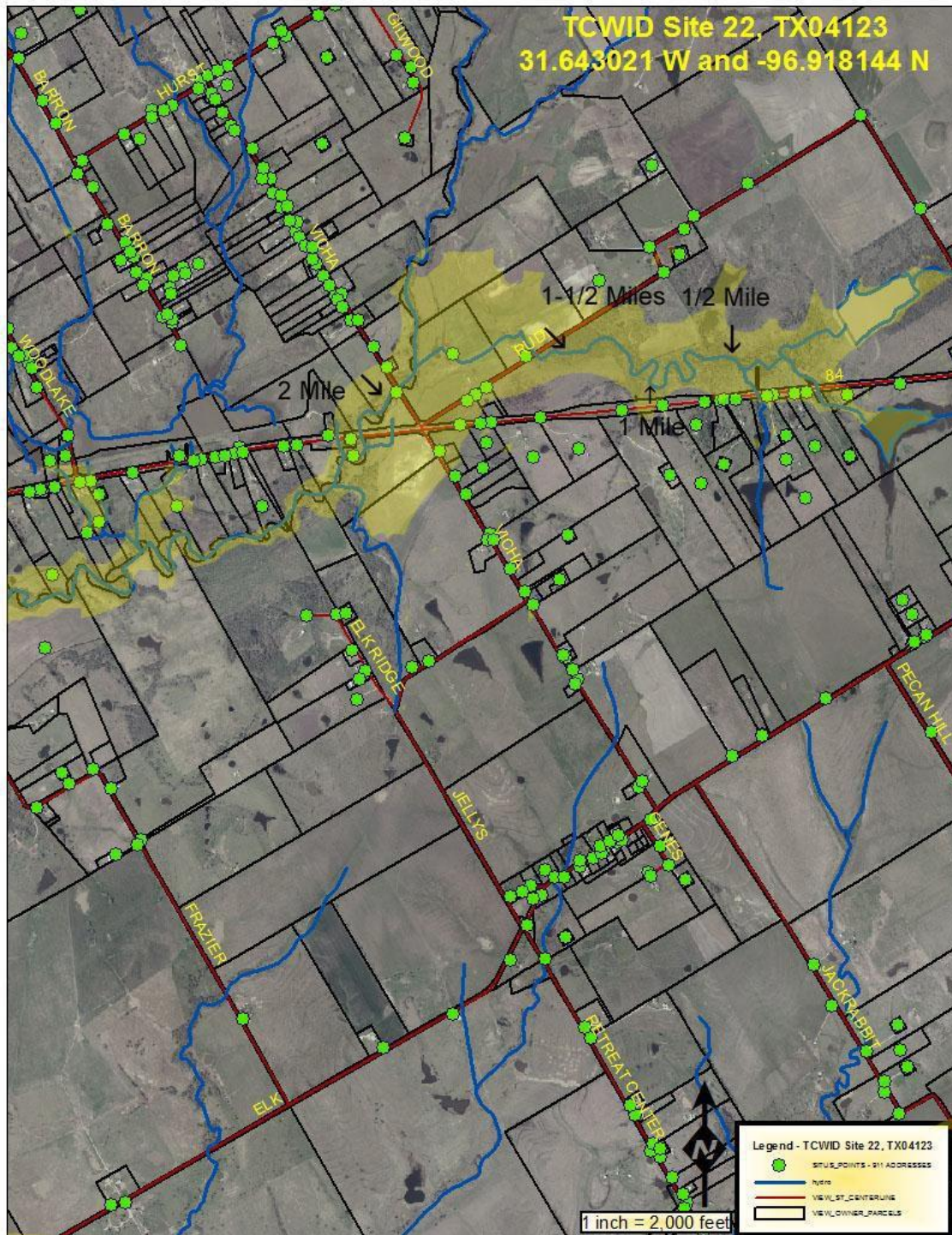


Figure 28: Location of Tehuacana Creek Site 22 Dam Inundation Area



Emergency Action Plan - Tehuacana Creek Water Improvement District -
Site 23

PROJECT DESCRIPTION - TCWID - SITE 23
National Inventory of Dams: TX 04124
Potential infrastructure damage: Hwy. 84

Sponsors

1. Hill and McLennan Counties Tehuacana Creek Water Improvement District No. 1 (TCWID)
2. McLennan County (County)

OWNERSHIP AND LOCATION

Dam property owner: L. D. Gauntt , 254-829-2211

Site 23 Dam is approximately 16 miles northeast of Waco in McLennan County, Texas.

A vicinity and precinct map for the dam and surrounding area is found in Tab B.

Dry branch into another dry branch Williams Creek.

Property owners are identified in the Tab G.

The hazard potential classification is high.

ENGINEERING DETAILS

Latitude and longitude of the dam are 31.638268 W and -96.917271 N.

