# Village of Bear Creek
## Hays County Hazard Mitigation Plan Update
2017

# Table of Contents



## *Tables*

## *Figures*

# Village of Bear Creek Annex
# Section 1: Organize and Review

This section contains a brief description of the Village of Bear Creek and its jurisdictional features. In addition, Section 1 contains the following details regarding Bear Creek's:

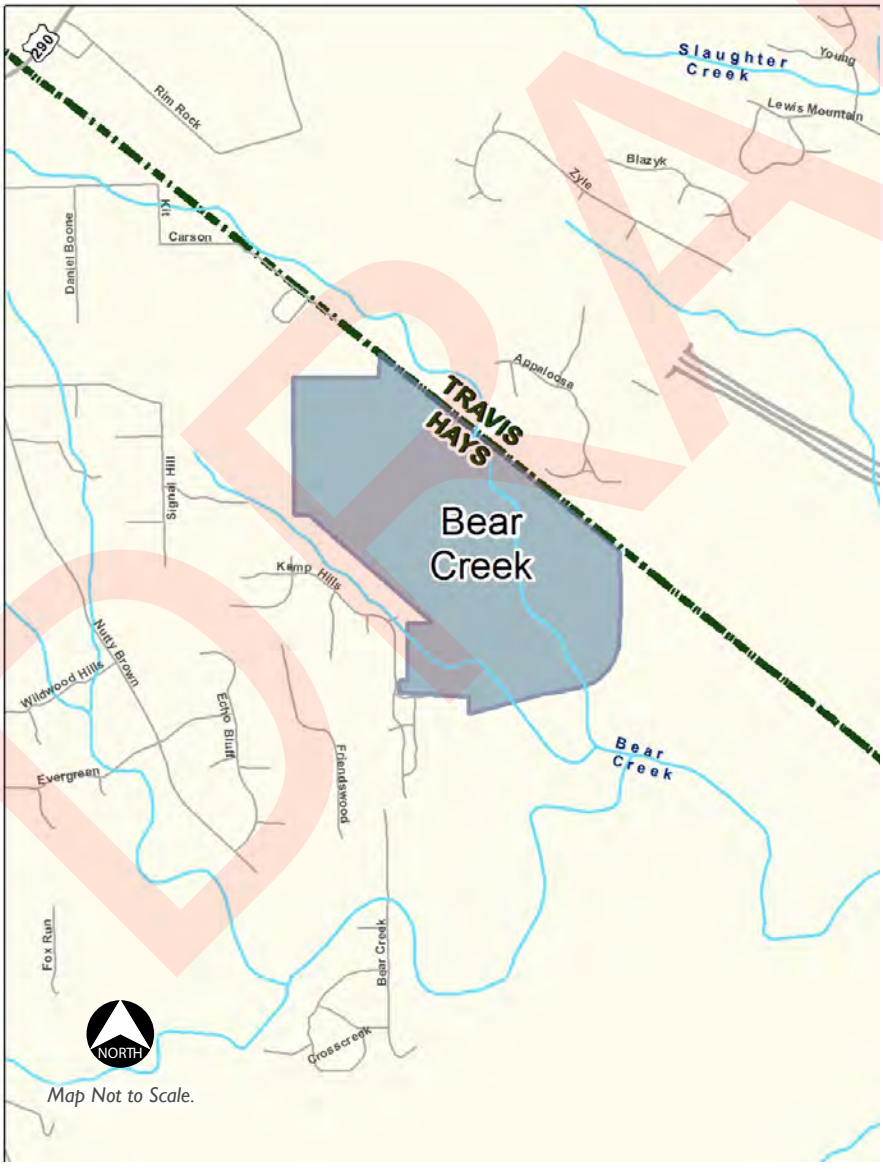
- participation in the Hays County HMP Update process,
- stakeholder engagement,
- public outreach strategy,
- incorporation efforts, and
- plan maintenance procedures.

| | |
|---|---|
| *Population : | 369 |
| Size of Community: | 1.15 sq. miles |
| *Population over 65 years old | 25 |
| *Population under 16 years old | 95 |
| *Economically Disadvantaged Population ($0-$20k) | 2 |
| Village of Bear Creek is serviced by the following responders: | |
| Fire - North Hays Fire/Rescue | |
| EMS - San Marcos Hays County EMS | |
| Law Enforcement - Hays County Sheriff's Office | |

*HAZUS-MH 3.2 Updated Census 2010 Population Estimates*

## Community Description

***Figure BC.1, Village of Bear Creek***




*Map Not to Scale.*

When planning, it is important to take into account the characteristics that make a community unique. Consideration of unique needs when it comes to mitigating or recovering from natural hazards ensures that all members of the community and their needs are addressed.

Located in Northern Hays County, this bedroom community values its freedom from regulation and taxation from large cities that have sought their annexation in the past. The community boundaries surround the Bear Oaks Subdivision which voted to be incorporated as a village on November 4, 1997. This fairly new community is completely comprised of approximately 159 residences within 687 acres in Hays County.

Regarded as "the Best Little Town in Texas", Bear Creek prioritizes maintaining the rural character of their area and their discretion on how it is developed.

Governed by a Mayor and 2 Commissioners, and supported by a Village Secretary, the community has no public buildings, equipment or vehicles.

Children in the Village attend schools within Dripping Springs Independent School District (ISD). Bear Creek's main utility providers are shown in Table BC.1.

## Major Employers

The Village of Bear Creek is 100% residential, and has no commercial properties outside of operations that are run out of residences. Another source, HAZUS, indicates that there are 11 commercial structures within the community. HAZUS is software hosted by the Federal Emergency Management Agency and used by emergency management professionals to estimate potential losses from disasters. This software bases property counts and values on aggregate census blocks, in the absence of parcel data. These references may differ from community input, but are given as simulated values based on National averages.

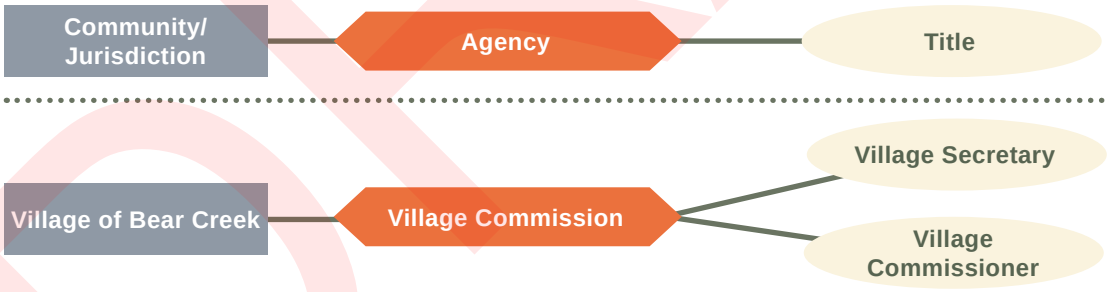
***Table BC.1, Utility Providers***

| Type | Provider |
|---|---|
| Electric | Pedernales Electric Cooperative (PEC) |
| Natural Gas | Individual Propane |
| Water | West Travis County Public Utility Agency/ Private Wells and Rainwater Collection Systems |
| Cable | Time Warner Cable |

## Planning Committee

Planners who represented Bear Creek for the update process are collectively known as the Bear Creek Mitigation Planning Committee (MPC) and are shown in Figure BC.2.

***Figure BC.2, Planning Committee Membership***



## Community Planning Involvement

MPC planning activities for the Hays County Hazard Mitigation Plan (HMP) Update are captured in Figure BC.3, which utilizes check-marks to indicate each of the activities that were completed by the Bear Creek MPC.

***Figure BC.3, Village of Bear Creek Plan Participation***

| Meetings | Data Submission | Public Involvement |
|---|---|---|
| ✓ Kick-Off<br>✓ Risk Assessment<br>✓ Mitigation Strategy | ✓ Planner's Survey<br>✓ Data Collection Spreadsheet/GIS Data<br>✓ Planning Worksheets<br>✓ Phone Interview | ✓ Village Commission/ Commissioner's Court Agenda Items<br>✓ Public Survey Posting/ Collection |

## Stakeholders

During the Phase 1 Kick-Off Meeting, planners were provided with a Planner/Stakeholder worksheet, referred to in Chapter 1, the Plan Process portion of the Hays County HMP Update. This document allowed planners to identify stakeholders for inclusion in the Risk Assessment and Mitigation Strategy Meetings. Table BC.2 identifies the stakeholders that were invited to participate by the following email:

Good Morning,

You or your organization has been identified by a local community planner as a stakeholder (interested/affected party) for the Hays County Hazard Mitigation Plan Update process. The planning team, made up of community officials from throughout Hays County, is working to update this plan that identifies actions for reducing and mitigating the risk from natural hazards (flood, tornado, severe winter, etc…) affecting Hays County and the communities within it. If your schedule allows, your insight would be valuable at a meeting being held on Thursday, January 12, 2017, from 1 p.m. to 4 p.m. at

Wimberley Community Center
**14068 Ranch Road 12**
**Wimberley, TX 78676**

Please register for the Hazard Mitigation Plan Update- Risk Assessment Meeting. https://www.eventbrite.com/e/hays-county-hazard-mitigation-plan-update-risk-assessment-meeting-registration-30892049953

If unable to complete registration on the Eventbrite site, please reply to this email and indicate who will attend from your organization so that the meeting facility can be prepared for the proper number of attendees.

JWSA and Halff Associates are providing coordination and facilitation support for this process for Hays County and participating communities utilizing FEMA mitigation grant funding. Any questions regarding this meeting can be directed to Paloma Alaniz at palaniz@halff.com.

Thank you.

### *Table BC.2, Plan Stakeholders*

| Organization | Agency | Title |
|---|---|---|
| Village of Bear Creek | Government | Mayor |
| Hays County | Office of Emergency Services | Director/Emergency Management Coordinator |
| West Travis County PUA | Association | President |
| Pedernales Electric Cooperative | Electric Cooperative | Chief Executive Officer |
| Travis County | Neighboring Community | Emergency Management Coordinator |
| North Hays County Fire & Rescue | Fire Department/EMS | Fire Chief |
| North Hays County Fire & Rescue | Fire Department/EMS | Lieutenant |
| Bear Creek Oaks Property Owners Association | Association | President |

## Outreach Strategy

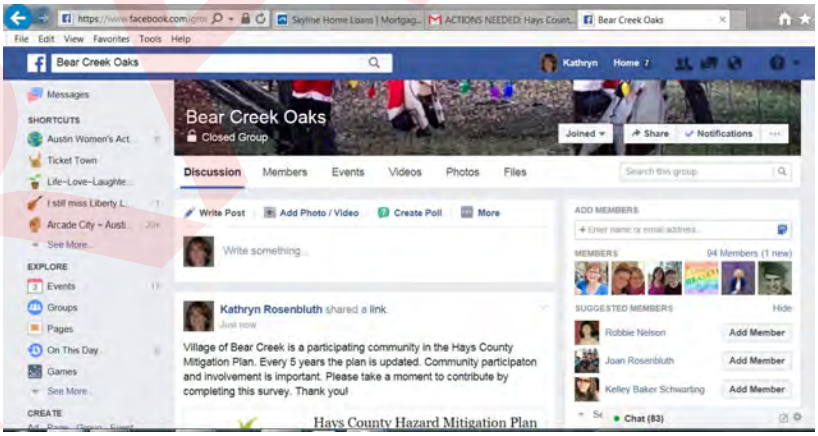
The Village of Bear Creek was very active in the outreach activities used to request public participation in the Hays County HMP Update. Their activities included promotion of the HMP Public Survey, a Village Commission announcement, plan phase newsletter distribution and a draft plan public comment period.

### *Public Survey Promotion*

The Village of Bear Creek advertised the Hays County HMP Update Public Survey on their community Facebook page.

As of March 15, 2017, Bear Creek had 28 residents respond to the public survey. A copy of the survey questions can be found in Appendix A of the Hays County HMP Update. Survey data was directly incorporated into the risk ranking process for hazards and mitigation actions. Details regarding the incorporation of the survey results is included in Chapter 2, the Risk Assessment portion of the Hays County HMP Update.

### *Figure BC.4, Bear Creek Survey Promotion*




### *Village Commission Meeting Announcement*

On December 19, 2016, the Village Secretary presented information on the Hays County HMP Update to the Bear Creek Commissioners. The agenda for this presentation is included in Appendix A of the Hays County HMP Update.

### *Plan Phase Newsletters*

Bear Creek MPC utilized newsletters for each phase of the planning process in order to share updates on the planning process with stakeholders, elected officials, Village staff and the public. Copies of the newsletters can be found in Plan Appendix A of the Hays County HMP Update.

### *Plan Draft Public Review and Comment Period*

The link to the draft Hays County HMP Update was posted on the Village of Bear Creek website from July 12, 2017 until July 26, 2017. A hard copy was placed in the North Hays Fire/Rescue building (as there are no village-owned buildings in which to make it available to the public). Email and letter comments were collected by the Village Secretary.

## Incorporation of Sources

In addition to stakeholder and public input, the MPC also reviewed other planning resources that could provide useful information to the plan update process. Table BC.3 lists the documents reviewed and how they were considered for incorporation in the updated plan.

### *Table BC.3, Review/Incorporation of Sources*

| Name of Document | Type | How Incorporated |
|---|---|---|
| 2013 State of Texas HMP | Plan | Utilized hazard definitions and hazard classification names |
| Flood Insurance Study | Study | Incorporated best available hydraulic and hydrologic study results for flood hazard profile |
| Village of Bear Creek Plans of Proposed Street Improvements | Plan | Existing plan for improvement that is funded and can be enhanced with mitigation |
| Driveway Permit Process | Procedure | Reviewed for possible mitigation enhancements in driveway construction to mitigate the impacts of flood and expansive soils (Village of Bear Creek) |
| Well Monitoring Data | Data | Reviewed as evidence of drought and water shortage (Village of Bear Creek, 2013) |

## Continued Public Participation in Maintenance Process

The strategy for updates at the local level for Bear Creek will include opportunities for public involvement, as shown in Table BC.4.

### *Table BC.4, Public Involvement for Updates*

| Activity | Public Involvement | Method Available |
|---|---|---|
| Monitoring | The public will be given notice when items will be reviewed and receive the opportunity to review the notes from any notable developments. | Newspaper/Social Media |
| Evaluation | The public will be given a means to voice their opinion on the completed actions. | SurveyMonkey/Paper Survey |
| Updates | Once updates are made, the changes will be recorded in a public revision history document. | Newspaper/Social Media/Council Meeting Announcements/ SurveyMonkey |

## Maintenance

Table BC.5 lists the method, schedule, and responsible agent for the monitoring, evaluation, and updating of the adopted 2017 HMP within the Plan's 5-year update cycle.

*Table BC.5, Hays County HMP Maintenance Schedule, Village of Bear Creek*

| Task | Scope | Method | Schedule | Responsible Agent |
|---|---|---|---|---|
| Monitoring | Jurisdictional | Review of mitigation action items using Mitigation Action Progress Report Worksheets (Appendix C of the Hays County HMP Update). | Every 12 months | Village of Bear Creek, Village Commission, Village Secretary |
| Evaluation | Jurisdictional | Complete Online Planner Survey (using SurveyMonkey) with evaluation of plan process. | Every 12 months | Village of Bear Creek, Village Commission, Village Secretary |
| Updates | Jurisdictional | Perform updates to Mitigation Strategy to edit/add/omit actions identified during monitoring activities.<br>Conduct post-disaster review of community annex in order to update for significant occurrences, construction of new critical infrastructure or facilities, changes in jurisdictional boundaries and development.<br>Participate in MPC for 5-year HMP update process. | As needed | Village of Bear Creek, Village Commission, Village Secretary |

# Section 2: Risk Assessment

## Bear Creek Jurisdictional Hazards

This section contains Bear Creek's hazard profiles for each natural hazard included in the Hays County HMP Update. Profiles include:

- Location - the area where the hazard is known to occur
- Previous Occurrences - a history of reported events for the hazard
- Significant Previous Occurrences (when applicable) - notable hazard events within the community
- Extent - the strength or magnitude of the hazard
- Probability - the likelihood of the hazard event occurring in the future
- Impact - the consequence or effect (or possible effect) of hazard events
- Vulnerability Summary - identification of structures, systems, populations or assets susceptible to loss or damage

Hazard descriptions and extent scales for hazard magnitudes, are found in Chapter 2, the Risk Assessment portion of the Hays County HMP Update.

When available, data specific to Bear Creek was used for hazard analysis. When no instances were reported specifically for the jurisdiction for regional hazards, County-level data was applied.

State and national datasets were used to determine occurrence, extent, and the respective probabilities, rather than verbal testimonies, in an effort to retain data consistency. For some hazards, the National Oceanic and Atmospheric Administration (NOAA) Storm Events Database was used as the most comprehensive data available for hazards. As a result, fatality, injury and damage amounts shown for previous hazard occurrences do not always reflect the most recent totals. The Previous Occurrences paragraph identifies instances in which this may occur. Verbal testimony, when available, was integrated into impact or vulnerability summaries.

Hazards profiled within the Risk Assessment include:

Drought

Extreme Heat

Severe Winter Storms

Lightning

Hailstorms

Windstorms

Tornadoes

Expansive Soils

Floods

Land Subsidence

Hurricanes/Tropical Storms

Earthquakes

Dam/Levee Failure

Wildfires

## Drought

### Drought: Location

Drought occurs on a regional scale, therefore, all of the Village of Bear Creek is equally at risk as it can occur anywhere in the jurisdiction.

### Drought: Previous Occurrences

NOAA Storm Events Database documents 27 drought events for Hays County since the year 1996 (see Table BC.6). Although there were no drought events reported specifically for the Village of Bear Creek, the jurisdiction would have been affected by the events that were reported for the surrounding County area.

Fatality, injury and damage amounts are shown in Table BC.6, per the NOAA Storm Events Database. Community testimony indicates that these amounts do not reflect the most recent totals, however NOAA data is being used as the best source of information available for the record period.

*Table BC.6, Reported Drought Occurrence, Hays County*

| Location | Date | Type | Fatalities | Injuries | Property Damage | Crop Damage |
|---|---|---|---|---|---|---|
| HAYS (ZONE) | 4/1/1996 | Drought | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 5/1/1996 | Drought | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 6/1/1996 | Drought | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 7/1/1996 | Drought | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 8/1/1996 | Drought | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 7/1/2000 | Drought | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 8/1/2000 | Drought | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 9/1/2000 | Drought | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 10/1/2000 | Drought | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 5/1/2011 | Drought | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 6/1/2011 | Drought | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 7/1/2011 | Drought | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 8/1/2011 | Drought | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 9/1/2011 | Drought | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 10/1/2011 | Drought | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 11/1/2011 | Drought | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 12/1/2011 | Drought | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 1/1/2012 | Drought | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 6/1/2012 | Drought | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 12/1/2012 | Drought | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 2/1/2013 | Drought | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 3/1/2013 | Drought | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 4/1/2013 | Drought | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 6/1/2013 | Drought | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 7/1/2013 | Drought | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 8/1/2013 | Drought | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 8/1/2014 | Drought | 0 | 0 | 0.00 | 0.00 |
| Total | | | | | $0.00 | $0.00 |

*(National Oceanic and Atmospheric Administration Storm Event Database, 2016)*

## Drought: Significant Past Events

Several significant regional drought events have previously impacted the Village. Refer to the *Drought: Significant Past Events* paragraph within Section 2, the Risk Assessment portion of the Hays County Annex for narratives discussing these events.

## Drought: Extent

The US Drought Monitor Drought Intensity scale classifies drought by 5 categories, D0 through D4. According to the reported previous drought occurrences in the jurisdiction, the maximum drought extent experienced is a Category D4 drought. Refer to Chapter 2, the Risk Assessment portion of the Hays County HMP Update, for a description of the US Drought Monitor Drought Intensity Index.