Type of Dam: Earthen Berm

Drainage Area: 512 acres

Principal Spillway: 24" x 48 " x 10 '

Inflow - 0 ports,

Principal Spillway Capacity:

Auxiliary Spillway Type and Max Capacity: 2,050 cfs

Maximum Storage Volume: 348 acre feet

Elevations (Mean Sea Level): 520 - 496 msl

Principal Spillway Crest: 506.9 (msl)

Auxiliary Spillway Crest: 517 (msl)

Top of Dam: 520.4 (msl)

The gate valve on the dam is normally closed. The service and emergency spillways drain into a dry branch across Hwy. 84, into another dry branch then into Williams Creek. Infrastructure damage to Hwy. 84 is possible.

Figure 29: Location of Tehuacana Creek Site 23 Dam

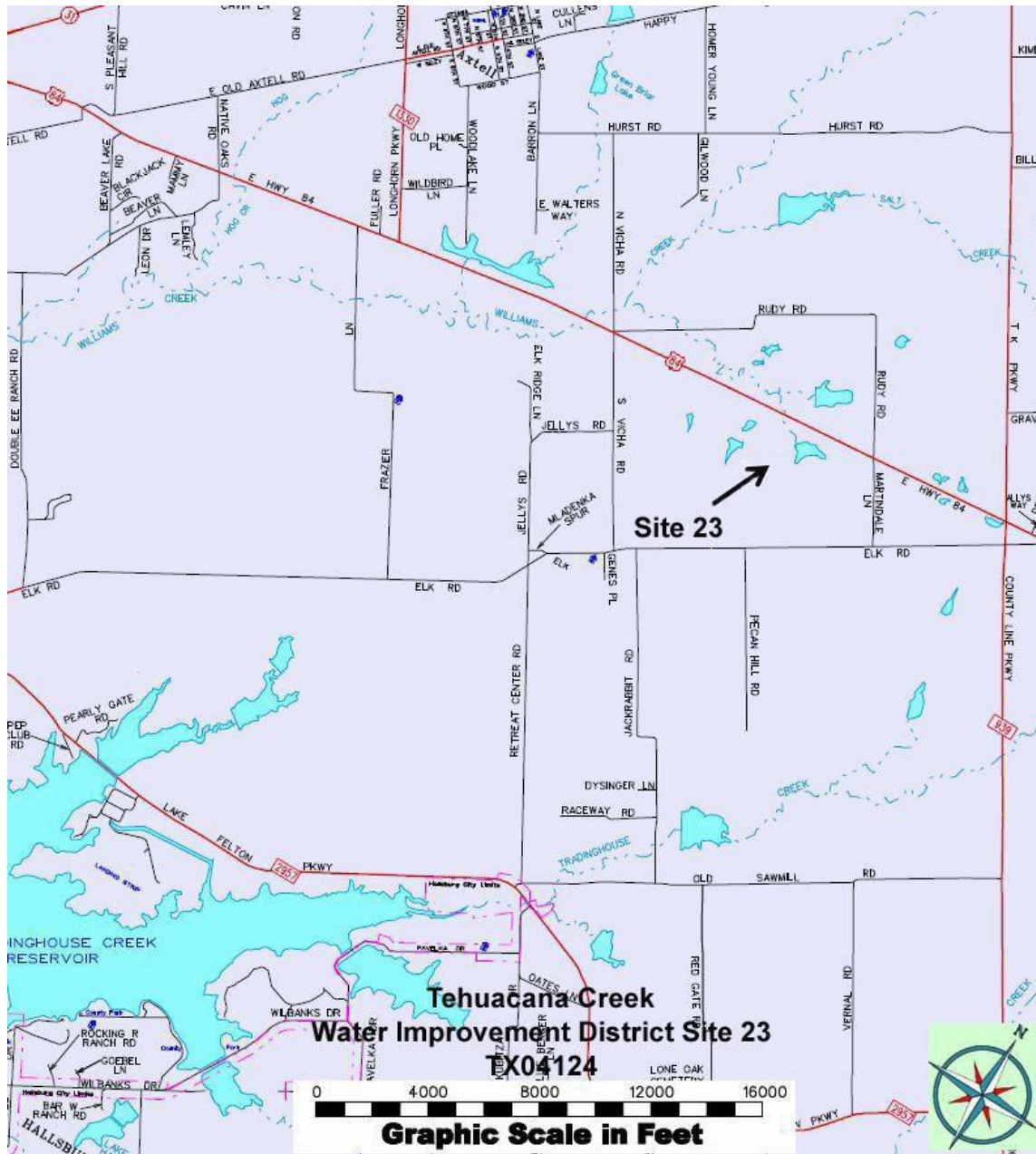


Figure 30: Location of Tehuacana Creek Site 23 Dam Inundation Area



Emergency Action Plan - Tehuacana Creek Water Improvement District -
Site 24

PROJECT DESCRIPTION, TCWID - SITE 24

National Inventory of Dams: TX04125

Sponsors

1. Hill and McLennan Counties Tehuacana Creek Water Improvement District No. 1 (TCWID)
2. McLennan County (County)

OWNERSHIP AND LOCATION

Dam property owner: Kevin Summers, 254-863-5754, 863-5684

Site 24 Dam is approximately 13 miles northeast of Waco in McLennan County, Texas.

A vicinity and precinct map for the dam and surrounding area is found in Tab B. Flows into Williams Creek.

Property owners are identified in the Tab G.

The hazard potential classification is high.

ENGINEERING DETAILS

Latitude and Longitude of the dam are 31.638490 W and -96.955018 N.

Type of Dam: Earthen Berm

Drainage Area: 3,040 acre feet

Principal Spillway: 170' x 24" i.d.

Principal Spillway Capacity: 24" x 70" x 5.0'; 12" x 12" side gate

Auxiliary Spillway Type and Max Capacity: 7,375 cfs

Maximum Storage Volume: 1,491 acre feet

Elevations (Mean Sea Level): 460.5 - 475 msl

Principal Spillway Crest: 460.5 (msl)

Auxiliary Spillway Crest: 470.0 (msl)

Top of Dam: 474.3 (msl)

The gate valve on the dam is normally closed. The service and emergency spillways drain into a small dry branch, across Hwy. 84 then into Williams Creek. There is a potential for infrastructure damage to Hwy. 84.

Figure 31: Location of Tehuacana Creek Site 24 Dam

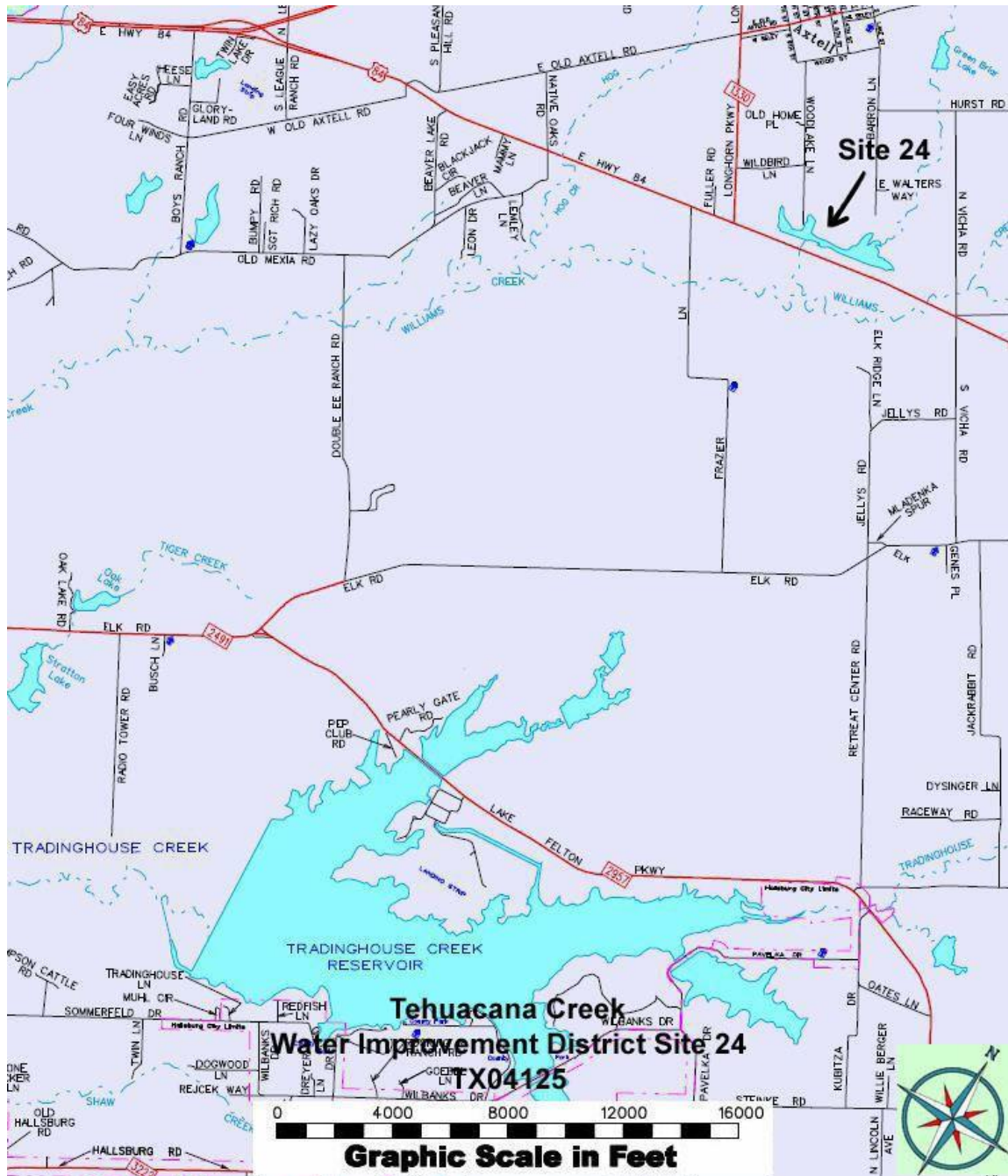
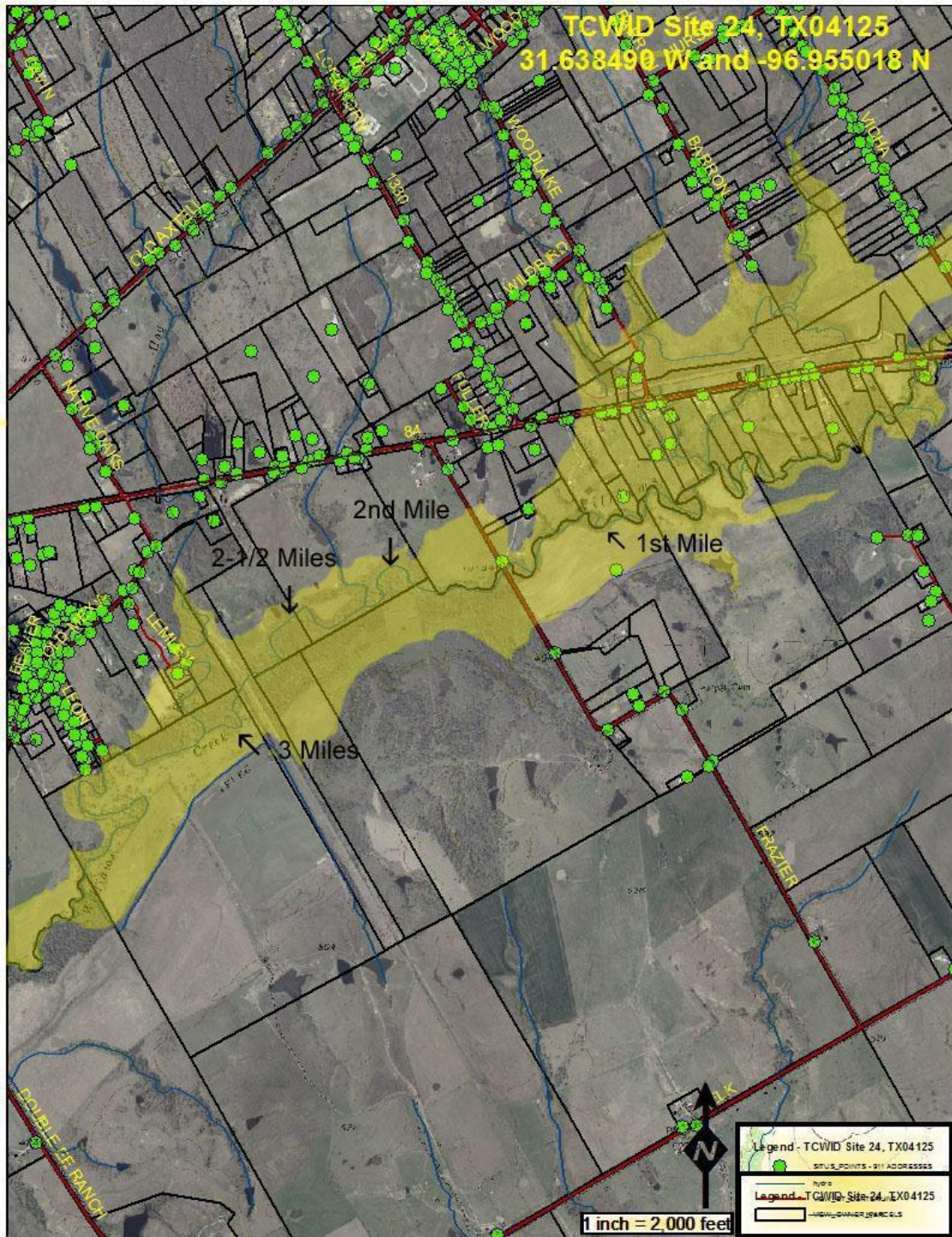


Figure 32: Location of Tehuacana Creek Site 24 Dam Inundation Area



Emergency Action Plan - Tehuacana Creek Water Improvement District -
Site 25

PROJECT DESCRIPTION - TCWID - SITE 25

National Inventory of Dams: TX04114

Potential Infrastructure Damage: Jackrabbit Road, Old Sawmill Road
and Lake Felton Pkwy.

Sponsors

1. Hill and McLennan Counties Tehuacana Creek Water Improvement District No. 1 (TCWID)
2. McLennan County (County)

OWNERSHIP AND LOCATION

Dam property owner: John and Marion Burleson, 254-876-2088

Site 25 Dam is approximately 18 miles east of Waco in McLennan County, Texas.

A vicinity and precinct map for the dam and surrounding area is found in Tab B.

Flows into the Tradinghouse Creek.

Property owners are identified in the Tab G.

The hazard potential classification is high.

ENGINEERING DETAILS

latitude and longitude of the dam are 31.599529 W and -96.906797 N.