## Drought: Probability

Based on 6 years with reported drought events from the NOAA Storm Events Database within 20 years, a drought event occurs approximately once every 3 years on average in Hays County. Since drought events can happen anywhere throughout the HMP jurisdiction and occur on a regional scale, the Village of Bear Creek's future probability is assumed to be similar to the surrounding County areas, and therefore can expect a drought event approximately once every 3 years on average, with up to a Stage D4 drought.

| Number of Years with Reported Event (Drought Year) | Number of Years in Dataset | Probability |
|---|---|---|
| 6 | 20 | 0.30 |

## Drought: Impact

Table BC.7 lists the impact of drought from the years 1996 to 2016 for Hays County according to the Drought Impact Reporter. The DIR is the nation's first comprehensive database of drought impacts. This database contains information from multiple Federal agencies, such as NOAA and United States Geological Survey (USGS), related to drought impacts from a national to city level by category and extent of impact. While there are no impacts reported specifically for the Village of Bear Creek, the effects of drought are not confined to jurisdictional boundaries and occur on a regional scale. Impacts reported at the Hays County level are applicable in illustrating impact to the Village of Bear Creek.

***Table BC.7, Reported Drought Impacts, Hays County***

| Hays County Drought Impacts 1996-2016 | |
|---|---|
| **Category** | **# of Incidents Reported** |
| Agriculture | 45 |
| Business & Industry | 3 |
| Energy | 2 |
| Fire | 24 |
| Plants & Wildlife | 33 |
| Relief, Response & Restrictions | 48 |
| Society & Public Health | 7 |
| Tourism & Recreation | 3 |
| Water Supply & Quality | 53 |

*(University of Nebraska-Lincoln, 2016)*

## Drought: Vulnerability Summary

Bear Creek residents depend on multiple sources for their water supply. Some residents use public water through the West Travis County Public Utility Agency. Others use rainwater harvesting and private wells. Well-monitoring data from private wells (Village of Bear Creek, 2013) shows that there have been occasions during which water levels have neared depletion. A drought event would negatively impact those who use rainwater, as they would need to seek water from a third party for drinking, hygiene and household needs. As the community is 100% residential, there are no economic outlets that depend on water for income. A cascading vulnerability would be the increased risk of wildfire spread that could occur low water levels impact water pressure for fighting fires.

## Extreme Heat

### Extreme Heat: Location

Extreme heat occurs on a regional scale; therefore, all of the Village of Bear Creek is equally at risk as it could occur anywhere in the jurisdiction.

### Extreme Heat: Previous Occurrences

NOAA's Online Weather Data (NOWData) provides temperature data ranging from the year 2000 to 2016. NOAA's National Weather Service (NWS) Heat Index (located in Chapter 2, the Risk Assessment portion of the Hays County HMP Update) indicates that temperatures meeting or exceeding 90°F are designated with an "Extreme Caution" or greater warning classification. According to Canyon Dam Station, the closest local weather data collection center with comprehensive data, the mean number of days with a daily max temperature equal or greater to 90°F is 94 days. Currently, the greatest number of days during which the jurisdiction experienced extreme heat is 119 in 2008 while the highest temperature experienced was 109°F in August 2011 (a "Danger" NWS Heat Index classification). Canyon Dam Station is the closest reporting NOWData station to the jurisdiction and applies equally to the Village of Bear Creek due to the regional nature of extreme heat occurrence.

### Extreme Heat: Extent

Extreme heat extent is classified by temperatures, as well as event level designations, within the NWS Heat Index. The extent of extreme heat that the Village of Bear Creek has experienced can be derived from the data provided from NOWData at Canyon Dam Station since the year 2000. The highest daily mean temperature experienced was 109°F in August 2011. This event is classified by the NWS Heat Index as "Danger". Refer to Chapter 2, the Risk Assessment portion of the Hays County HMP Update, for a description of heat extent scale, NOAA's NWS Heat Index.

### Extreme Heat: Probability

The probability of future events can be determined by assessing historical averages. Since extreme heat events occur on a regional scale, the Village of Bear Creek's future probability is assumed to be similar to the area surrounding Canyon Dam Station. Based on NOWData, the Village can expect, on average, approximately 94 days a year with temperatures equal or greater to 90°F, and up to a "Danger" warning classification per the NOAA NWS Heat Index. As extreme heat events have occurred every year since 2000, the probability of extreme heat affecting the community is 100% in any given year.

### Extreme Heat: Impact

Extreme heat has physical impacts on the public and the infrastructure that supports them. According to the Texas Health Care Information Collection and Trauma Registry from the Texas Department of State Health Services' Injury Epidemiology & Surveillance Branch, the following number of patients were received in Hays County medical facilities for Heat Related Injuries and Trauma (shown in Tables BC.8 and BC.9).

***Table BC.8, Hays County Hospital Inpatient Data, Extreme Heat***

| Description | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|
| Accident caused by excessive heat due to weather conditions | 1 | 3 | 5 | 0 | 0 |
| Accident due to excessive heat of unspecified origin | 1 | 0 | 0 | 0 | 0 |

*(Texas Department of State Health Services- Injury Epidemiology & Surveillance Branch, 2017)*

*Table BC.9, Hays County Trauma Data, Extreme Heat*

| Description | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|
| Accident due to excessive heat of unspecified origin | 0 | 1 | 0 | 0 | 0 |

*(Texas Department of State Health Services- Injury Epidemiology & Surveillance Branch, 2017)*



In addition to the physical impacts, an excessive heat event can also be the cause of cascading incidents. Electrical outages could occur due to the high demands of electricity needed to power cooling systems. A loss of critical resources, such as power, has significant impact on the entire population, with higher impacts to those with vulnerabilities to such conditions. The following portion of the Village of Bear Creek's population, according to HAZUS-MH 3.2 updated Census 2010 population estimates, would be greatly impacted by the severe temperatures related to excessive heat and/or the loss of electrical energy in their dwellings.

Population over 65 years old: 25

Population under 16 years old: 95

Economically Disadvantaged Population ($0-$20k): 2

An organization called Inside Energy (http://insideenergy.org) provided a compiled database outlining 15 years of power outages across the United States from annual data available at the Department of Energy. Within the database, the following excessive heat events affected electrical availability in the areas in or near Hays County (shown in Table BC.10).

*Table BC.10, Extreme Heat Affecting Electrical Availability*

| Event Description | Year | Start Date | Start Time | End Date | Respondent | Location | Customers Affected |
|---|---|---|---|---|---|---|---|
| Declared Energy Emergency Alert2/Heat Wave | 2007 | 8/14/2007 | 2:00 p.m. | 8/14/2007 | American Electric Power (CSWS) | CSWS Control Area of Southwest Power Pool Parts of Oklahoma, Texas, Louisiana, Arkansas | N/A |

*(Wirfs-Brock, 2014)*

## Extreme Heat: Vulnerability Summary

Bear Creek does not have a formal cooling station plan for the community and does not have the public facilities with which to cool people. Agreements would have to be achieved with outside agencies, non-profits or private interest groups.

# Severe Winter Storms

## Severe Winter Storms: Location

Severe winter storms occur on a regional scale; therefore, all of the Village of Bear Creek is equally at risk.

## Severe Winter Storms: Previous Occurrences

NOAA Storm Events Database documents 13 winter storm events for Hays County since the year 1996 (see Table BC.11). Although there were no winter storm events reported specifically for the Village of Bear Creek, the jurisdiction would have been affected by the events that were reported for the surrounding County area.

Fatality, injury and damage amounts are shown in Table BC.11, per the NOAA Storm Events Database. Community testimony indicates that these amounts do not reflect the most recent totals, however NOAA data is being used as the best source of information available for the record period.

***Table BC.11, Winter Weather Occurrences, Hays County***

| Location | Date | Type | Fatalities | Injuries | Property Damage | Crop Damage |
|---|---|---|---|---|---|---|
| HAYS (ZONE) | 2/1/1996 | Winter Storm | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 1/7/1997 | Winter Storm | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 1/11/1997 | Winter Storm | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 12/23/1998 | Winter Storm | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 12/12/2000 | Winter Storm | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 11/28/2001 | Winter Storm | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 2/24/2003 | Winter Storm | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 12/7/2005 | Winter Storm | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 1/15/2007 | Winter Storm | 0 | 0 | 125,000.00 | 0.00 |
| HAYS (ZONE) | 2/3/2011 | Winter Storm | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 11/26/2013 | Winter Weather | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 1/23/2015 | Winter Weather | 0 | 0 | 0.00 | 0.00 |
| HAYS (ZONE) | 2/16/2015 | Winter Weather | 0 | 0 | 0.00 | 0.00 |
| Total | | | 0 | 0 | $125,000.00 | $0.00 |

*(National Oceanic and Atmospheric Administration Storm Event Database, 2016)*

## Severe Winter Storms: Significant Past Events

Regionally, there were significant winter weather events reported as Hays (Zone) that may have impacted the Village, as shown in Table BC.11. Refer to the *Severe Winter Storms: Significant Past Events* section within the Hays County Annex for narratives discussing these events.

## Severe Winter Storms: Extent

Ice accumulation is captured and measured with the Regional Snowfall Index (RSI) and the Sperry-Piltz Ice Accumulation (SPIA) Index, as detailed in Chapter 2, the Risk Assessment portion of the Hays County HMP Update. According to the reported previous winter weather occurrences in the jurisdiction, the maximum winter weather extent experienced is a RSI Category 1 snowfall event or SPIA Ice Index Category 2 ice event.

## Severe Winter Storms: Probability

Based on 13 reported events from the NOAA Storm Events Database in 20 years, a winter weather event occurs approximately every 2 years on average in Hays County. There were no events reported specifically for the Village of Bear Creek. Since these events can happen anywhere throughout the HMP update area and occur on a regional scale, the Village's future probability is assumed to be similar to the surrounding County area. The jurisdiction can expect a winter weather event approximately once every 2 years on average in the future with up to an RSI Category 1 snowfall event or SPIA Ice Index Category 2 ice event.

| Number of Reported Events | Number of Years in Dataset | Probability |
|---|---|---|
| 13 | 20 | 0.65 |

## Severe Winter Storms: Impact

Severe winter weather has physical impacts upon the public and the infrastructure that supports them. According to the Texas Health Care Information Collection and Trauma Registry from the Texas Department of State Health Services' Injury Epidemiology & Surveillance Branch, the following number of patients were received in Hays County medical facilities for Cold Related Injuries and Trauma (shown in Tables BC.12 and BC.13).

***Table BC.12, Hays County Hospital Inpatient Data, Severe Winter Storms***

| Description | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|
| Accident caused by excessive cold due to weather conditions | 2 | 0 | 0 | 0 | 0 |
| Accident due to excessive cold of unspecified origin | 1 | 0 | 0 | 0 | 1 |

*(Texas Department of State Health Services- Injury Epidemiology & Surveillance Branch, 2017)*

***Table BC.13, Hays County Trauma Data, Severe Winter Storms***

| Description | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|
| Accident due to excessive cold due to weather conditions | 1 | 0 | 0 | 0 | 0 |

*(Texas Department of State Health Services- Injury Epidemiology & Surveillance Branch, 2017)*

In addition to the physical impacts, a severe winter storm event can also be the cause of cascading incidents. Electrical outages could occur due to the high demands of electricity needed to power heating systems. A loss of critical resources, such as power, has significant impact on the entire population, with higher impacts to those with vulnerabilities to such conditions. The following portion of Bear Creek's population, according to HAZUS-MH 3.2 updated Census 2010 population estimates, would be greatly impacted by the extreme temperature conditions related to severe winter storms and/or the loss of electrical energy in their dwellings.

| | |
|---|---|
| Population over 65 years old: | 25 |
| Population under 16 years old: | 95 |
| Economically Disadvantaged Population ($0-$20k): | 2 |

An organization called Inside Energy (http://insideenergy.org) provided a compiled database outlining 15 years of power outages across the United States from annual data available at the Department of Energy. Within the database, the following winter storm events affected electrical availability in the areas in or near Hays County (shown in Table BC.14).

***Table BC.14, Severe Winter Storms Affecting Electrical Availability***

| Event Description | Year | Start Date | Start Time | End Date | Respondent | Location | Customers Affected |
|---|---|---|---|---|---|---|---|
| Cold Weather Event | 2011 | 2/9/2011 | 4:30 PM | 2/10/2011 | ERCOT ISO | Texas | N/A |
| Public Appeal due to Severe Weather - Cold | 2014 | 1/6/2014 | 7:01 AM | 1/7/2014 | ERCOT | Texas | N/A |
| Public Appeal due to Severe Weather - Cold | 2014 | 3/2/2014 | 7:00 PM | 3/4/2014 | ERCOT | ERCOT Region Texas | N/A |

**Electrical Reliability Council of Texas (ERCOT)*

*(Wirfs-Brock, 2014)*

In addition, severe winter storms and the icy roads that accompany them lead to dangerous driving conditions. Although there were no reports specifically for the Village of Bear Creek, data available from the Texas Department of Transportation's Crash Records Information System shows that between the years of 2010 and 2017, rural Hays County experienced 42 crashes related to sleet/hail and snow conditions (shown in Table BC.15). Injuries sustained from these crash events included 12 incapacitating injuries, 6 non-incapacitating injuries, and 2 possible injuries. Since winter weather occurs on a regional scale, it is assumed that weather related crashes in the surrounding County area would be similar to those experienced in these conditions within Bear Creek.



***Table BC.15, Severe Winter Storms, Vehicle Accidents, Hays County***

| City | Fatality | Incapacitating Injury | Non-Incapacitating | Possible Injury | Crash Year | Street Name | Surface Condition | Weather Condition |
|---|---|---|---|---|---|---|---|---|
| Rural Hays County | 0 | 0 | 1 | 0 | 2010 | US0290 | Slush | Snow |
| Rural Hays County | 0 | 0 | 1 | 0 | 2010 | US0290 | Slush | Snow |
| Rural Hays County | 0 | 0 | 0 | 0 | 2010 | W FITZHUGH RD | Slush | Snow |
| Rural Hays County | 0 | 0 | 0 | 0 | 2010 | US0290 | Slush | Snow |
| Rural Hays County | 0 | 0 | 0 | 0 | 2010 | RM0012 | Slush | Snow |
| Rural Hays County | 0 | 0 | 0 | 0 | 2010 | RM0012 | Slush | Snow |
| Rural Hays County | 0 | 0 | 0 | 0 | 2011 | RM0967 | Ice | Sleet/Hail |
| Rural Hays County | 0 | 0 | 0 | 0 | 2011 | US0290 | Ice | Sleet/Hail |
| Rural Hays County | 0 | 0 | 0 | 0 | 2011 | MCGREGOR LN | Ice | Sleet/Hail |
| Rural Hays County | 0 | 1 | 0 | 0 | 2011 | RM0012 | Ice | Sleet/Hail |
| Rural Hays County | 0 | 1 | 0 | 0 | 2011 | RM0012 | Ice | Sleet/Hail |
| Rural Hays County | 0 | 1 | 0 | 0 | 2011 | RM0012 | Ice | Sleet/Hail |
| Rural Hays County | 0 | 0 | 0 | 0 | 2011 | MCGREGOR LN | Ice | Sleet/Hail |
| Rural Hays County | 0 | 0 | 0 | 0 | 2011 | HILLIARD RD | Snow | Snow |
| Rural Hays County | 0 | 0 | 0 | 1 | 2011 | FM1626 | Snow | Snow |
| Rural Hays County | 0 | 0 | 0 | 0 | 2011 | IH0035 | Snow | Snow |
| Rural Hays County | 0 | 0 | 0 | 0 | 2011 | IH0035 | Snow | Snow |

*Table BC.15, Severe Winter Storms, Vehicle Accidents, Hays County (cont.)*

| City | Fatality | Incapacitating Injury | Non-Incapacitating | Possible Injury | Crash Year | Street Name | Surface Condition | Weather Condition |
|---|---|---|---|---|---|---|---|---|
| Rural Hays County | 0 | 0 | 0 | 0 | 2011 | US0290 | Ice | Snow |
| Rural Hays County | 0 | 0 | 0 | 0 | 2011 | US0290 | Ice | Snow |
| Rural Hays County | 0 | 3 | 0 | 0 | 2014 | RM0012 | Wet | Sleet/Hail |
| Rural Hays County | 0 | 3 | 0 | 0 | 2014 | RM0012 | Wet | Sleet/Hail |
| Rural Hays County | 0 | 3 | 0 | 0 | 2014 | RM0012 | Wet | Sleet/Hail |
| Rural Hays County | 0 | 0 | 0 | 0 | 2014 | RM0012 | Wet | Sleet/Hail |
| Rural Hays County | 0 | 0 | 0 | 0 | 2014 | FM1626 | Ice | Sleet/Hail |
| Rural Hays County | 0 | 0 | 0 | 0 | 2014 | FM1626 | Ice | Sleet/Hail |
| Rural Hays County | 0 | 0 | 0 | 0 | 2014 | FM1626 | Ice | Sleet/Hail |
| Rural Hays County | 0 | 0 | 0 | 0 | 2014 | FM1626 | Ice | Sleet/Hail |
| Rural Hays County | 0 | 0 | 0 | 0 | 2014 | FM1626 | Ice | Sleet/Hail |
| Rural Hays County | 0 | 0 | 1 | 0 | 2014 | DOVE DR | Ice | Sleet/Hail |
| Rural Hays County | 0 | 0 | 0 | 0 | 2014 | US0290 | Ice | Sleet/Hail |
| Rural Hays County | 0 | 0 | 0 | 0 | 2014 | US0290 | Ice | Sleet/Hail |
| Rural Hays County | 0 | 0 | 0 | 0 | 2014 | US0290 | Ice | Sleet/Hail |
| Rural Hays County | 0 | 0 | 0 | 0 | 2014 | STAPLES RD | Ice | Sleet/Hail |
| Rural Hays County | 0 | 0 | 0 | 1 | 2014 | RM0165 | Wet | Sleet/Hail |
| Rural Hays County | 0 | 0 | 0 | 0 | 2015 | RM0012 | Wet | Sleet/Hail |
| Rural Hays County | 0 | 0 | 0 | 0 | 2015 | RM0012 | Wet | Sleet/Hail |
| Rural Hays County | 0 | 0 | 0 | 0 | 2015 | RM0012 | Wet | Sleet/Hail |
| Rural Hays County | 0 | 0 | 0 | 0 | 2015 | RM0012 | Wet | Sleet/Hail |

*Table BC.15, Severe Winter Storms, Vehicle Accidents, Hays County (cont.)*

| City | Fatality | Incapacitating Injury | Non-Incapacitating | Possible Injury | Crash Year | Street Name | Surface Condition | Weather Condition |
|---|---|---|---|---|---|---|---|---|
| Rural Hays County | 0 | 0 | 0 | 0 | 2015 | RM0012 | Wet | Sleet/Hail |
| Rural Hays County | 0 | 0 | 1 | 0 | 2015 | RM0150 | Ice | Sleet/Hail |
| Rural Hays County | 0 | 0 | 1 | 0 | 2015 | RM0150 | Ice | Sleet/Hail |
| Rural Hays County | 0 | 0 | 1 | 0 | 2015 | RM0150 | Ice | Sleet/Hail |

*Crash Records Information System Query for Accidents in Hays County from 2010-2017 from non-Clear Weather Conditions (Texas Department of Transportation, 2017)*



### Severe Winter Storms: Vulnerability Summary

Although the occurrence and intensity of severe winter storms do not pose a serious risk, the fact that 100% of the roads in Bear Creek are owned by the Village means that County or State assets are not always readily available for sanding the roads in the event of winter storms. In addition, the abundance of trees on the lots, along with all the overhead electrical utilities increase the risk of power outages from branches falling on powerlines. Although prolonged outages have not been an issue in the past, it is unknown if icy roads could impact the ability of Pedernales Electric Cooperative from being able to respond to a power outage in the community. It is unknown how many private residents have emergency generator power.

# Lightning

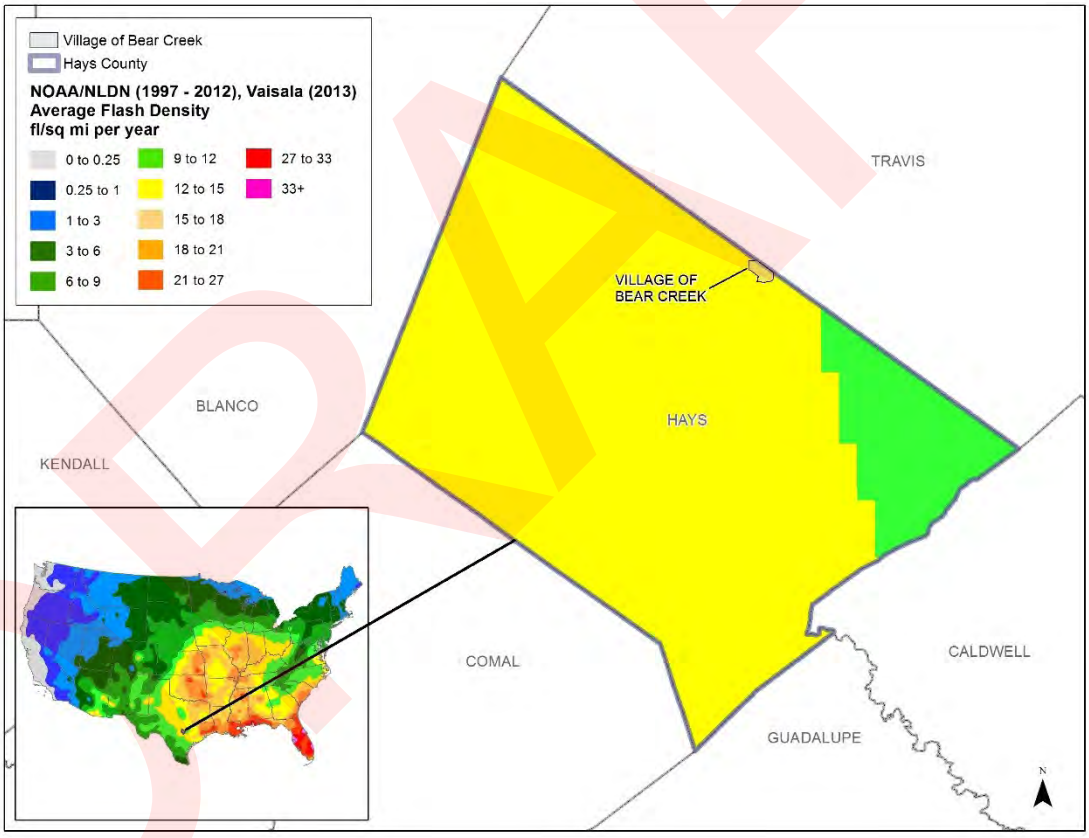
## Lightning: Location

The entire extent of the Village of Bear Creek is exposed to some degree of lightning hazard. Since lightning can occur at any location, lightning events could be experienced anywhere within the jurisdiction.

## Lightning: Previous Occurrences

Figure BC.5 reflects the Village of Bear Creek within the area that was calculated to receive approximately 12 to 15 lightning strikes per square mile per year according to National Lightning Detection Network (NLDN) data for the years 1997 to 2012. There were no lightning events reported specifically for the jurisdiction in the NOAA Storm Events Database.

*Figure BC.5, Average Annual Lightning Density*




*(Vaisala NLDN, 2016)*

## Lightning: Extent

Due to the lack of reported occurrences, there is not sufficient data to determine the maximum Lightning Activity Level (LAL) for the jurisdiction (refer to Chapter 2, the Risk Assessment portion of the Hays County HMP Update, for a description of the lightning extent scale LAL Grids). However, with the data available, the extent of lightning events that the Village of Bear Creek has experienced can be derived from the NOAA/NLDN data seen in Figure BC.4. There were up to 12 to 15 strikes per square mile per year within the jurisdiction of approximately 1.27 square miles.

## Lightning: Probability

Since lightning can occur at any location, lightning events could be experienced anywhere within the jurisdiction. Based on the data provided in Figure BC.5, the Village of Bear Creek can expect future events to fall in line with NLDN data from previous years, with a probability of up to approximately 12 to 15 lightning strikes per square mile per year.

## Lightning: Impact

The National Lightning Detection Network (NLDN) reported 217 lightning fatalities within the State between the years 1959 and 2013. According to the Texas Health Care Information Collection and Trauma Registry from the Texas Department of State Health Services' Injury Epidemiology & Surveillance Branch, the following number of patients were received in Hays County medical facilities for Lightning Related Trauma (shown in Table BC.16).

***Table BC.16, Hays County Trauma Registry Data, Lightning Events***

| Description | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|
| Accident due to lightning | 0 | 1 | 0 | 0 | 1 |

*(Texas Department of State Health Services- Injury Epidemiology & Surveillance Branch, 2017)*



In addition to the physical impacts, a lightning event can also be the cause of cascading incidents. Electrical outages could occur due to the impact that lightning strikes can have on electrical utility infrastructure. A loss of critical resources, such as power, has significant impact on the entire population, with higher impacts to those with vulnerabilities to such conditions. The following portion of the Village of Bear Creek's population, according to HAZUS-MH 3.2 updated Census 2010 population estimates, would be greatly impacted by the loss of electrical energy in their dwellings.

| | |
|---|---|
| Population over 65 years old: | 25 |
| Population under 16 years old: | 95 |
| Economically Disadvantaged Population ($0-$20k): | 2 |

An organization called Inside Energy (http://insideenergy.org) provided a compiled database outlining 15 years of power outages across the United States from annual data available at the Department of Energy. Within the database, the following thunderstorm/severe storm events affected electrical availability in the areas in or near Hays County (shown in Table BC.17).

*Table BC.17, Lightning Affecting Electrical Availability*

| Event Description | Year | Start Date | Start Time | End Date | Respondent | Location | Customers Affected |
|---|---|---|---|---|---|---|---|
| Severe Weather | 2008 | 4/9/2008 | 4:00 p.m. | 4/13/2008 | Oncor Electric Delivery Company LLC | North, Central and East Texas | 488,689 |
| Severe Thunderstorms | 2008 | 6/17/2008 | 9:01 a.m. | 6/19/2008 | Oncor Electric Delivery Company LLC | North, Central and East Texas | 234,393 |
| Severe Thunderstorms | 2008 | 8/3/2008 | 1:30 a.m. | 8/3/2008 | Entergy Corporation | Mississippi, Louisiana, Texas | 59,500 |
| Severe Storms | 2009 | 6/10/2009 | 6:00 p.m. | 6/14/2009 | Oncor Electric Delivery Company, LLC | North and Central Texas | 800,000 |
| Thunderstorms | 2010 | 6/8/2010 | 11:00 a.m. | 6/8/2010 | Centerpoint Energy | Southeastern Texas | 79,741 |

*(Wirfs-Brock, 2014)*



Lightning strikes can also cause wildfire ignitions. According to the National Fire Protection Association (NFPA), "during 2007-2011, U.S. local fire departments responded to an average of 22,600 fires per year that were started by lightning. These fires caused an average of 9 civilian deaths, 53 civilian injuries and $451 million in direct property damage per year." The source also cites that the fires are more common in June through August and in the late afternoon and evening.

## Lightning: Vulnerability Summary

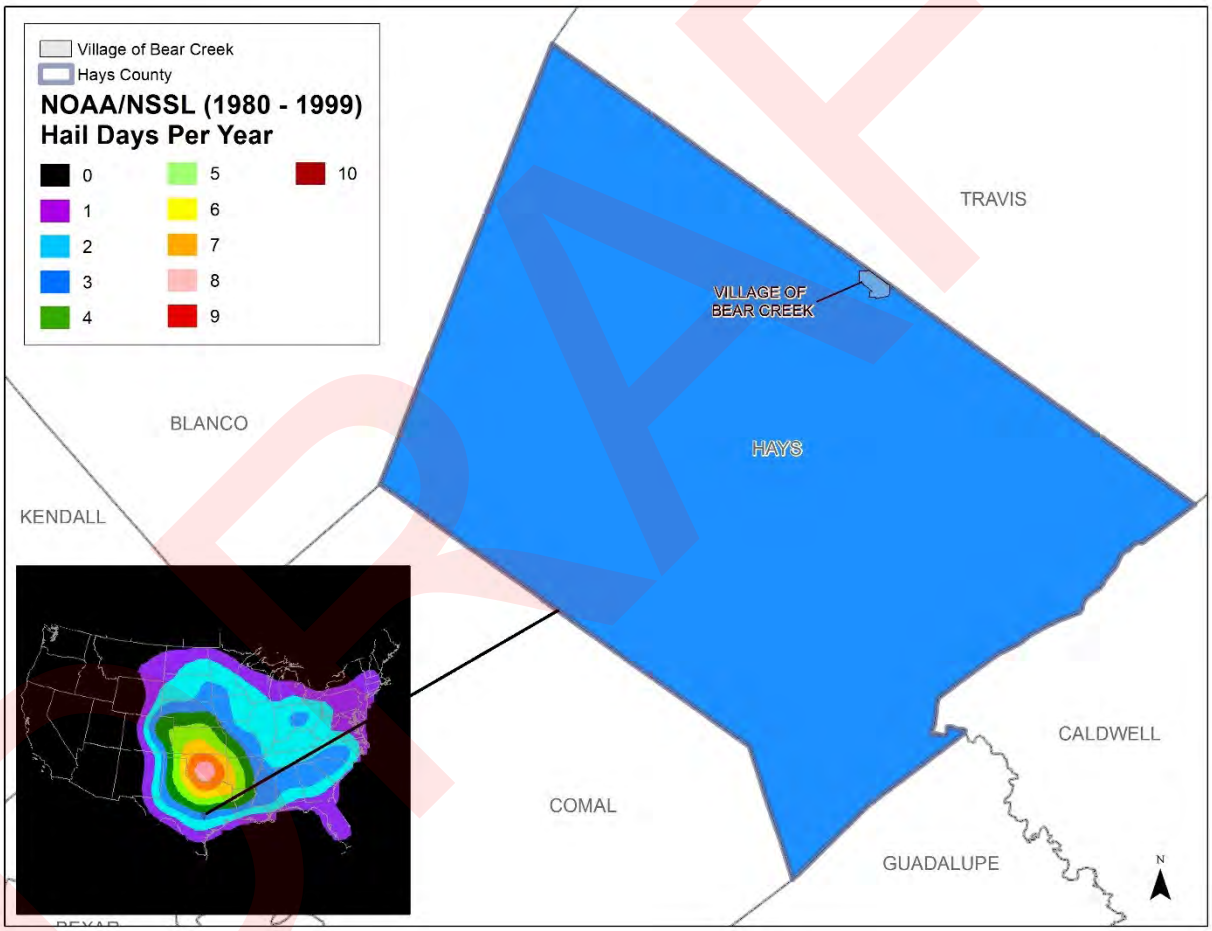
According to community testimony, Bear Creek has experienced lightning strikes that have hit trees and open areas in the community. A notable risk is created by the number of trees in the Village, due to many residential lots left wooded for the purposes of keeping the community as natural as possible.

## Hailstorm

### Hailstorms: Location

The entire extent of the Village of Bear Creek is exposed to some degree of hail hazard. Since hail can occur at any location, hail events could be experienced anywhere within the jurisdiction. NOAA's National Severe Storms Laboratory used historical data from 1980 to 1999 to estimate the daily probability of hail occurrences of at least 0.75-inch diameter hail across the U.S. Figure BC.6 shows the average number of hail days per year determined by this analysis and the corresponding location of the Village. The density of hail days per year in the map's legend indicates the probable number of hail days for each 25-square-mile cell within the contoured zone that can be expected per year. It should be noted that the density number does not indicate the number of events that can be expected within each cell, rather the average number of days per year with 1 or more event occurring within each cell.

*Figure BC.6, National Hail Days Per Year, Village of Bear Creek*




*(National Severe Storms Laboratory, 2016)*

### Hailstorms: Previous Occurrences

Since hail can occur at any location, hail events could be experienced anywhere within the jurisdiction. While the Village of Bear Creek has not had any previous occurrences reported through the NOAA Storm Events Database, if an event were to occur, it would be similar in size and magnitude to events within the surrounding County area. Table BC.18 lists the 57 hail events reported for Hays County since the year 1967. Note that multiple listings for the same dates are the result of reports from different affected parts of the County for the given event.

Fatality, injury and damage amounts are shown in Table BC.18, per the NOAA Storm Events Database. Community testimony indicates that these amounts do not reflect the most recent totals, however NOAA data is being used as the best source of information available for the record period.

*Table BC.18, Hail Events, Hays County*

| Location | Date | Type | Magnitude (mm) | Fatalities | Injuries | Property Damage | Crop Damage |
|---|---|---|---|---|---|---|---|
| Hays County | 5/20/1967 | Hail | 76.20 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 5/8/1969 | Hail | 25.40 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 10/27/1970 | Hail | 25.40 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 2/25/1971 | Hail | 57.15 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 3/12/1971 | Hail | 76.20 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 5/29/1975 | Hail | 44.45 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 3/30/1976 | Hail | 44.45 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 4/7/1976 | Hail | 44.45 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 4/7/1976 | Hail | 44.45 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 4/7/1976 | Hail | 44.45 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 4/7/1976 | Hail | 44.45 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 4/7/1976 | Hail | 44.45 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 5/5/1976 | Hail | 44.45 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 4/3/1977 | Hail | 25.40 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 4/14/1977 | Hail | 50.80 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 4/14/1977 | Hail | 50.80 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 4/18/1979 | Hail | 25.40 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 1/17/1980 | Hail | 44.45 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 1/17/1980 | Hail | 25.40 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 2/29/1980 | Hail | 44.45 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 4/11/1980 | Hail | 25.40 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 5/8/1980 | Hail | 25.40 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 5/9/1981 | Hail | 25.40 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 4/20/1982 | Hail | 25.40 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 5/13/1982 | Hail | 25.40 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 3/30/1983 | Hail | 25.40 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 5/20/1983 | Hail | 25.40 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 5/20/1983 | Hail | 31.75 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 5/20/1987 | Hail | 50.80 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 5/5/1989 | Hail | 19.05 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 5/5/1989 | Hail | 38.10 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 5/10/1989 | Hail | 19.05 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 5/10/1989 | Hail | 38.10 | 0 | 0 | 0.00 | 0.00 |

*Table BC.18, Hail Events, Hays County (cont.)*

| Location | Date | Type | Magnitude (mm) | Fatalities | Injuries | Property Damage | Crop Damage |
|---|---|---|---|---|---|---|---|
| Hays County | 2/1/1990 | Hail | 38.10 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 4/14/1991 | Hail | 19.05 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 4/28/1991 | Hail | 19.05 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 4/19/1992 | Hail | 38.10 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 5/12/1992 | Hail | 44.45 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 5/12/1992 | Hail | 19.05 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 5/27/1992 | Hail | 19.05 | 0 | 0 | 0.00 | 0.00 |
| Hays County | 5/27/1992 | Hail | 25.40 | 0 | 0 | 0.00 | 0.00 |
| Henly | 11/1/1995 | Hail | 44.45 | 0 | 0 | 0.00 | 0.00 |
| Henly | 3/7/1998 | Hail | 19.05 | 0 | 0 | 0.00 | 0.00 |
| Henly | 2/10/2009 | Hail | 25.4 | 0 | 0 | 0.00 | 0.00 |
| Driftwood | 5/11/2011 | Hail | 44.45 | 0 | 0 | 0.00 | 0.00 |
| Mt. Gainor | 5/20/2011 | Hail | 19.05 | 0 | 0 | 0.00 | 0.00 |
| Driftwood | 5/20/2011 | Hail | 25.40 | 0 | 0 | 0.00 | 0.00 |
| Driftwood | 5/20/2011 | Hail | 25.40 | 0 | 0 | 0.00 | 0.00 |
| Mt. Gainor | 5/20/2011 | Hail | 25.40 | 0 | 0 | 0.00 | 0.00 |
| Driftwood | 5/20/2011 | Hail | 25.40 | 0 | 0 | 0.00 | 0.00 |
| Driftwood | 5/20/2011 | Hail | 22.35 | 0 | 0 | 0.00 | 0.00 |
| Fitzhugh | 1/24/2012 | Hail | 25.40 | 0 | 0 | 0.00 | 0.00 |
| Fitzhugh | 3/19/2013 | Hail | 38.10 | 0 | 0 | 0.00 | 0.00 |
| Driftwood | 4/27/2013 | Hail | 44.45 | 0 | 0 | 0.00 | 0.00 |
| Driftwood | 5/27/2014 | Hail | 25.40 | 0 | 0 | 0.00 | 0.00 |
| Fitzhugh | 5/27/2014 | Hail | 19.05 | 0 | 0 | 0.00 | 0.00 |
| Driftwood | 4/16/2015 | Hail | 22.35 | 0 | 0 | 0.00 | 0.00 |
| **Total** | | | | **0** | **0** | **$0.00** | **$0.00** |

*(National Oceanic and Atmospheric Administration Storm Event Database, 2016)*



### Hailstorms: Extent

The Tornado and Storm Research Organization (TORRO) created a hail extent index to measure hail called the Hailstorm Intensity Scale. According to the reported previous hail occurrences in the jurisdiction, the maximum hail extent experienced is hail up to 3 inches or 76.20 millimeters in diameter, corresponding to a TORRO Hailstorm Intensity Scale classification of a "Super Hailstorm." Refer to Chapter 2, the Risk Assessment portion of the Hays County HMP Update, for hail extent scale descriptions.