Type of Dam: Earthen Berm

Drainage Area: 6,298 acres

Principal Spillway: 30' x 100" x 16'5"

Inflow – 4 ports, 8" x 10" x 6'

Principal Spillway Capacity: N/A

Auxiliary Spillway Type and Max Capacity: 5,900 cfs

Maximum Storage Volume: 3,018 acre feet

Elevations (Mean Sea Level): 510.1 – 478.5 msl

Principal Spillway Crest: 490.5 (msl)

Auxiliary Spillway Crest: 504.5 (msl)

Top of Dam: 509.1 (msl)

The gate valve on the dam is normally closed. The service and emergency spillways drain into downstream channel of Tradinghouse Creek into Tradinghouse Creek Reservoir. Impacted infrastructure includes Jackrabbit Road, Old Sawmill Road and Lake Felton Pkwy.

Figure 33: Location of Tehuacana Creek Site 25 Dam

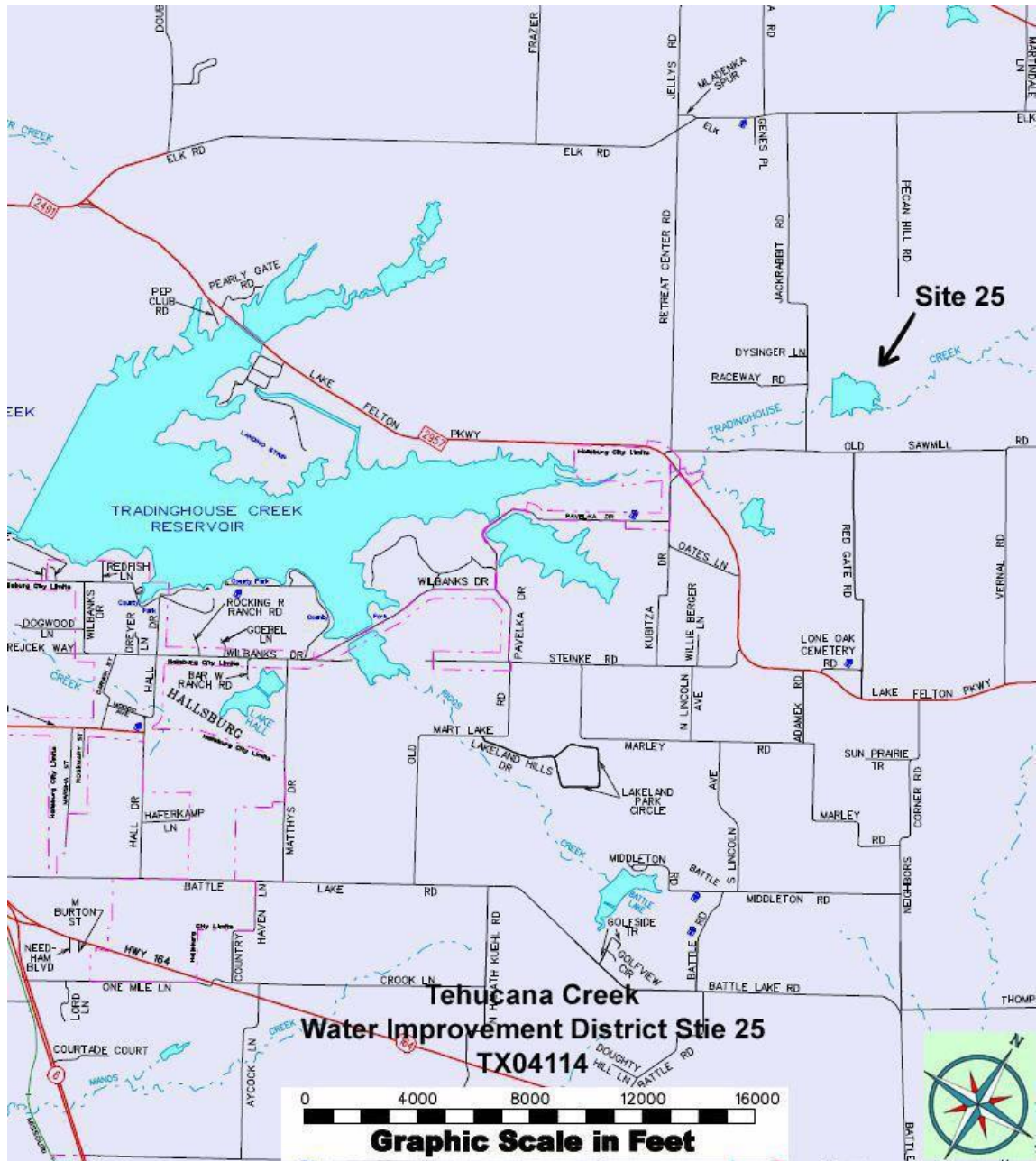
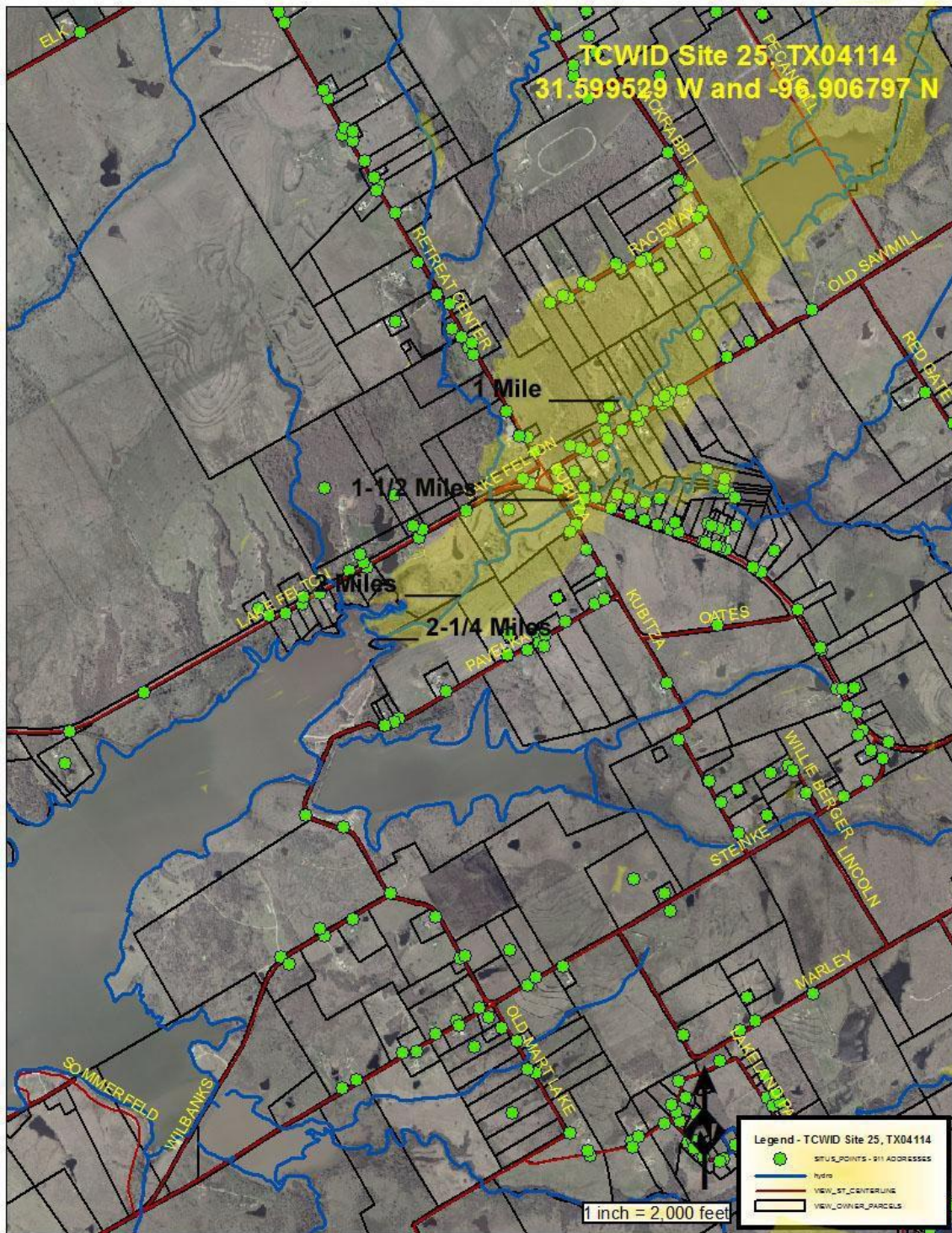