### Hailstorms: Probability

Figure BC.5 reports 3 hail days per year as a result of NLDN's nationwide analysis. Since this calculation is based on national data, a more specific calculation based on local-level NOAA reports was utilized to calculate probability. Based on 57 reported events in 49 years, a hail event occurs approximately once a year on average in Hays County. Since hail events can happen anywhere throughout the HMP update area, the Village of Bear Creek's future probability is assumed to be similar to the surrounding County area. The Village can expect a hail event approximately once every year on average in the future, with hail up to 3 inches, or 76.20 millimeters in diameter, corresponding to a TORRO Hailstorm Intensity Scale classification of a "Super Hailstorm."

| Number of Reported Events | Number of Years in Dataset | Probability |
|---|---|---|
| 57 | 49 | 1.16 |

### Hailstorms: Impact

Although there are no specific occurrences for which hailstorm damages are captured, based on the maximum hail extent experienced in the surrounding County area (76.20 mm), the TORRO Hailstorm Intensity Scale (found in Chapter 2, Risk Assessment within the Hays County HMP Update) indicates that impact can be expected to include any of the following:

- Varying degrees of damage to vegetation and crops
- Damage to plastic structures
- Varying degrees of damage to glass
- Paint and wood scored
- Vehicle bodywork damage
- Varying degrees of roof damage
- Varying degrees of risk of injuries
- Varying degrees of aircraft damage
- Brick walls pitted
- Risk of severe or even fatal injuries to persons caught in the open

### Hailstorms: Vulnerability Summary

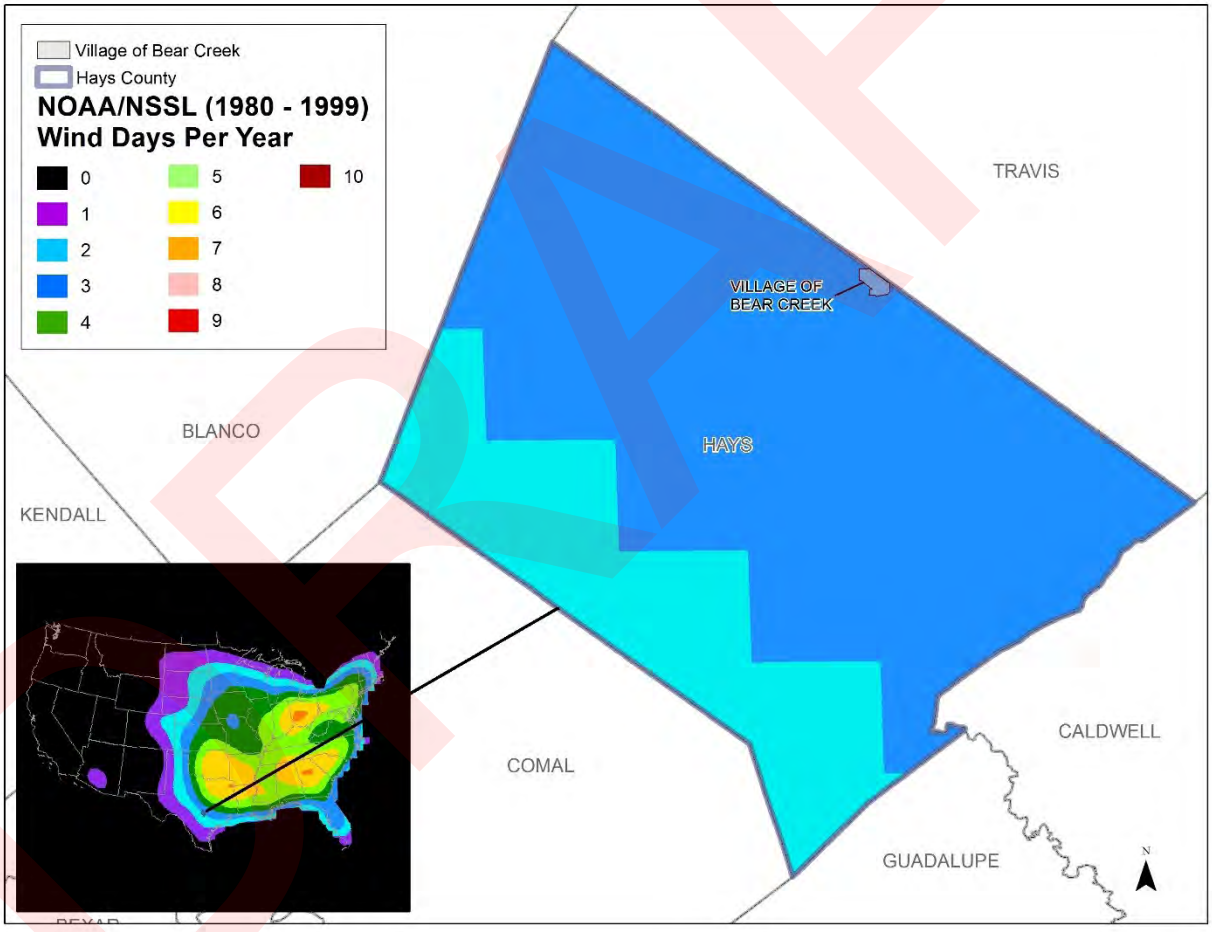
According to community testimony, hail events are a regular occurring hazard in Bear Creek and are somewhat of an acceptable risk to those who live there. Events typically cause minor damage to roofs in the community. As there are no Village-owned structures or vehicles, there is no concern for damage to publicly-owned property.

## Windstorms

### Windstorms: Location

The entire extent of the Village of Bear Creek is exposed to some degree of wind hazard. Since wind can occur at any location, wind events could be experienced anywhere within the jurisdiction. NOAA's National Severe Storms Laboratory used historical data from 1980 to 1999 to estimate the daily probability of wind occurrences across the U.S., with gusts of at least 58 mph. Figure BC.7 shows the estimates for wind days determined from this analysis and the corresponding location of the Village. The density of wind days per year in the map's legend indicates the probable number of wind days for each 25-square-mile cell within the contoured zone that can be expected per year. It should be noted that the density number does not indicate the number of events that can be expected within each cell, rather the average number of days per year with 1 or more events occurring within each cell.

*Figure BC.7, National Wind Days Per Year, Village of Bear Creek*




*(National Severe Storms Laboratory, 2016)*

## Windstorms: Previous Occurrences

Since windstorms can occur at any location, wind events could be experienced anywhere within the jurisdiction. While the Village of Bear Creek has not had any previous occurrences reported through the NOAA Storm Events Database, if an event were to occur, it would be similar in size and magnitude to events within the surrounding County area. Table BC.19 lists the 38 wind events reported for Hays County and its unincorporated jurisdictions since the year 1974.

Fatality, injury and damage amounts are shown in Table BC.19, per the NOAA Storm Events Database. Community testimony indicates that these amounts do not reflect the most recent totals, however NOAA data is being used as the best source of information available for the record period.

*Table BC.19, Reported Wind Events, Hays County*

| Location | Date | Type | Extent (knots) | Fatalities | Injuries | Property Damage | Crop Damage |
|---|---|---|---|---|---|---|---|
| Hays County | 5/9/1974 | Thunderstorm Wind | NA | 0 | 0 | 0.00 | 0.00 |
| Hays County | 4/7/1975 | Thunderstorm Wind | NA | 0 | 0 | 0.00 | 0.00 |
| Hays County | 5/19/1975 | Thunderstorm Wind | 70 kts. | 0 | 0 | 0.00 | 0.00 |
| Hays County | 5/31/1976 | Thunderstorm Wind | NA | 0 | 0 | 0.00 | 0.00 |
| Hays County | 5/31/1976 | Thunderstorm Wind | NA | 0 | 0 | 0.00 | 0.00 |
| Hays County | 5/11/1978 | Thunderstorm Wind | NA | 0 | 0 | 0.00 | 0.00 |
| Hays County | 5/29/1978 | Thunderstorm Wind | NA | 0 | 0 | 0.00 | 0.00 |
| Hays County | 4/18/1979 | Thunderstorm Wind | 52 kts. | 0 | 0 | 0.00 | 0.00 |
| Hays County | 7/10/1979 | Thunderstorm Wind | NA | 0 | 0 | 0.00 | 0.00 |
| Hays County | 2/29/1980 | Thunderstorm Wind | 55 kts. | 0 | 0 | 0.00 | 0.00 |
| Hays County | 5/13/1980 | Thunderstorm Wind | 52 kts. | 0 | 0 | 0.00 | 0.00 |
| Hays County | 7/28/1980 | Thunderstorm Wind | NA | 0 | 0 | 0.00 | 0.00 |
| Hays County | 5/13/1982 | Thunderstorm Wind | NA | 0 | 0 | 0.00 | 0.00 |
| Hays County | 6/22/1982 | Thunderstorm Wind | NA | 0 | 0 | 0.00 | 0.00 |
| Hays County | 3/30/1983 | Thunderstorm Wind | NA | 0 | 0 | 0.00 | 0.00 |
| Hays County | 10/21/1984 | Thunderstorm Wind | NA | 0 | 0 | 0.00 | 0.00 |
| Hays County | 12/31/1984 | Thunderstorm Wind | NA | 0 | 0 | 0.00 | 0.00 |

*Table BC.19, Reported Wind Events, Hays County (cont.)*

| Location | Date | Type | Extent (knots) | Fatalities | Injuries | Property Damage | Crop Damage |
|---|---|---|---|---|---|---|---|
| Hays County | 5/8/1985 | Thunderstorm Wind | NA | 0 | 0 | 0.00 | 0.00 |
| Hays County | 6/12/1986 | Thunderstorm Wind | NA | 0 | 0 | 0.00 | 0.00 |
| Hays County | 5/5/1989 | Thunderstorm Wind | NA | 0 | 0 | 0.00 | 0.00 |
| Hays County | 5/20/1989 | Thunderstorm Wind | NA | 0 | 0 | 0.00 | 0.00 |
| Hays County | 4/26/1990 | Thunderstorm Wind | NA | 0 | 0 | 0.00 | 0.00 |
| Hays County | 4/26/1990 | Thunderstorm Wind | NA | 0 | 0 | 0.00 | 0.00 |
| Hays County | 5/18/1990 | Thunderstorm Wind | NA | 0 | 0 | 0.00 | 0.00 |
| Hays County | 4/7/1991 | Thunderstorm Wind | NA | 0 | 0 | 0.00 | 0.00 |
| Hays County | 5/27/1992 | Thunderstorm Wind | 53 kts. | 0 | 0 | 0.00 | 0.00 |
| Hays County | 6/12/1992 | Thunderstorm Wind | 60 kts. | 0 | 0 | 0.00 | 0.00 |
| Hays County | 6/12/1992 | Thunderstorm Wind | NA | 0 | 0 | 0.00 | 0.00 |
| Hays County | 9/3/1992 | Thunderstorm Wind | 50 kts. | 0 | 0 | 0.00 | 0.00 |
| Hays County | 9/3/1992 | Thunderstorm Wind | 50 kts. | 0 | 0 | 0.00 | 0.00 |
| Countywide | 3/8/1995 | Thunderstorm Wind | 55 kts. | 0 | 0 | 0.00 | 0.00 |
| Countywide | 6/11/1995 | Thunderstorm Wind | NA | 0 | 0 | 0.00 | 3,000.00 |
| Countywide | 3/19/2002 | Thunderstorm Wind | NA | 0 | 0 | 100,000.00 | 100,000.00 |
| Driftwood | 4/14/2014 | Thunderstorm Wind | 50 kts. EG | 0 | 0 | 0.00 | 0.00 |
| Driftwood | 6/12/2014 | Thunderstorm Wind | 61 kts. EG | 0 | 0 | 0.00 | 0.00 |
| Fitzhugh | 6/12/2014 | Thunderstorm Wind | 61 kts. EG | 0 | 0 | 0.00 | 0.00 |
| Fitzhugh | 6/12/2014 | Thunderstorm Wind | 56 kts. EG | 0 | 0 | 0.00 | 0.00 |
| Mt Gainor | 4/30/2016 | Thunderstorm Wind | 61 kts. EG | 0 | 0 | 0.00 | 0.00 |
| **Total** | | | | **0** | **0** | **$100,000.00** | **$103,000.00** |

**NA - No data available*
*EG = Estimated Gust*

*(National Oceanic and Atmospheric Administration Storm Event Database, 2016)*

### Windstorms: Extent

Wind is measured by the Beaufort Wind Scale that relates wind speed to observed conditions on land and sea. According to the reported previous windstorm occurrences in the jurisdiction, the maximum wind extent experienced was 70 knots (Beaufort Wind Classification: Hurricane). Refer to Chapter 2, the Risk Assessment portion of the Hays County HMP Update, for a description of wind extent scales.

### Windstorms: Probability

Figure BC.7 reports 3 wind days per year as a result of NLDN's nationwide analysis. Since this calculation is based on national data, a more specific calculation based on local-level NOAA reports was utilized to calculate probability. Based on 38 reported events in 42 years, a wind event occurs approximately once every year on average in Hays County. Since wind events can happen anywhere throughout the HMP update area, the Village of Bear Creek's future probability is assumed to be similar to the surrounding County area. In the future, the Village can expect a wind event of up to 70 knots or 80.55 miles per hour (Beaufort Wind Classification: Hurricane), approximately once every year on average in the future.

| Number of Reported Events | Number of Years in Dataset | Probability |
|---|---|---|
| 38 | 42 | 0.90 |

### Windstorms: Impact

Although there were no documented reports specifically providing impact data for the Village of Bear Creek, data available from the Texas Department of Transportation's Crash Records Information System shows that between the years of 2010 and 2017, rural Hays County experienced 5 crashes related to severe crosswind weather conditions (see Table BC.20). There were no injuries reported from these crash events. Since wind events occur on a regional scale, it is assumed that weather-related crashes in the surrounding County area would be similar to those experienced during these conditions within the Village of Bear Creek.

***Table BC.20, Windstorms, Vehicle Accidents, Hays County***

| City | Fatality | Incapacitating Injury | Non-Incapacitating | Possible Injury | Crash Year | Street Name | Surface Condition | Weather Condition |
|---|---|---|---|---|---|---|---|---|
| Rural Hays County | 0 | 0 | 0 | 0 | 2010 | LIME KILN RD | Dry | Severe Crosswinds |
| Rural Hays County | 0 | 0 | 0 | 0 | 2014 | IH0035 | Dry | Severe Crosswinds |
| Rural Hays County | 0 | 0 | 0 | 0 | 2014 | IH0035 | Dry | Severe Crosswinds |
| Rural Hays County | 0 | 0 | 0 | 0 | 2014 | IH0035 | Dry | Severe Crosswinds |
| Rural Hays County | 0 | 0 | 0 | 0 | 2017 | US0290 | Wet | Severe Crosswinds |

*(Texas Department of Transportation, 2017)*

### Windstorms: Vulnerability Summary

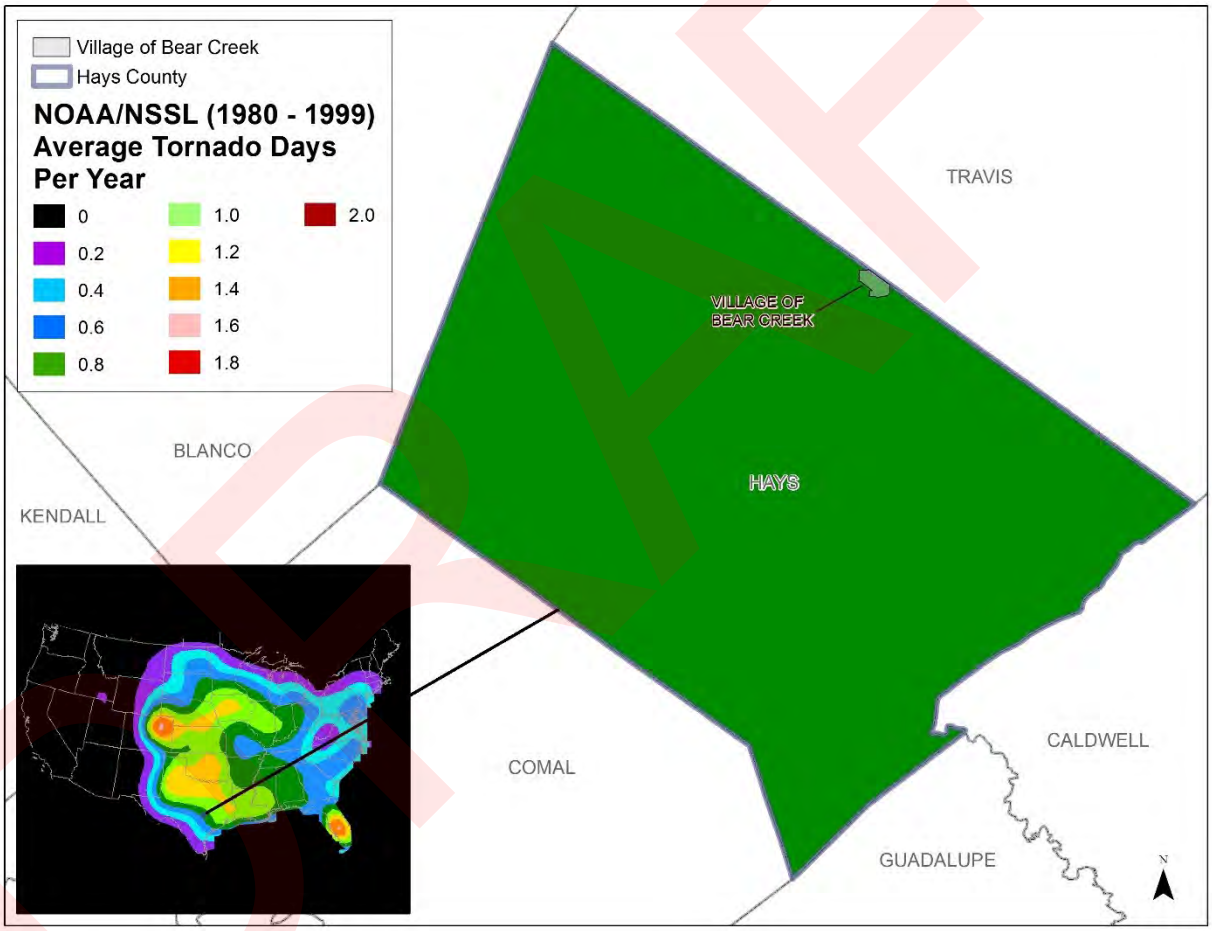
According to community testimony, Bear Creek has suffered undocumented/unrecorded damage from straight line wind events in the past. Two years ago, a wind event caused roof damage to multiple structures and ripped off treetops and uprooted several from the ground. Although power was not affected, there were multiple trees that fell into the roadways and obstructed traffic. Residences, trees and roadways in Bear Creek are vulnerable.

## Tornado

### Tornadoes: Location

The entire extent of the Village of Bear Creek is exposed to some degree of tornado hazard. Since tornadoes can occur at any location, tornado events could be experienced anywhere within the jurisdiction. NOAA's National Severe Storms Laboratory used historical data from 1980 to 1999 to estimate the daily probability of tornado occurrences across the U.S., regardless of tornado magnitude. Figure BC.8 shows the average number of tornado days resulting from this analysis and the respective location of the Village. The density of average tornado days per year in the map's legend indicates the probable number of tornado days for each 25-square-mile cell within the contoured zone that can be expected per year. This density number does not indicate the number of events that can be expected within each cell, rather the average number of days per year with 1 or more events occurring within each cell.

*Figure BC.8, National Tornado Days Per Year, Village of Bear Creek*




*(National Severe Storms Laboratory, 2016)*

### Tornadoes: Previous Occurrences

Since tornadoes can occur at any location, tornado events could be experienced anywhere within the jurisdiction. While the Village of Bear Creek has not had any previous occurrences reported through the NOAA Storm Events Database, if an event were to occur, the event would be similar in size and magnitude to events within the surrounding County area. Table BC.21 lists the 16 tornado events reported for Hays County and its unincorporated jurisdictions since year 1953.

Fatality, injury and damage amounts are shown in Table BC.21, per the NOAA Storm Events Database. Community testimony indicates that these amounts do not reflect the most recent totals, however NOAA data is being used as the best source of information available for the record period.

*Table BC.21, Tornado Events, Hays County*

| Location | Date | Type | Magnitude | Fatalities | Injuries | Property Damage | Crop Damage |
|---|---|---|---|---|---|---|---|
| Hays County | 4/28/1953 | Tornado | F3 | 1 | 5 | 250,000.00 | 0.00 |
| Hays County | 4/30/1954 | Tornado | F1 | 0 | 0 | 250,000.00 | 0.00 |
| Hays County | 5/2/1958 | Tornado | F1 | 0 | 0 | 30.00 | 0.00 |
| Hays County | 11/12/1961 | Tornado | F2 | 0 | 0 | 2,500.00 | 0.00 |
| Hays County | 9/20/1967 | Tornado | NA | 0 | 0 | 250.00 | 0.00 |
| Hays County | 9/20/1967 | Tornado | NA | 0 | 0 | 30.00 | 0.00 |
| Hays County | 5/10/1975 | Tornado | F1 | 0 | 0 | 25,000.00 | 0.00 |
| Hays County | 3/30/1976 | Tornado | F2 | 0 | 0 | 25,000.00 | 0.00 |
| Hays County | 3/30/1976 | Tornado | F2 | 0 | 1 | 250,000.00 | 0.00 |
| Hays County | 8/10/1980 | Tornado | F2 | 0 | 0 | 25,000,000.00 | 0.00 |
| Hays County | 4/22/1985 | Tornado | F2 | 0 | 0 | 250,000.00 | 0.00 |
| Hays County | 8/22/1991 | Tornado | F1 | 0 | 0 | 2,500.00 | 0.00 |
| Countywide | 5/13/1994 | Tornado | F0 | 0 | 0 | 500.00 | 500.00 |
| Henly | 11/15/2001 | Tornado | F0 | 0 | 1 | 50,000.00 | 0.00 |
| Driftwood | 10/8/2002 | Tornado | F0 | 0 | 0 | 70,000.00 | 0.00 |
| M. Gainor | 5/23/2015 | Tornado | EF0 | 0 | 0 | 0.00 | 0.00 |
| Total | | | | 1 | 7 | $26,175,810.00 | $500.00 |

*(National Oceanic and Atmospheric Administration Storm Event Database, 2016)*

## Tornadoes: Extent

Tornadoes are measured by severity on the Enhanced Fujita Scale, with a range from 0-6. According to the reported previous tornado occurrences in the jurisdiction, the maximum tornado extent experienced was a category F3 tornado in 1953. Refer to Chapter 2, the Risk Assessment portion of the Hays County HMP Update, for a description of tornado extent scales, Fujita (F) Scale and Operational Enhanced Fujita (EF) Scale.

### Tornadoes: Probability

Figure BC.8 reports 0.8 tornado days per year as a result of NLDN's nationwide analysis. Since this calculation is based on national data, a more specific calculation based on local-level NOAA reports was utilized to calculate probability. Based on 16 reported events in 63 years, a tornado event occurs approximately every 4 years on average in Hays County. Since tornado events can happen anywhere throughout the HMP update area, the Village of Bear Creek's future probability is assumed to be similar to the surrounding County area. The Village can expect a tornado event approximately once every 4 years on average in the future with up to an F3 magnitude.



| Number of Reported Events | Number of Years in Dataset | Probability |
|---|---|---|
| 16 | 63 | 0.25 |

### Tornadoes: Impact

There is no specific event data available for the Village of Bear Creek, from which impacts would be calculated. However, it can be assumed that impacts would be similar to those that the surrounding County area experiences.

Based on Hays County having experienced tornadoes between F0 and F3 levels in the past, if similar events were to happen in the future in the Village, the type of impacts that the jurisdiction can expect associated with those magnitudes would include, from least to greatest:

- Light Damage - Broken branches; shallow rooted trees pushed over; some chimney damage.
- Moderate Damage - Surface damage to roofs; mobile homes pushed off foundation; moving vehicles pushed off the road.
- Significant Damage - Frame houses have roof torn off; mobile homes completely destroyed; train boxcars overturned; large trees snapped or uprooted; smaller debris turned into missiles.
- Severe Damage - Roofs completely torn off well-constructed buildings, along with some walls; majority of trees uprooted; trains overturned; vehicles lifted off the ground.

(Tornado Facts, 2016)

Additional impacts from tornado events could include downed utility poles, communication towers, street signals, and debris created from residential and urban property.

Critical infrastructure could be disrupted, resulting in periods of impact to service due to the lack of back-up utility resources. See Lightning: Impact section within this annex for more information on utility interruption.

### Tornadoes: Vulnerability Summary

The Village of Bear Creek includes solely residential structures, with no manufactured or modular structures. With only 2 members of the population of 369 living below the US poverty level (according to HAZUS-MH 3.2 updated Census 2010 population estimates), there are not any particular structure types or populations that have increased vulnerability to low intensity storms. However, a higher intensity event that could affect the structures could have a high impact due to a lack of documented evacuation routes and lack of mass notification capabilities besides social media.

## Expansive Soils

### Expansive Soils: Location

Areas within the Village of Bear Creek with structures that are underlain by soils containing clays with swelling potential are most affected by expansive soils. Figure 2.4 within Chapter 2 (the Risk Assessment portion within the Hays County HMP Update) shows the location of expansive soil areas for the Village. The jurisdiction has the same expansive soil composition throughout the entire area.

### Expansive Soils: Previous Occurrences

There was no documentation of site-specific past events of structural damage due to expansive soils from local, state, or national databases queried.

Expansive soils cannot be documented as a time-specific event, except when they lead to structural and infrastructure damage. There are no specific damage reports or historical records of events in the Village, however future events can occur.

### Expansive Soils: Extent

According to the USGS Expansive Soils Regions, Figure 2.4 in Chapter 2, (Risk Assessment within the Hays County HMP Update), less than 50% of the jurisdiction is underlain by soils with clay textures that have high shrink-swell properties.

### Expansive Soils: Probability

Considering the amount of swelling potential within the jurisdiction, as well as the lack of reported events, the probability of a future event is low (unlikely in next 10 years) for the jurisdiction.

### Expansive Soils: Impact

Areas within the Village of Bear Creek are not readily experiencing new development. Most structures were constructed 20 to 30 years ago, when the community was not yet incorporated. Since building standards were not in place, it is possible that less than 50% of the 159 structures could be impacted by expansive soils in the event of shrink-swell activity. This corresponds with the USGS expansive soil region classification for the Village of Bear Creek.

### Expansive Soils: Vulnerability Summary

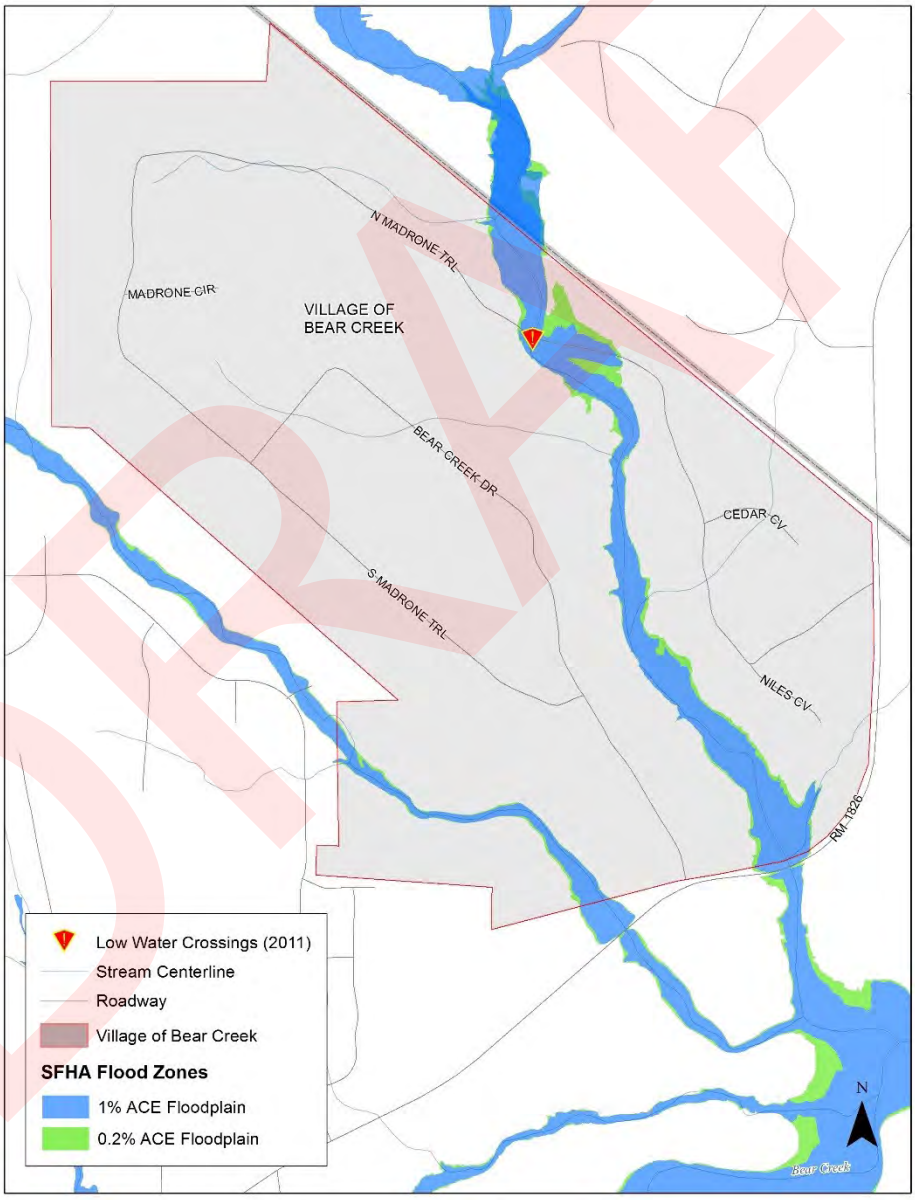
The Village of Bear Creek is located within the USGS region of soils that have less than 50% of the area underlain by soils with clays of swelling potential. There is only 1 other level lower than this one. As there are no instances of specific expansive soil impacts, the probability of expansive soils affecting the Village is relatively low.

## Floods

### Floods: Location

The location of low water crossings as well as the 1% (100 year) and 0.2% (500 year) Annual Chance Event (ACE) floodplains for the Village of Bear Creek are shown in Figure BC.9 and are the locations within the jurisdiction that are most affected by flooding. This figure is based upon newly developed hydrological and hydraulic analysis and is the best information available to date. Table BC.22 provides the total acreage in the jurisdiction that is located in the 1% and 0.2% floodplains.

***Figure BC.9, Special Flood Hazard Areas and Low Water Crossings, Village of Bear Creek***




*(Texas Natural Resources Information System, 2011)*

*Table BC.22, Village of Bear Creek Floodplain Acreage*

| Jurisdiction | 100yr (1%) Floodplain Acres (Includes Floodway) | 500yr (0.2%) Floodplain Acres (Includes 100yr) |
|---|---|---|
| Village of Bear Creek | 44 | 53 |

## Floods: Previous Occurrences

Hays County was included in 3 Federal disaster declarations between 2013 and 2015, all related to flooding. Although the NOAA Storm Events Database did not list flood events reported specifically for the Village of Bear Creek, Table BC.23 lists the 69 documented events reported for Hays County between the years 1997 and 2016. Due to the size and extent of some flood occurrences, as well as the regional nature of reports in the NOAA Storm Events Database, the Village of Bear Creek may have been affected by many of the events that were reported for the surrounding areas.

Fatality, injury and damage amounts are shown in Table BC.23, per the NOAA Storm Events Database. Community testimony indicates that these amounts do not reflect the most recent totals, however NOAA data is being used as the best source of information available for the record period.

*Table BC.23, Flood Events, Hays County*

| Location | Date | Type | Fatalities | Injuries | Property Damage | Crop Damage |
|---|---|---|---|---|---|---|
| Countywide | 5/23/1997 | Flash Flood | 0 | 0 | 10,000.00 | 0.00 |
| Countywide | 6/6/1997 | Flash Flood | 0 | 0 | 10,000.00 | 0.00 |
| Countywide | 6/7/1997 | Flash Flood | 0 | 0 | 15,000.00 | 0.00 |
| Countywide | 6/8/1997 | Flash Flood | 2 | 7 | 2,500,000.00 | 50,000.00 |
| Countywide | 6/21/1997 | Flash Flood | 0 | 0 | 5,000.00 | 0.00 |
| Countywide | 6/22/1997 | Flash Flood | 0 | 0 | 50,000.00 | 50,000.00 |
| Countywide | 2/21/1998 | Flash Flood | 0 | 0 | 5,000.00 | 0.00 |
| Countywide | 7/3/1998 | Flash Flood | 0 | 0 | 20,000.00 | 0.00 |
| Countywide | 8/22/1998 | Flash Flood | 0 | 0 | 20,000.00 | 10,000.00 |
| Countywide | 8/23/1998 | Flash Flood | 0 | 0 | 10,000.00 | 0.00 |
| Countywide | 10/17/1998 | Flash Flood | 0 | 100 | 500,000.00 | 50,000.00 |
| HAYS (ZONE) | 10/17/1998 | Flood | 0 | 25 | 4,000,000.00 | 50,000.00 |
| HAYS (ZONE) | 10/17/1998 | Flood | 0 | 25 | 4,000,000.00 | 50,000.00 |
| Countywide | 6/21/1999 | Flash Flood | 0 | 0 | 3,000.00 | 0.00 |
| Countywide | 6/9/2000 | Flash Flood | 0 | 0 | 15,000.00 | 0.00 |
| Countywide | 11/2/2000 | Flash Flood | 0 | 0 | 20,000.00 | 0.00 |
| HAYS (ZONE) | 11/4/2000 | Flood | 0 | 0 | 0.00 | 0.00 |
| North Portion | 8/26/2001 | Flash Flood | 0 | 0 | 10,000.00 | 0.00 |
| Countywide | 8/31/2001 | Flash Flood | 0 | 0 | 20,000.00 | 0.00 |
| Countywide | 8/31/2001 | Flash Flood | 0 | 0 | 30,000.00 | 20,000.00 |
| Countywide | 11/15/2001 | Flash Flood | 0 | 20 | 200,000.00 | 50,000.00 |
| HAYS (ZONE) | 11/15/2001 | Flood | 0 | 0 | 0.00 | 0.00 |

*Table BC.23, Flood Events, Hays County (cont.)*

| Location | Date | Type | Fatalities | Injuries | Property Damage | Crop Damage |
|---|---|---|---|---|---|---|
| West Portion | 6/30/2002 | Flash Flood | 0 | 0 | 10,000.00 | 0.00 |
| HAYS (ZONE) | 7/1/2002 | Flood | 0 | 0 | 0.00 | 0.00 |
| South Portion | 7/1/2002 | Flash Flood | 0 | 0 | 0.00 | 0.00 |
| Countywide | 7/2/2002 | Flash Flood | 0 | 0 | 0.00 | 0.00 |
| West Portion | 7/3/2002 | Flash Flood | 0 | 0 | 0.00 | 0.00 |
| West Portion | 7/5/2002 | Flash Flood | 0 | 0 | 0.00 | 0.00 |
| South Portion | 9/19/2002 | Flash Flood | 0 | 0 | 0.00 | 0.00 |
| South Portion | 10/24/2002 | Flash Flood | 0 | 0 | 0.00 | 0.00 |
| Countywide | 11/4/2002 | Flash Flood | 0 | 0 | 0.00 | 0.00 |
| Countywide | 2/20/2003 | Flash Flood | 0 | 0 | 10,000.00 | 0.00 |
| West Portion | 6/13/2003 | Flash Flood | 0 | 0 | 5,000.00 | 0.00 |
| South Portion | 9/11/2003 | Flash Flood | 0 | 0 | 3,000.00 | 0.00 |
| Northwest Portion | 1/16/2004 | Flash Flood | 0 | 0 | 3,000.00 | 0.00 |
| East Portion | 6/5/2004 | Flash Flood | 0 | 0 | 0.00 | 0.00 |
| Countywide | 6/9/2004 | Flash Flood | 0 | 0 | 350,000.00 | 0.00 |
| Driftwood | 6/26/2004 | Flash Flood | 0 | 0 | 0.00 | 0.00 |
| West Portion | 6/27/2004 | Flash Flood | 0 | 0 | 0.00 | 0.00 |
| West Portion | 6/28/2004 | Flash Flood | 0 | 0 | 0.00 | 0.00 |
| Countywide | 6/29/2004 | Flash Flood | 0 | 0 | 0.00 | 0.00 |
| South Portion | 6/30/2004 | Flash Flood | 0 | 0 | 0.00 | 0.00 |
| Hays (Zone) | 6/30/2004 | Flood | 0 | 0 | 0.00 | 0.00 |
| West Portion | 7/25/2004 | Flash Flood | 0 | 0 | 0.00 | 0.00 |
| Countywide | 10/2/2004 | Flash Flood | 0 | 0 | 0.00 | 0.00 |
| Countywide | 10/23/2004 | Flash Flood | 0 | 0 | 0.00 | 0.00 |
| Hays (Zone) | 10/23/2004 | Flood | 0 | 0 | 0.00 | 0.00 |
| Hays (Zone) | 10/24/2004 | Flood | 0 | 0 | 0.00 | 0.00 |
| Countywide | 11/16/2004 | Flash Flood | 0 | 0 | 0.00 | 0.00 |
| Hays (Zone) | 11/17/2004 | Flood | 0 | 0 | 0.00 | 0.00 |
| Countywide | 11/21/2004 | Flash Flood | 0 | 0 | 0.00 | 0.00 |
| Countywide | 11/22/2004 | Flash Flood | 0 | 0 | 0.00 | 0.00 |
| Countywide | 11/22/2004 | Flash Flood | 0 | 0 | 0.00 | 0.00 |
| Southeast Portion | 11/23/2004 | Flash Flood | 0 | 0 | 0.00 | 0.00 |
| South Portion | 5/6/2006 | Flash Flood | 0 | 0 | 0.00 | 0.00 |
| Henly | 3/30/2007 | Flash Flood | 0 | 0 | 0.00 | 0.00 |
| Driftwood | 3/30/2007 | Flood | 0 | 0 | 0.00 | 0.00 |
| Henly | 5/2/2007 | Flash Flood | 0 | 0 | 0.00 | 0.00 |
| Henly | 7/2/2007 | Flash Flood | 0 | 0 | 0.00 | 0.00 |

*Table BC.23, Flood Events, Hays County (cont.)*

| Location | Date | Type | Fatalities | Injuries | Property Damage | Crop Damage |
|---|---|---|---|---|---|---|
| Henly | 5/17/2010 | Flash Flood | 0 | 0 | 0.00 | 0.00 |
| Driftwood | 9/7/2010 | Flash Flood | 0 | 0 | 0.00 | 0.00 |
| Driftwood | 5/10/2012 | Flash Flood | 0 | 0 | 0.00 | 0.00 |
| Driftwood | 5/11/2012 | Flash Flood | 0 | 0 | 0.00 | 0.00 |
| Fitzhugh | 5/17/2015 | Flash Flood | 0 | 0 | 0.00 | 0.00 |
| Henly | 5/30/2015 | Flash Flood | 0 | 0 | 0.00 | 0.00 |
| Fitzhugh | 6/14/2015 | Flash Flood | 0 | 0 | 0.00 | 0.00 |
| Driftwood | 10/30/2015 | Flash Flood | 0 | 0 | 10,000,000.00 | 0.00 |
| Fitzhugh | 5/19/2016 | Flash Flood | 0 | 0 | 0.00 | 0.00 |
| Driftwood | 8/16/2016 | Flash Flood | 0 | 0 | 0.00 | 0.00 |
| Totals | | | 2 | 177 | $21,824,000.00 | $330,000.00 |

*(National Oceanic and Atmospheric Administration Storm Event Database, 2016)*



### Floods: Significant Past Events

Hays County experienced 3 disaster declarations discussed under Floods: Previous Occurrences. Refer to the *Floods: Significant Past Events* section within the Hays County Annex for narratives discussing these events.

### Floods: Extent

Flood extent is described by a combination of ground elevation, river heights, 100-year water surface elevation and HAZUS depth grids. An example of flooding within the jurisdiction are areas along Bear Creek. These areas are exposed to the greatest extent of a flood event. Areas of the community along the creek have an approximate overbank ground elevation of 877 feet with an intersecting 100 year Water Surface Elevations of 881 feet. For a 100-year event, water depth of approximately 4 feet can be expected within this area. A further analysis of Bear Creek is described below.

With Bear Creek having an approximate average normal in-channel elevation of 866 feet (per Light Detection and Ranging [LiDAR] data) through the center of the community, flood depths based on the Water Surface Elevation are approximately 11 feet. Such an event is categorized as a 'Flood Stage' Category. Refer to the Water Depth Extent Scale in Chapter 2 Flood Impact Section for further description.

### Floods: Probability

Probability has been calculated on the basis of NOAA reported events, as a standard, consistent calculation method for all hazards profiled with the Hays County HMP. Based on 69 reported events in 19 years, a flood event occurs approximately 3 to 4 times per year on average in Hays County and its unincorporated jurisdictions. Due to the size and extent of some flood occurrences, as well as the regional nature of reports in the NOAA Storm Events Database, the Village of Bear Creek's future probability is assumed to be similar to the surrounding County area. The Village can expect a flood event approximately 3 to 4 times per year on average in the future, with up to a "Major Flood Stage."

| Number of Reported Events | Number of Years in Dataset | Probability |
|---|---|---|
| 69 | 19 | 3.63 |

## Floods: Impact

A 100-year flood analysis was run for the study area. This analysis utilized the best available LIDAR (COA 2012 and CAPCOG 2008) and Depth Grids. The following describes the inventory counts and building replacement values for the jurisdictional area.

| Village of Bear Creek Building Counts* | | | |
|---|---|---|---|
| Residential | Commercial | Other | Total |
| 131 | 11 | 9 | 151 |

| Village of Bear Creek Building Replacement Value* | | |
|---|---|---|
| Building ($) | Content ($) | Total ($) |
| 63,243,144 | 35,328,106 | 98,571,249 |

A Probabilistic 100-year Return Period HAZUS-MH 3.2 analysis was run on the participating communities. HAZUS results are calculated to census blocks. These blocks were then intersected with the participating community to run a weighted area analysis to get jurisdictional results. The following describes results of the 100-year Return (1% Annual Chance Event) weighted area analysis.