Figure 34: Location of Tehuacana Creek Site 25 Dam Inundation Area



Emergency Action Plan - Tehuacana Creek Water Improvement District -
Site 26

PROJECT DESCRIPTION - TCWID - SITE 26

National Inventory of Dams: TX04115

Sponsors

1. Hill and McLennan Counties Tehuacana Creek Water Improvement District No. 1 (TCWID)
2. McLennan County (County)

OWNERSHIP AND LOCATION

Dam property owner: Angie Woodard, 254-863-0419, 644-9144

Site 26 Dam is approximately 17 miles northeast of Waco in McLennan County, Texas.

A vicinity and precinct map for the dam and surrounding area is found in Tab B. Salt Creek flows into Williams Creek.

Property owners are identified in the Tab G.

The hazard potential classification is high.

ENGINEERING DETAILS

Latitude and longitude of the dam are 31.586148 W and -96.908997N.

Type of Dam: Earthen Berm

Drainage Area: 1,651 acres

Principal Spillway: 24" x 48" x 10'

Principal Spillway Capacity: 210' of 24" i.d.

Auxiliary Spillway Type and Max Capacity: 3,219 cfs

Maximum Storage Volume: 832 acre feet

Elevations (Mean Sea Level): 480 – 496 msl

Principal Spillway Crest: 480.2 (msl)

Auxiliary Spillway Crest: 492.5 (msl)

Top of Dam: 495.9 (msl)

The gate valve on the dam is normally closed. The service and emergency spillways drain into a dry branch then across the Lake Felton Parkway into the downstream of the Tradinghouse Reservoir.