### *HAZUS-MH Results*

#### *General Building Stock Damage*

HAZUS estimates that 4 buildings will be at least moderately damaged in the Village of Bear Creek. 'At least moderately damaged' is defined by HAZUS as greater than 10% damage to a building. The majority of damage can be expected to impact residential areas (75%). The remaining damages (25%) are expected for commercial, industrial, agriculture and religious buildings.

| Residential Buildings* | Commercial Buildings* | Other Buildings* | Total Buildings* |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

#### *Building-Related Losses*

Exposed Value is the total building and content values for structures within the community. The exposed value for the community is $98,571,249. The total building-related losses were $67,894 for this scenario. This represents 0.10% of the total replacement value of the community. Loss values are divided into building and content loss dollars.

| Building Loss ($)* | Content Loss ($)* | Total Loss ($)* |
|---|---|---|
| 42,676 | 25,218 | 67,894 |

**HAZUS software bases property counts and values on aggregate census blocks, in the absence of parcel data. These references may differ from community input, but are given as simulated values based on National averages for comparable census blocks. Bear Creek has no commercial buildings, according to local officials.*

### *Essential Facility Damage*

HAZUS does not estimate any critical facilities or infrastructure to be out of service for more than 1 day on the day of the event. Additionally, the model estimates that 100% of available hospital beds are ready for use by patients already in the hospital and for those injured by an event.

### *Debris Generation*

HAZUS estimates the amount of debris that will be generated in this scenario at a total of 4 tons. If the building debris tonnage is converted to an estimated number of truckloads, it will require 1 truckload (1 to 25 tons per truck) to remove the building debris generated in this scenario.

### *Shelter Requirements*

HAZUS estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. HAZUS also estimates those people displaced that will require accommodations in temporary public shelters. The model estimates 2 people will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, no people are estimated to seek temporary shelter in public shelters.

## Floods: Vulnerability Summary

There are 3 structures in the floodplain that were built prior to the Village of Bear Creek incorporation. Due to this timing, there is no floodplain documentation on file with the Village. Traffic flow can be affected when floodwaters overtop North Madrone Trail, the only low water crossing in the Village of Bear Creek.

## National Flood Insurance Program Repetitive Loss

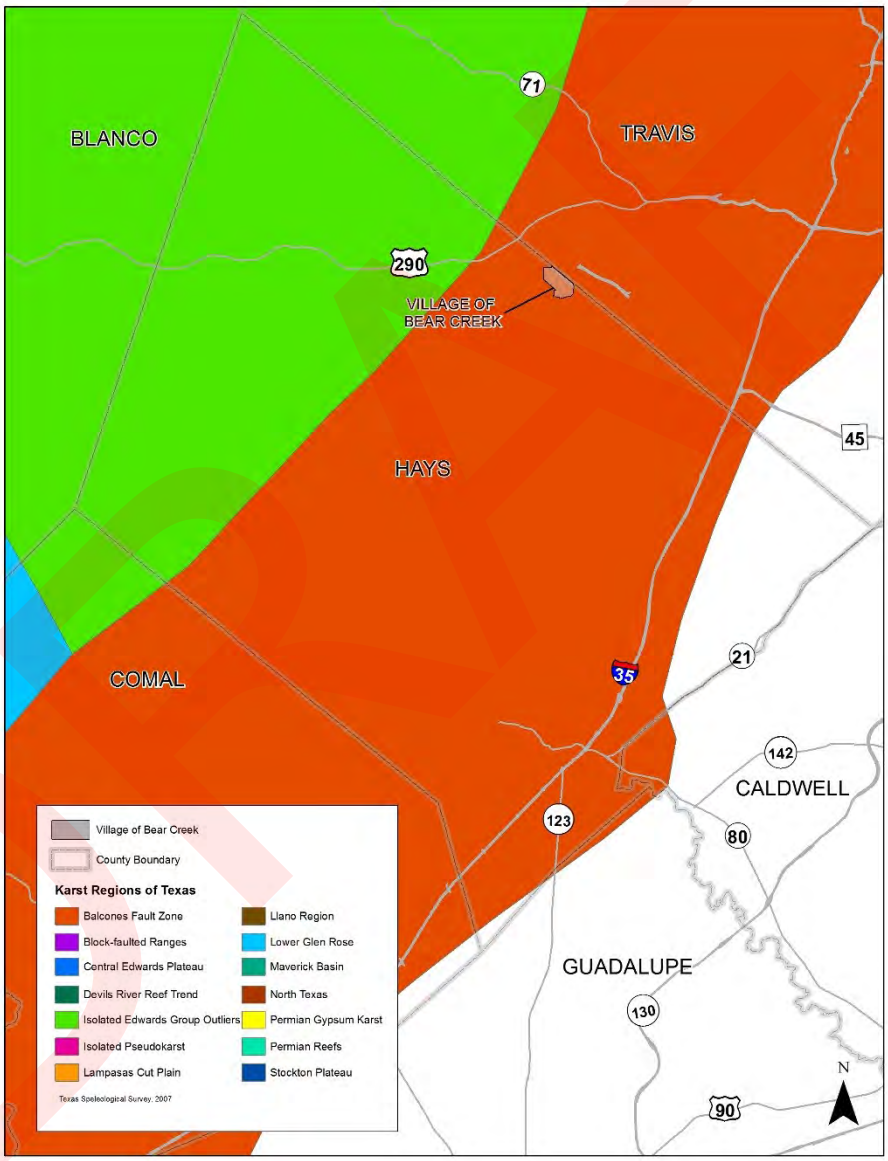
The Village of Bear Creek is a current participant in the National Flood Insurance Program (NFIP). As of September of 2016, the Village does not have any listed RL or SRL properties according to FEMA RL/SRL data.

## Land Subsidence

### Land Subsidence: Location

Karst features are a landscape formed from the dissolution of soluble rocks, such as limestone, that can cause sinkholes and caves. Locations within Bear Creek that are underlain by karst features or that are experiencing extensive groundwater depletion, are most at risk. Figures BC.10 and BC.11 illustrate the jurisdiction's location in conjunction with the karst regions of Texas and USGS Groundwater Depletion Zones. As shown in Figure BC.10, the Village of Bear Creek is located within the Balcones Fault Zone karst region.

*Figure BC.10, Karst Regions of Texas, Village of Bear Creek*




*(Texas Speleological Survey, 2007)*

## Land Subsidence: Previous Occurrences

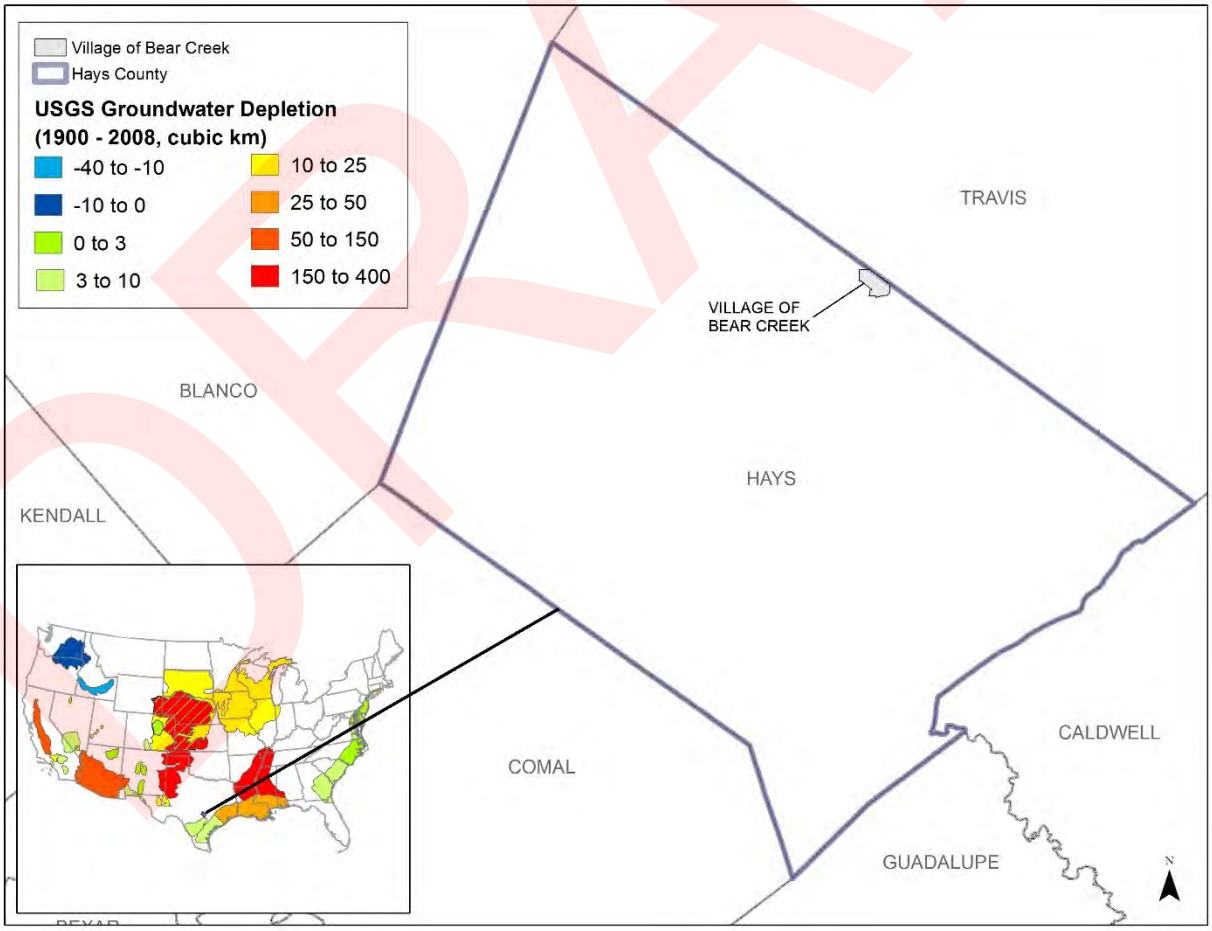
There were no land subsidence events documented specifically for the Village of Bear Creek. As the data displayed in Figure BC.11 illustrates, the HMP jurisdiction does not have a significant history of groundwater depletion.

Land subsidence can occur in the Central Texas Hill County Area. Recently, a small event occurred in Travis County (located approximately 6 miles northeast of the study area) when a 25-foot-wide and 12-foot-deep sinkhole opened up at a Costco parking lot in Austin, Texas (Mashhood, 2012), *Shopping center sinkhole provides chance to study runoff*, www.statesman.com). The update area could potentially experience an event of similar depths, widths, and impact as the event described above, but conditions would vary depending on the location and geography of the event. Since future events cannot be predicted, the estimated extents previously described are hypothetical.

## Land Subsidence: Extent

Due to the lack of reported occurrences, there is not sufficient data to determine the maximum extent of land subsidence for the jurisdiction. However, if a future event were to occur, it can be assumed it would be similar in extent to previous events in the region. This includes the aforementioned sinkhole in Austin, Texas measuring 25-feet wide and 12-feet deep.

***Figure BC.11, Groundwater Depletion Zones, Village of Bear Creek***




*(Groundwater depletion in the United States (1900–2008), 2013)*

### Land Subsidence: Probability

The occurrence of subsidence is an ongoing process resulting from natural and human-induced causes. As seen in Figure BC.10, the entire Village of Bear Creek is located within a known karst region. However, with no documented history of subsidence, the probability of a future land subsidence event for the Village is low (unlikely in next 10 years). If a future event were to occur, however unlikely, it can be assumed it would be similar in extent to previous events in the area. This includes the previously mentioned sinkhole documented in Austin, Texas.

### Land Subsidence: Impact

When considering the impact of land subsidence, it is important to note that many areas within the karst zone have structures and infrastructure that could be affected by a collapsed area. The possible impact of isolated incidents within the karst region could include damage to any, but not all, of the 159 structures located in the zone in the unlikely event of a future occurrence. All structures are cumulatively valued at approximately $98,571,249 based on HAZUS building and content values.

### Land Subsidence: Vulnerability Summary

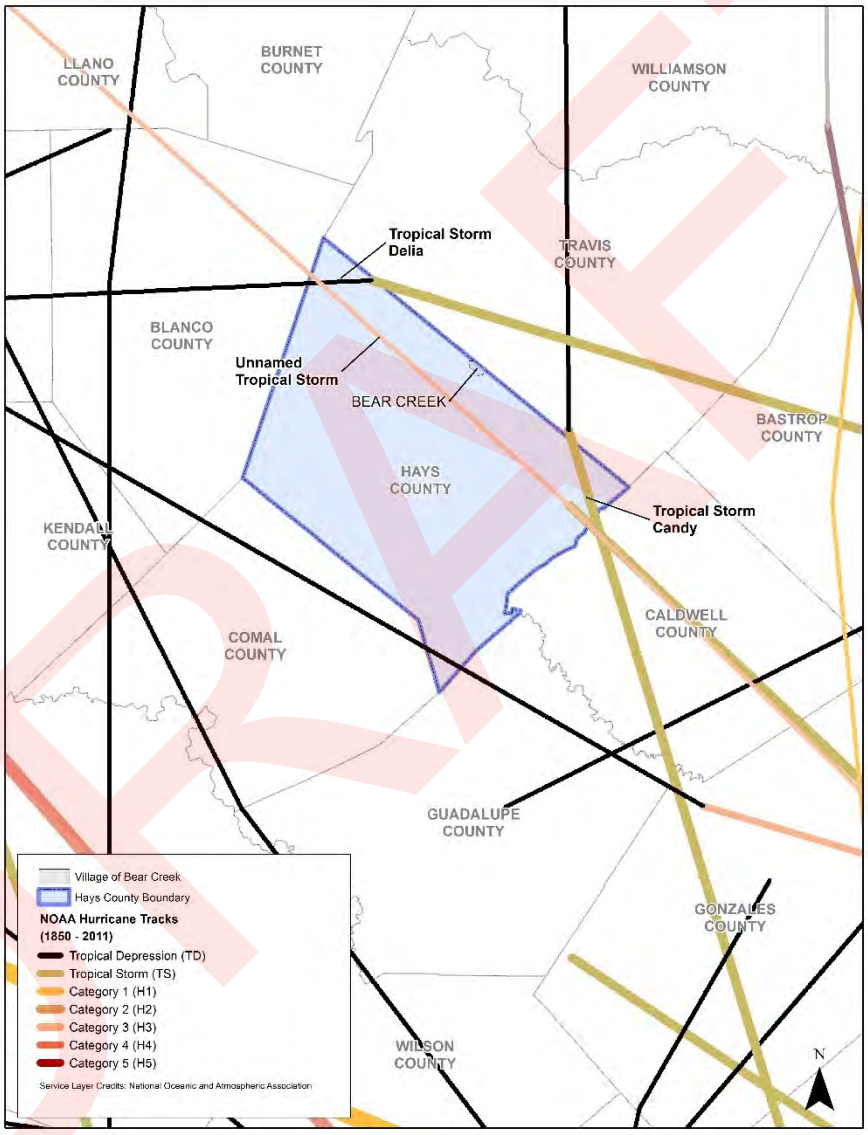
Due to the lack of land subsidence events occurring in the Village of Bear Creek, there could be an overall lack of concern for the effects of a depletion of groundwater in the karst zone in which they are located. During periods of strain on the groundwater supplies, voids in the limestone bases of these areas could result in unexpected, unprecedented events of land subsidence that the residents may not expect.

## Hurricanes/Tropical Storms

### Hurricanes/Tropical Storms: Location

Due to the regional nature of a hurricane or tropical storm event, the entire extent of the Village of Bear Creek is equally exposed to a hurricane or tropical storm. Figure BC.12 illustrates the location of the jurisdiction with historical hurricane and tropical storm paths documented by NOAA's Hurricane Tracker from 1850 to 2011.

***Figure BC.12, Historical Hurricane/Tropical Storm Paths, Village of Bear Creek***




*(National Oceanic and Atmospheric Administration, 2016)*

### Hurricanes/Tropical Storms: Previous Occurrences

Previous events are listed below from NOAA Storm Events Database for Tropical Storm Hermine and NOAA Hurricane Tracker for all other events. By the time most hurricanes reach the County, they are tropical storms, depressions or thunderstorms. Because hurricane and tropical storm events occur on a regional scale, all events listed for Hays County have been included, as they would also impact the Village of Bear Creek.

July 13 to July 22, 1909 – An unnamed storm made landfall near Freeport, as a Category 3 Hurricane. This storm impacted Hays County and participating communities as a tropical depression with wind speeds up to 30 knots. No significant damages, injuries, or fatalities were reported for the Village.

June 22 to June 26, 1968 – Tropical Storm Candy made landfall near Port Aransas. This storm impacted Hays County and participating communities as a tropical storm with wind speeds slowing to 30 knots as a tropical depression just after leaving the County. No significant damages, injuries, or fatalities were reported for the jurisdiction.

September 1 to September 7, 1973 – Tropical Storm Delia made landfall near the border of Brazoria and Matagorda Counties. This storm impacted Hays County and participating communities as a tropical storm with wind speeds slowing to 30 knots as a tropical depression just after leaving the County. No significant damages, injuries, or fatalities were reported for the Village of Bear Creek.

September 6 to September 8, 2010 – According to the NOAA Storm Events Database, Tropical Storm Hermine made landfall near the Texas/Mexico border on the night of September 6. South Central Texas was hit very hard with widespread rains of 8 to 12 inches across much of the IH-35 corridor from Austin down to San Antonio.



## Hurricanes/Tropical Storms: Extent

The Saffir-Simpson Scale measures pressure, wind speed, and storm surge in 5 categories. According to the reported previous hurricane occurrences in the jurisdiction, the maximum hurricane extent experienced was categorized as a Tropical Storm. Refer to Chapter 2, the Risk Assessment portion of the Hays County HMP Update, for a description of storm extents.

## Hurricanes/Tropical Storms: Probability

Based on 4 reported events in 107 years, a hurricane or tropical storm event occurs approximately every 27 years on average in Hays County. Since hurricane and tropical storm events can happen anywhere throughout the HMP update area, the Village of Bear Creek's future probability is assumed to be similar to the surrounding County area. In the future, the Village can expect an event approximately once every 27 years on average, of up to a magnitude of a Tropical Storm based on historical extents for the jurisdiction.

| Number of Events Reported | Number of Years in Dataset | Probability | 100yr Max Wind Speed (mph) |
|---|---|---|---|
| 4 | 107 | 0.04 | 68 |

## Hurricanes/Tropical Storms: Impact

A Probabilistic 100-year Return Period HAZUS-MH 3.2 analysis was run on the participating communities. The following describes the results of this analysis.

### *HAZUS-MH Results*

#### *General Building Stock Damage*

The total property damage losses were $59,379. The majority of damage can be expected to impact residential areas (98%). The remaining damages (2%) are for commercial, industrial, agricultural and religious buildings. While some building damage is experienced, it is estimated that no buildings will be completely destroyed or experience severe damage. Exposed Value is the total building and content values for structures within the community. Loss values are divided separately for building and content loss in dollars.

| Exposed Value ($) (Building + Content) | Building Loss ($) | Content Loss ($) | Total Loss ($) |
|---|---|---|---|
| 98,571,249 | 59,379 | 0 | 59,379 |



### *Essential Facility Damage*

HAZUS does not estimate any critical facilities or infrastructure to be out of service for more than 1 day on the day of the event. Additionally, the model estimates that 100% of available hospital beds are ready for use by patients already in the hospital and for those injured by the hurricane.

### *Debris Generation*

HAZUS estimates the amount of debris that will be generated by the hurricane. The model estimates that a total of 3 tons of debris will be generated. Of the total amount, Brick/Wood comprises 100% of the total. If the building debris tonnage is converted to an estimated number of truckloads, it will require 1 truckload (1 to 25 tons per truck) to remove the building debris generated by the hurricane.

### *Shelter Requirements*

HAZUS estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of people displaced that will require accommodations in temporary public shelters. The model estimates no households to be displaced due to the hurricane. While there is an estimation of over $59,000 in property damages expected, it is aforementioned that “no buildings would be completely destroyed or experience severe damage.” Residents would likely remain in their homes as damages were repaired, therefore no temporary shelter is needed.

## Hurricanes/Tropical Storms: Vulnerability Summary

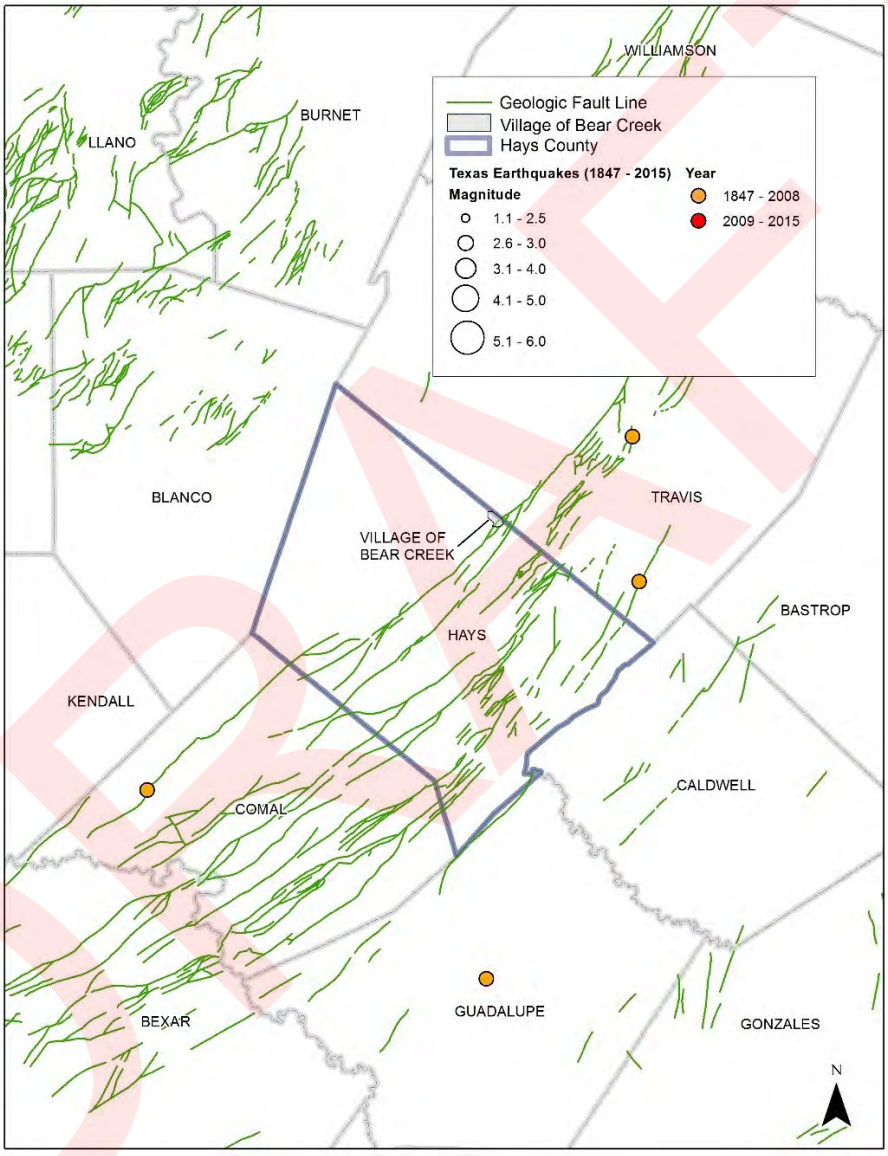
Similar to the impacts of windstorms, hailstorms, and lightning, the Village of Bear Creek can expect to be impacted with debris and possible utility interruptions of critical infrastructure. In addition, the community’s proximity to IH-35 could lead to traffic delays caused by major evacuation efforts if the highway is used as an evacuation route for coastal residents. The Farm-to-Market roads used to access the community could also become congested by people seeking alternate routes.

# Earthquakes

## Earthquakes: Location

Locations within proximity to USGS-documented fault lines are typically the areas most at-risk for earthquakes. Figure BC.13 shows fault lines and the locations of earthquake events occurring from 1847 to 2015 in relation to the Village of Bear Creek.

***Figure BC.13, Texas Earthquakes, 1847 – 2015, Village of Bear Creek***




*(USGS Earthquake Hazard Program, 2015)*

## Earthquakes: Previous Occurrences

There have been no documented earthquake events for the Village of Bear Creek according to USGS 1847 to 2015 data, as illustrated in Figure BC.13.

### Earthquakes: Extent

Earthquakes are measured by Peak Ground Acceleration (PGA). The HAZUS PGA for the jurisdiction is 1.56% (see Village of Bear Creek: Impact Section for a description of the HAZUS Analysis). This corresponds to the Modified Mercalli Scale Category IV, with light perceived shaking and no potential structure damage. HAZUS measures PGA on a census tract level. Cities within more than 1 census tract were assigned the highest PGA level to maximize possible extent. Refer to Chapter 2, Risk Assessment within the Hays County HMP Update for extent scale and PGA descriptions.

### Earthquakes: Probability

As there have been no recorded previous occurrences of earthquakes for the Village of Bear Creek and the PGA is less than 2% for the area, the probability of an earthquake in the Village in the future is low (unlikely within the next 10 years).

| Number of Reported Events | Number of Years in Dataset | 500yr PGA |
|---|---|---|
| 0 | 170 | 1.56 |

### Earthquakes: Impact

The FEMA How-To Guidance, Understanding Your Risks (FEMA 386-2, page 1-7), suggests the earthquake hazard should be profiled if the PGA is greater than 3%g, where PGA is measured in the acceleration of gravity (g). The Village's PGA is less than 3%g (0.03) and there have been no recorded earthquakes in or near the update area. Therefore, only a minimum level-1 HAZUS analysis was profiled using the 500-year probability event scenario. The HAZUS analysis produced a PGA of 1.56%. HAZUS also produced $0 in building damages (Residential, Commercial, Agriculture, Religious and Government) from an event. Critical facilities and infrastructure did not experience any loss of service. There were no critical facilities or infrastructure that experienced moderate to complete damage. No debris was generated from this event and no people or households required temporary housing. There were no moderate, extensive or completely damaged buildings by this event. HAZUS estimates no households are expected to be displaced from their homes or will require accommodations in temporary public shelters due to the earthquake. Additionally, there were no causalities or fatalities from this event.

### Earthquakes: Vulnerability Summary

While the probability of an earthquake in the Village Bear Creek is low, with no significant prior events on file, there are fault lines within the community that could cause impact if there were to be an increase in seismic activity in the area. There are 2 fault lines located on the east side of the Village according to USGS data. Bear Creek could expect to be impacted with debris and possible utility interruptions if an event were to occur in this unlikely and unprecedented scenario. If an event were to incapacitate a roadway, emergency responders would be hindered from responding, thus leaving the residents who were affected at risk. The following local roadways are crossed by the USGS fault lines displayed on Figure BC.13: Bear Creek Drive, Cedar Cove, N. Madrone Trail, and S. Madrone Trail.

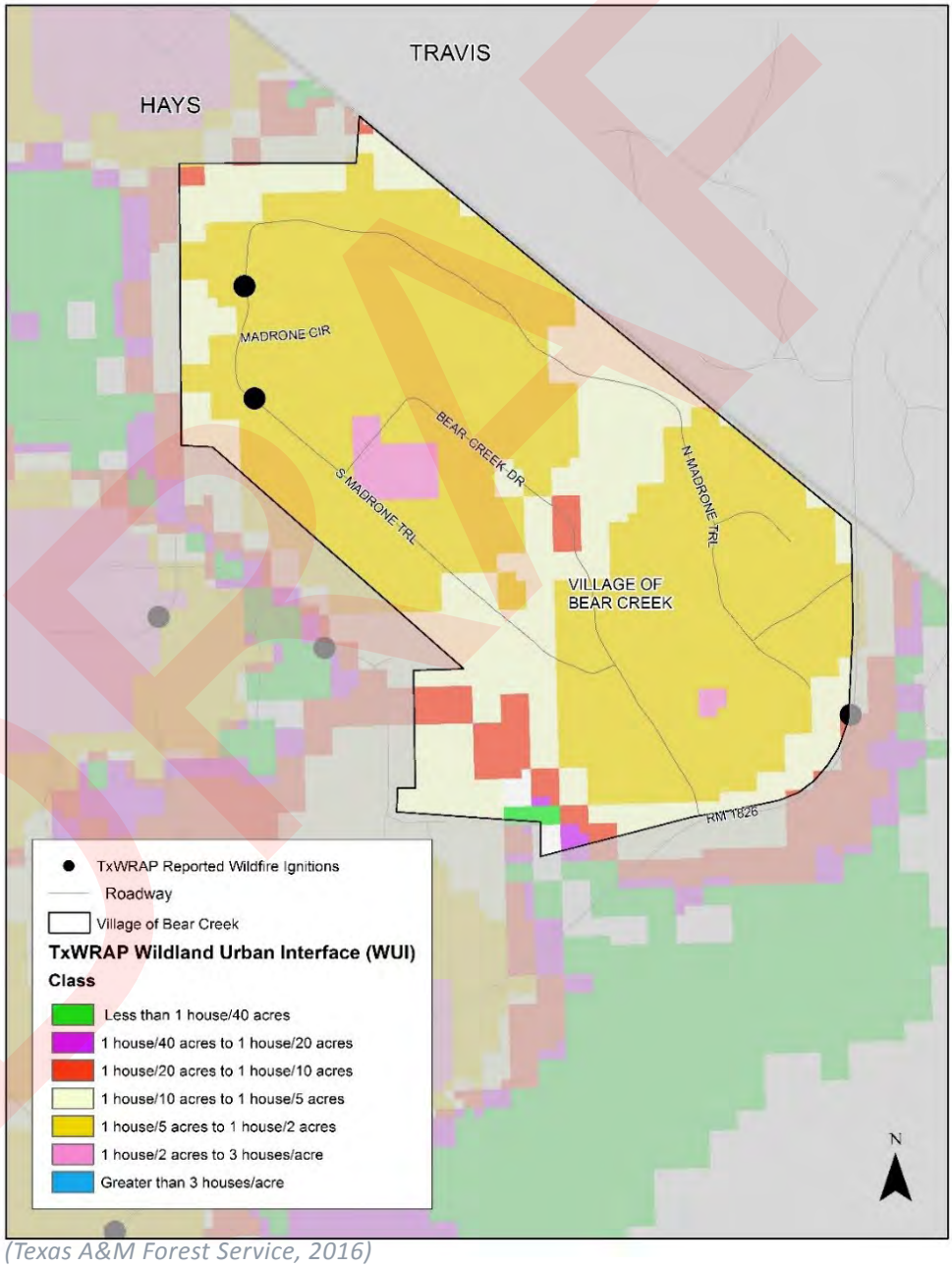
Page 48, Dam/Levee Failure has been redacted from this copy of the plan.

## Wildfires

### Wildfires: Location

The Texas A&M Forest Service's Texas Wildfire Risk Assessment Portal (TxWRAP) can be used to help communities understand their wildfire risk. Figure BC.14 below shows the location of TxWRAP's documented wildfire occurrences with Wildland Urban Interface (WUI) classifications within the Village of Bear Creek. The WUI illustrates areas of development that are abutting natural areas. Here, communities and the built environment have an increased vulnerability to a wildfire event. Wildfires can be ignited from a variety of sources including lightning or human activity such as campfires, smoking, arson, or equipment use.

*Figure BC.14, Wildland Urban Interface (WUI) / Reported Wildfire Ignitions, Village of Bear Creek*




*(Texas A&M Forest Service, 2016)*

## Wildfires: Previous Occurrences

Table BC.24 shows the reported wildfire ignitions within the Village of Bear Creek according to TxWRAP and USGS Federal Fire Occurrence data from the years 1980 to 2015.

*Table BC.24, Wildfire Ignitions, Village of Bear Creek*

| FPA ID | Date | Fire Size |
|---|---|---|
| SFO-TX02240705-6382 | 1/14/2005 | 1 |
| SFO-TX02240705-6389 | 4/7/2005 | 1 |

## Wildfires: Extent

Table BC.25 lists the Fire Intensity Acreage for the Village according to the TxWRAP Community Summary Report. Refer to Chapter 2, the Risk Assessment portion of the Hays County HMP Update, for a description of the Characteristic Fire Intensity Scale (FIS).

*Table BC.25, Fire Intensity Acreage, Bear Creek, Texas*

| Class | Acres | Percent |
|---|---|---|
| Non-Burnable | 130 | 19.30% |
| 1 (Very Low) | 6 | 1.00% |
| 1.5 | 22 | 3.20% |
| 2 (Low) | 10 | 1.50% |
| 2.5 | 8 | 1.20% |
| 3 (Moderate) | 40 | 5.80% |
| 3.5 | 51 | 7.50% |
| 4 (High) | 159 | 23.50% |
| 4.5 | 251 | 37.10% |
| 5 (Very High) | 0 | 0.00% |
| Total | 677 | 100.00% |

## Wildfires: Probability

Based on 2 reported events in 35 years, the Village of Bear Creek can expect a wildfire event approximately once every 17 to 18 years on average in the future.

| Number of Reported Events | Number of Years in Dataset | Probability |
|---|---|---|
| 2 | 35 | 0.06 |

### Wildfires: Impact

Impact on the community can be measured using TxWRAP Housing Density levels within the WUI. Areas with a higher housing and population density, and especially areas near burnable fuels, would be affected to a greater extent than more rural areas. Table BC.26 below lists the population, percent of total population, WUI acreage and percent of WUI acreage for the Village of Bear Creek according to the Texas A&M Forest Service TxWRAP Community Summary Report. See Figure BC.14 for the location of WUI areas within the jurisdiction.

*Table BC.26, WUI Acreage, Village of Bear Creek*

| Housing Density | | WUI Population | Percent of WUI Population | WUI Acres | Percent of WUI Acres |
|---|---|---|---|---|---|
| | LT 1hs/40ac | 0 | 0.0 % | 1 | 0.1 % |
| | 1hs/40ac to 1hs/20ac | 0 | 0.0 % | 0 | 0.0 % |
| | 1hs/20ac to 1hs/10ac | 7 | 1.2 % | 12 | 1.7 % |
| | 1hs/10ac to 1hs/5ac | 71 | 12.3 % | 156 | 23.0 % |
| | 1hs/5ac to 1hs/2ac | 472 | 81.9 % | 493 | 72.8 % |
| | 1hs/2ac to 3hs/1ac | 26 | 4.5 % | 15 | 2.3 % |
| | GT 3hs/1ac | 0 | 0.0 % | 0 | 0.0 % |
| Total | | 576 | 100.0 % | 677 | 100.0 % |

### Wildfires: Vulnerability Summary

The Village of Bear Creek has no dedicated fire service. Instead, it is a part of an emergency services district that is shared amongst other communities in the area. There are 159 housing units and few hydrants that are equipped to be used for firefighting, as they are connected to waterlines that could not withstand the pressure used to pump water by fire apparatus. Thus, these hydrants would more accurately be described as pressure relief valves. The community of Bear Creek would benefit from more hydrants for firefighting.

The Village is entirely residential and many residents chose to keep their acreage as natural as possible. The result is that there are inhabited and vacant lots with an abundance of growth that could act as fuel to wildfires. The closest fire station is the North Hays Fire Rescue and their average response time is 7 minutes.

# Risk Ranking Result

On January 12, 2017, planning representatives from the Village of Bear Creek completed a questionnaire as part of the Hays County HMP Update: Risk Assessment. The questions covered the risk associated with the hazards that affect each community based on the level of concern over each profiled hazard, the hazards' impact on health and safety, as well as property damage and business continuity. The answers from this questionnaire were combined with public survey results on perception of risk, and the values from both sources were analyzed using the Halff Risk Ranking Tool (details regarding the risk ranking tool are in Chapter 2, the Risk Assessment portion of the Hays County HMP Update). The results provided a quantified ranking of risk with values ranging from 0 to 100. The results for Village of Bear Creek are shown below (hazard values shown from highest to lowest risk):



| Ranking Order | Hazard | Risk Ranking Value |
|---|---|---|
| 1 | Drought | 98.6 |
| 2 | Wildfire | 98.4 |
| 3 | Floods | 95.1 |
| 4 | Tornadoes | 90.6 |
| 5 | Hurricanes/Tropical Storms | 77.8 |
| 6 | Wind Storms | 71.7 |
| 7 | Severe Winter Storms | 68.2 |
| 8 | Extreme Heat | 55.2 |
| 9 | Lightning | 49.0 |
| 10 | Hail Storms | 48.9 |
| 11 | Land Subsidence | 37.8 |
| 12 | Expansive Soils | 37.6 |
| 13 | Earthquakes | 36.4 |
| 14 | Dam/Levee Failure | 35.1 |

# Section 3: Mitigation Strategy

This section examines the community's ability to perform mitigation (review of existing capabilities, shown in Table BC.27) and identifies specific actions to address vulnerabilities for each hazard profiled in the Hays County HMP Update. The mitigation strategy is the application of actions into an approach for performing structural and non-structural mitigation efforts within the jurisdiction. Actions are also prioritized and considered for incorporation into other community programs, regulations, projects or plans.

Completed and canceled actions are also included in a separate section for future reference.

***Table BC.27, Existing Capabilities***

| Resources Name | Resource Type | How it can Accomplish Mitigation |
|---|---|---|
| Mayor/Emergency Management Coordinator/ Floodplain Administrator | Elected Official | Political support and funding for mitigation actions/ Management of Village-level HMP updates/Responsibility for continued participation in the NFIP. |
| Commissioners | Elected Officials | Supplements political support for implementation of mitigation actions. |
| Village Secretary | Village Staff | Support for implementation of mitigation actions. |
| Engineer | Consultant | Expertise in structural mitigation projects and compliance with flood damage preventation ordinance. |
| Property Tax | Funding | Provides potential funding for Hazard Mitigation items. |
| Chapter 211 of the Local Government Code: Zoning | Authority | Authorizes the Village to regulate Zoning. (State of Texas, 1987) |
| Chapter 213 of the Local Government Code: Municipal Comprehensive Plans | Authority | Authorizes the Village to adopt a comprehensive plan for the long-range development of the Village. (State of Texas, 1997) |
| Chapter 214 of the Local Government Code: Municipal Regulation of Housing and Other Structures | Authority | Authorizes the Village to have regulatory authority as it related to building code, such as structural integrity and plumbing. (State of Texas, 1995) |
| Ordinance 980514.001- Providing for "The Village of Bear Creek Handbook for Citizens Committee Members" | Authority | Establishes the duties, powers and responsibilities of the Citizens Committee. Consideration of how the committee can be used for the advancement of mitigation purposes. (Village of Bear Creek, 1998) |
| Ordinance 980416.002- Providing for any VOBC directed work projects to be approved by a majority vote | Authority | Establishes how projects, to "repair or develop the roads, drainage ditches, low water crossings, entrances and flood plain control…"can be undertaken. (Village of Bear Creek, 1998) |
| Ordinance 150619.001- Subdivision Ordinance Amendment | Authority | Authorizes the requirements for subdividing land. (Village of Bear Creek, 2015) |
| Ordinance 091221.001- Providing Regulations to Control Outdoor Burning (Amendment) | Authority | Amendment- Sets regulations for outdoor burning in village limits. (Village of Bear Creek, 2009) |
| Ordinance 0905183.001- Standards for Excavation/ Removal and Alternation of Facilities/Requiring Permits/ Establishing Fees | Authority | Gives community authority to charge fees and penalties, that assist in funding for mitigation projects and enforcement. (Village of Bear Creek, 2017) |
| Ordinance 070618.001- Establishing Emergency Management Program | Authority | Gives community powers to cope with all phases of emergency management, to include mitigation. (Village of Bear Creek, 2007) |

| Resources Name | Resource Type | How it can Accomplish Mitigation |
|---|---|---|
| Ordinance 060821.002- Establishing Driveway Regulation | Authority | Gives Village power to require driveway and culvert permitting and standards. (Village of Bear Creek, 2017) |
| Ordinance 050919.003- Flood Damage Prevention Ordinance | Authority | Provides Village the authority to regulate development as part of floodplain management. (Village of Bear Creek, 2005) |
| Ordinance 000612.001- Establishes Outdoor Burning Violation | Authority | Provides control of outdoor burning. (Village of Bear Creek, 2000) |
| Minimum Standards for Driveway Construction | Standards | Guidance that dictates culvert sizes, and design to minimize adverse impact. (Village of Bear Creek, 2006) |

## National Flood Insurance Program Participation

The Village of Bear Creek has adopted a flood damage prevention ordinance (Village of Bear Creek, 2005), in which the Mayor is designated as the floodplain administrator. There are flood damage mitigation requirements incorporated into other ordinances, such as the subdivision ordinance and driveway construction ordinance, however there is not a trained floodplain manager. Should a request for development be submitted for an area located in the floodplain, the duties would be contracted out to a consultant. This situation is unlikely, as the community is close to fully developed, however would be required if substantial repairs or improvements were to be made to current structures within the floodplain. The Village will continue to explore options for higher standards. The Village of Bear Creek has a total of 2 NFIP policies in force as of June 2016. This totals $700,000 in total insurance coverage.