Figure 35: Location of Tehuacana Creek Site 26 Dam

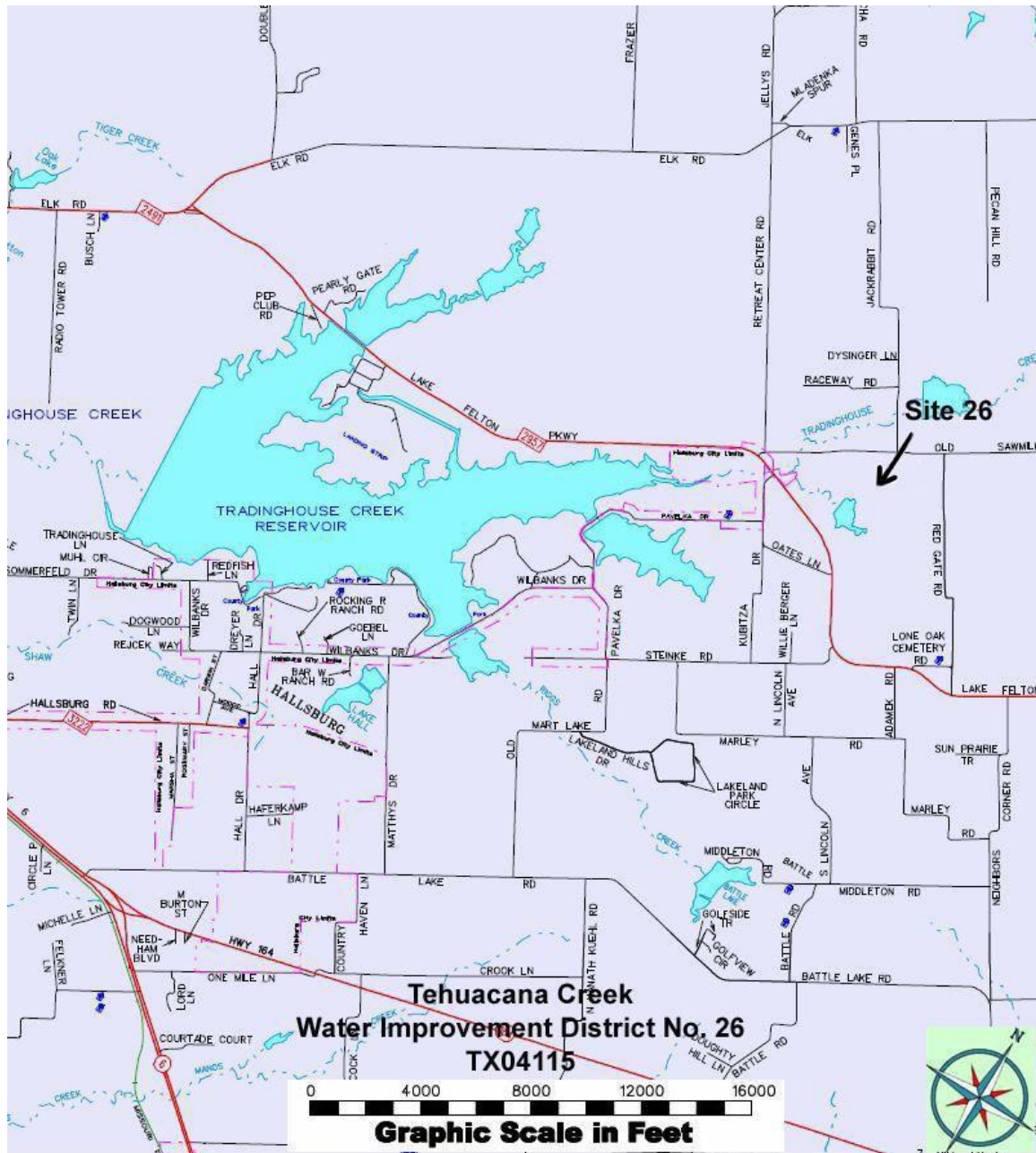
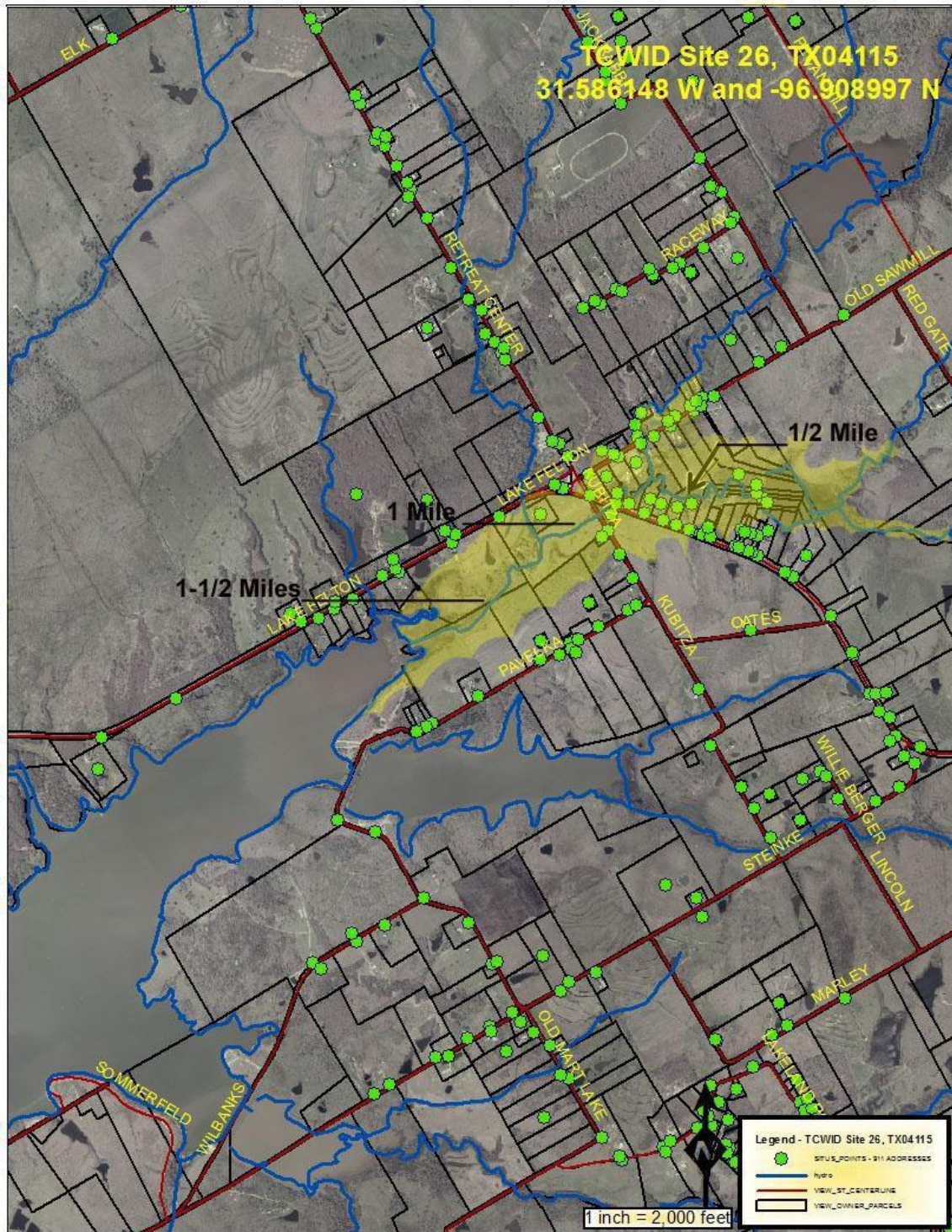


Figure 36: Location of Tehuacana Creek Site 26 Dam Inundation Area



Appendix E

Public Meeting Documentation: Proof of Notice to public and Sign in Sheet





Municipal Information Services

Post Office Box 2570
Waco, Texas 76702-2570
254-750-5635
Fax: 254-750-5634
www.waco-texas.com

FOR IMMEDIATE RELEASE:

Contact: Daniel Scott
Assistant Emergency Management Coordinator
Waco-McLennan County Office of Emergency Management
Office: 254-750-5911
daniels@wacotx.gov

McLennan County LEPC Public Meeting Set for Tues. Oct 10

Waco, Texas (October 4, 2017) – The Waco-McLennan County Office of Emergency Management cordially invites the public to attend a McLennan County LEPC (Local Emergency Planning Committee) meeting on Tuesday, October 10 from 6 to 9 p.m. in the Bosque Theater at the Waco Convention Center, located at 100 Washington Avenue.

The purpose of Tuesday's meeting is to review and share with the public our county Hazard Mitigation Action Plan (HMAP) and Hazardous Material Annex information. The HMAP planning process is designed to reduce the loss of life and property during times of hazardous events.

During the meeting, the public is invited to make comments or suggestions. City, county and emergency management officials will be on hand to answer any questions. All comments received from the public will be documented and considered for inclusion in the HMAP.

###

WACO- MCLENNAN COUNTY OEM EVENT SIGN-IN SHEET**Project:** Hazard Mitigation & Hazard Materials Meeting**Date:** 10/10/17**Time:** 6 – 9 pm**Facilitator:** Waco-McLennan County Office of Emergency Management**Location:** Convention Center (Bosque Theater)

NAME	AGENCY/ORGANIZATION	EMAIL
Daniel Scott	WMCOEM	daniels@waco.tx.gov
Boye Wilson	HOTCOG	boye.wilson@hot.cog.tx.us
Dalores Pear	Mars Wrigley Confectionary	dalores.pear@effem.com
Kristin Hopps	Waco Tribune-Herald	khoppa@wacotrib.com
Anthony Bettes	Anthony@waco.tx.gov	City of Waco