## Mitigation Goals

The plan-level mitigation goals can be found in Chapter 3, the Mitigation Strategy portion of the Hays County HMP. These goals apply to each community and were mutually decided upon as the guiding goals for the development of actions in each jurisdiction.

### *Mitigation Actions*

**Risk Focus is defined as:**
***E= Actions reducing risk to existing buildings and infrastructure**
***F= Actions reducing risk to new development and redevelopment**

| Number/Title | Hazard | Item Description | Implementation Agency | | |
|---|---|---|---|---|---|
| 1 Development and Implementation of Flood Insurance Information Campaign (previously action 1 in 2011 plan, modified) | Floods | Promote the flood insurance program to lessen the number of structures uninsured from flood loss by providing citizens access to brochures about the NFIP at the local Volunteer Fire Department. | VOBC Village Secretary | | |
| **Cost Estimate/Funding** | | | **Schedule** | **Status as of 2017** | ***Risk Focus:** |
| Existing village staff and free NFIP materials from FEMA publication warehouse | | | 3 months | Not started | N/A |
| **Cost and Benefit Considerations** | | | | | |
| This project would indirectly benefit residents who need information about the hazard at little cost. | | | | | |

| Number/Title | Hazard | Item Description | Implementation Agency | | |
|---|---|---|---|---|---|
| 2 Flood Ordinance Higher Standards (previously action 2 in 2011 plan) | Floods | Create higher standards to increase protection of development in/near the floodplain, increasing freeboard. | VOBC Commissioners | | |
| **Cost Estimate/Funding** | | | **Schedule** | **Status as of 2017** | ***Risk Focus:** |
| Existing staff with Texas Water Development Board Support | | | 6 months | Not started | E/F |
| **Cost and Benefit Considerations** | | | | | |
| This project would be a low-cost method of ensuring that new development and substantial improvements are done with less risk for flood damage. | | | | | |

| Number/Title | Hazard | Item Description | Implementation Agency |
|---|---|---|---|
| 3 Local FPA Floodplain Management Training Plan Development and Implementation (previously action 3 in 2011 plan, modified) | Floods | Implement training plan attendance at Texas Water Development Board or Texas Floodplain Management Association classes. | VOBC Village Secretary/ Commissioners |

| Cost Estimate/Funding | Schedule | Status as of 2017 | *Risk Focus: |
|---|---|---|---|
| Existing staff | 1 month | Not started | E/F |

**Cost and Benefit Considerations**

These classes are low-cost/free and range between 4 hours and 4 days. The benefit would be enhanced enforcement of flood damage prevention ordinance.

| Number/Title | Hazard | Item Description | Implementation Agency |
|---|---|---|---|
| 4 Application preparation and submittal for Storm Ready Designation from National Weather Service (previously action 6 in 2011 plan, modified) | Severe Winter Storms, Lightning, Hailstorms, Windstorms, Tornadoes, Hurricanes/ Tropical Storms | Application for designation that classifies community's level of preparedness for severe weather and storms. | VOBC Village Secretary |

| Cost Estimate/Funding | Schedule | Status as of 2017 | *Risk Focus: |
|---|---|---|---|
| Existing staff | 6 months | Not Started | N/A |

**Cost and Benefit Considerations**

There is a high level of effort to complete the application, however no other cost applies. The level of increased preparedness would benefit the entire population.

| Number/Title | Hazard | Item Description | Implementation Agency |
|---|---|---|---|
| 5 Energy Restore Priority Effort | Severe Heat, Severe Winter Storms, Lightning, Windstorms, Tornadoes, Hurricane/ Tropical Storms | Plan that provides the energy provider with data on the highest priority energy users who need their power recovered first, due to medical dependencies on power. | VOBC staff and Pedernales Electric Cooperative/Hays County Preparedness |

| Cost Estimate/Funding | Schedule | Status as of 2017 | *Risk Focus: |
|---|---|---|---|
| Existing staff | 6 months | Not Started | N/A |

**Cost and Benefit Considerations**

This would be a low-cost action that could be lifesaving for the small number of residents that are dependent on their access to electricity for medical purposes.

| Number/Title | Hazard | Item Description | Implementation Agency |
|---|---|---|---|
| 6 Development and Implementation of Natural Hazard Awareness Program (previously action 8 in 2011 plan, modified) | All Hazards | Publication of hazard awareness materials from HaysInformed.com referenced on Village of Bear Creek website. | VOBC Village Secretary |

| Cost Estimate/Funding | Schedule | Status as of 2017 | *Risk Focus: |
|---|---|---|---|
| Existing Staff | 1 month | Not started | N/A |

**Cost and Benefit Considerations**

Although this effort does not directly benefit the community in a quantifiable way, the cost is only the man hours to add the link to a website. The County hosts HaysInformed.com and ensures the validity and accuracy of the information shared.

| Number/Title | Hazard | Item Description | Implementation Agency |
|---|---|---|---|
| 7 Development and Implementation of Drought Monitoring Program (combined--previously actions 10/11 in 2011 plan, modified) | Drought, Land Subsidence | Drought stage triggers added to water ordinance for preservation. Also the link to the National Drought Monitor on website. | VOBC Village Secretary/ Commissioners |

| Cost Estimate/Funding | Schedule | Status as of 2017 | *Risk Focus: |
|---|---|---|---|
| Existing staff | 12 months | Not started | N/A |

**Cost and Benefit Considerations**

This low cost monitoring and inclusion of drought water conservation measures will take more time than money to institute and could save the community from a water shortage. All residents that use the water source would benefit.

| Number/Title | Hazard | Item Description | Implementation Agency |
|---|---|---|---|
| 8 Sanding Contract Research/ Plan Development (previously action 13 in 2011 plan) | Severe Winter Weather | Creation of a plan that provides established procedures and negotiated service providers and rates for sanding. | VOBC Village Secretary, VOBC Commissioners |

| Cost Estimate/Funding | Schedule | Status as of 2017 | *Risk Focus: |
|---|---|---|---|
| Existing staff | 12 months | Not started | N/A |

**Cost and Benefit Considerations**

By setting rates for sanding for extreme cases of icy weather, the whole community could save money on potential price increases.

| Number/Title | Hazard | Item Description | Implementation Agency |
|---|---|---|---|
| 9 Enhancement of Large-Item Pick-up Event to promote brush clean-up (previously action 14 from 2011 plan, modified) | Lightning, Wildfire | Marketing effort to encourage brush cleanup during existing Large-Item Pickup Event hosted by trash service. | VOBC Village Secretary |

| Cost Estimate/Funding | Schedule | Status as of 2017 | *Risk Focus: |
|---|---|---|---|
| Existing staff | 6 months | Not started (enhancement of existing program) | N/A |

**Cost and Benefit Considerations**

By emphasizing the need to protect from wildfires, an unknown number of residents could benefit slowing the spread of fire through brush clean-up.

| Number/Title | Hazard | Item Description | Implementation Agency |
|---|---|---|---|
| 10 Low Water Crossing Protection Plan | Floods | Documented project plan to define low water crossings that need to be repaired, retrofitted and establish maintenance schedule/procedures. | VOBC Commissioners, VOBC Village Secretary, Contracted Engineers |

| Cost Estimate/Funding | Schedule | Status as of 2017 | *Risk Focus: |
|---|---|---|---|
| Existing staff, cost of engineer support for plan | 12 months | Not started | E |

**Cost and Benefit Considerations**

Documentation of a plan to mitigate the risks of low water crossings, to the benefit of the safety of residents who drive along the Bear Creek roads.

| Number/Title | Hazard | Item Description | Implementation Agency |
|---|---|---|---|
| 11 Watershed Review Tour for Private Dams (previously action 17 in 2011 plan, modified) | Dam/ Levee Failure, Floods | Plan for how to enforce against encroachments in the floodway by inspecting for unauthorized private dams. | VOBC Commissioners |

| Cost Estimate/Funding | Schedule | Status as of 2017 | *Risk Focus: |
|---|---|---|---|
| Existing staff | 6 months | Not started | E |

**Cost and Benefit Considerations**

This effort of enforcement will protect downstream properties and protect the community from liability from encroachments that create adverse impact to neighbors. Although benefits are unquantifiable at this point, the cost is low enough for it to be negligible.

| Number/Title | Hazard | Item Description | Implementation Agency |
|---|---|---|---|
| 12 Low-water crossing mitigation (previously action 18 in 2011 plan, modified) | Hurricanes/ Tropical Storms, Floods, Dam/ Levee Failure, Wildfire | Elevated low-water crossing at community ingress point. | VOBC Commissioners |

| Cost Estimate/Funding | Schedule | Status as of 2017 | *Risk Focus: |
|---|---|---|---|
| Existing staff, possible cost of buy out for an easement of land to develop an additional emergency exit for the community | 18 months | Not started | N/A |

| Cost and Benefit Considerations |
|---|
| The cost of not establishing an alternate route out of the community would greatly outweigh the cost of mitigating this risk of not being able to evacuate. |

| Number/Title | Hazard | Item Description | Implementation Agency |
|---|---|---|---|
| 13 ERCOT App Download Event | Severe Winter Weather, Extreme Heat | Promoting VOBC residents to download the Electric Reliability Council of Texas app (via Facebook promotion and website link) in order to receive alerts for reducing energy usage to keep from grid failure. | VOBC Village Secretary |

| Cost Estimate/Funding | Schedule | Status as of 2017 | *Risk Focus: |
|---|---|---|---|
| Existing staff | 1 month | Not started | N/A |

| Cost and Benefit Considerations |
|---|
| This low-cost effort will increase awareness for all residents who use electricity from the Texas grid via Pedernales Electric Co-operative. |

| Number/Title | Hazard | Item Description | Implementation Agency |
|---|---|---|---|
| 14 Purchase and install weather radios for all public facilities | Extreme Heat, Severe Winter Storms, Lightning, Hailstorms, Windstorms, Tornadoes, Floods, Hurricanes/Tropical Storms, Earthquakes, Dam/Levee Failure, Wildfire | Installing weather radios at Bear Creek public facilities. | VOBC Commissioners, VOBC Village Secretary, Bear Creek Oaks Subdivision Property Owners Association |

| Cost Estimate/Funding | Schedule | Status as of 2017 | *Risk Focus: |
|---|---|---|---|
| General Fund | 6 months | Not started | N/A |

| Cost and Benefit Considerations |
|---|
| The minimal cost of these radios would be beneficial to all citizens who receive information from the local government. |

| Number/Title | Hazard | Item Description | Implementation Agency |
|---|---|---|---|
| 15 Rainwater Harvesting Education Program | Drought, Land Subsidence (ground water depletion exacerbates subsidence) | Providing community members with sample plans and case study information on the different types of rainwater harvesting that other citizens in VOBC use to encourage the practice and lessen strain on groundwater. | VOBC Commissioners |

| Cost Estimate/Funding | Schedule | Status as of 2017 | *Risk Focus: |
|---|---|---|---|
| Existing staff/other community member volunteer hours | 6 months | Not started | N/A |

**Cost and Benefit Considerations**

This low-cost educational effort would assist people in cost saving measures to harvest their own rainwater and would benefit the natural sources of water, so that all who access the aquifer would benefit from conservation efforts.

| Number/Title | Hazard | Item Description | Implementation Agency |
|---|---|---|---|
| 16 Homeowner Hazard Mitigation How-to: Soil Compaction | Expansive Soils | Enhancement to the existing Minimum Standards for Driveway Construction Guidelines to include a recommendation for soil compaction to lessen the possible effects of expansive soils. | VOBC Commissioners/ Contracted Engineers |

| Cost Estimate/Funding | Schedule | Status as of 2017 | *Risk Focus: |
|---|---|---|---|
| Existing staff, cost of engineer support | 6 months | Started with publication of Minimum Standards for Driveway Construction | F |

**Cost and Benefit Considerations**

This recommendation to enhance an existing document would add a level of protection to future development of driveways so that they mitigate against expansive soil damage.

| Number/Title | Hazard | Item Description | Implementation Agency |
|---|---|---|---|
| 17 Development and Implementation of Emergency Communications-Phone Tree Plan Document (previously action 4 in 2011 plan) | All Hazards except Expansive Soils and Land Subsidence | Manual call-down procedures and data for this small town to do emergency messaging to residents in cases during which County resources aren't available to do so for them. | VOBC Village Secretary/ Commissioners |

| Cost Estimate/Funding | Schedule | Status as of 2017 | *Risk Focus: |
|---|---|---|---|
| Existing staff/volunteers | 6 months | Not started | N/A |

**Cost and Benefit Considerations**

This would provide a low-cost manual method to reach all residents in a way that is not currently possible.

# Capabilities Assessment

## Evaluation/Prioritization of Actions

Each action added to the plan was developed using the Mitigation Action Summary Worksheet shown in Figure BC.15. Non-cost effective projects were not included in prioritization activity.

### *Figure BC.15, Mitigation Action Summary Worksheet*

**Hays County Hazard Mitigation Plan Update Process**

**Mitigation Action Summary Worksheet**

Community Name: _____

Person completing questionnaire: _____

| | |
|---|---|
| Mitigation Action/ Project Title | |
| Background/ Issue | |
| Opportunities for Integration | |
| Responsible Agency | |
| Partners | |
| Strategy for Existing Structures | |

**Hays County Hazard Mitigation Plan Update Process**

**Mitigation Action Summary Worksheet**

| | |
|---|---|
| Strategy for Future Development | |
| Potential Funding | |
| Cost Estimate (Values from "Measuring Costs" fields from Benefit and Cost Review Worksheet) | |
| Benefits (Statements from the "Difference" fields on the Benefit and Cost Review Worksheet) | |
| Timeline | |
| Priority (Based off Priority worksheet) | |

***Table BC.28, Mitigation Action Prioritization Tool (with Hazards in order of highest priority to lowest)***

| Mitigation Action | Life Safety | Property Protection | Technical | Political | Legal | Environmental | Social | Administrative | Local Champion | Other Community | Risk Ranking Score | Total Score |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6. Natural Hazard Awareness Program | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 99 | 101 |
| 14. Weather Radio Programming Class | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 98 | 101 |
| 15. Rainwater Harvesting Education Program | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 99 | 101 |
| 7. Drought Monitoring Program | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 99 | 99 |
| 9. Enhancement of Large-Item Pick-up Event to promote brush Cleanup | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 98 | 99 |
| 12. Evacuation Plans/Alternate road consideration | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 98 | 99 |
| 17. Emergency Communications Plan- Phone Tree | 1 | 1 | 0 | 0 | 0 | 0 | 0 | -1 | 0 | 0 | 98 | 99 |
| 1. Flood Insurance Information Campaign | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | -1 | 0 | 95 | 97.1 |
| 2. Flood Ordinance Higher Standards | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 95 | 97.1 |
| 10. Low Water Crossing Protection Plan | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 95 | 97 |
| 11. Watershed Review Tour for Private Dams/Encroachment Enforcement | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 95 | 96 |
| 4. Storm Ready Designation from National Weather Service | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 95 | 95 |
| 3. Floodplain Management Training | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -1 | 0 | 0 | 95 | 94.1 |
| 5. Energy Restore Priority Effort | 1 | 0 | -1 | 0 | 0 | 0 | 1 | -1 | 0 | 0 | 90 | 90 |
| 8. Sanding Contract Research/ Plan Development | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 68 | 70 |
| 13. ERCOT App Download Event | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 55 | 56 |
| 16. Soil Compaction Recommendation to Enhance Driveway Guidelines | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 38 | 39 |

## Mitigation Actions by Hazard

The mitigation actions in Table BC.29 are shown with corresponding hazards.

*Table BC.29, Mitigation Action Impact, Village of Bear Creek*

| Action Number | Drought | Extreme Heat | Severe Winter Storms | Lightning | Hailstorms | Windstorms | Tornadoes | Expansive Soils | Floods | Land Subsidence | Hurricanes/ Tropical Storms | Earthquakes | Dam/ Levee Failure | Wildfire |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | X | | | | | |
| 2 | | | | | | | | | X | | | | | |
| 3 | | | | | | | | | X | | | | | |
| 4 | | | X | X | X | X | X | | | | X | | | |
| 5 | | X | X | X | | X | X | | | | X | | | |
| 6 | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| 7 | X | | | | | | | | | X | | | | |
| 8 | | | X | | | | | | | | | | | |
| 9 | | | | X | | | | | | | | | | X |
| 10 | | | | | | | | | X | | | | | |
| 11 | | | | | | | | | X | | | | X | |
| 12 | | | | | | | | | X | | X | | X | X |
| 13 | | X | X | | | | | | | | | | | |
| 14 | | X | X | X | X | X | X | | X | | X | X | X | X |
| 15 | X | | | | | | | | | X | | | | |
| 16 | | | | | | | | X | | | | | | |
| 17 | X | X | X | X | X | X | X | | X | | X | X | X | X |

## Integration Efforts

Table BC.30 captures ways that the Risk Assessment, Goals and Actions developed in the HMP can be integrated into other Village of Bear Creek documents, programs and regulations

***Table BC.30, Plan Integration Efforts, Village of Bear Creek***

| Name of Document | Type | Item Type | Opportunity for Integration |
|---|---|---|---|
| Minimum Standards for Driveway Construction | Regulations | Action | Addition of soil compaction recommendation for driveway construction in order to lessen the impact of potential expansive soils |
| Village of Bear Creek Website/ Facebook | Outreach Program | Actions | Use current VOBC outreach methods online to promote actions to promote natural hazards awareness (through HaysInformed.com), monitor drought data, monitor times of conservation for energy through ERCOT, emergency communications phone tree creation, rainwater harvesting educational materials, flood insurance information, evacuation plans, energy prioritization registration for medical needs, weather radio programming educational opportunities and events promoting brush pickup/clean up. |
| Flood Damage Prevention Ordinance | Regulation | Action | Add higher standards to flood damage prevention ordinance and associate to encroachment review procedures. |
| Village of Bear Creek Plans of Proposed Street Improvements | Plan | Action | Add low water crossing protection plan efforts to current plans for 2017 road resurfacing projects in order to meet mitigation needs while working on existing project. This would include replacing undersized culverts during road replacement effort. |
| Ordinance 980514.001- Providing for "The Village of Bear Creek Handbook for Citizens Committee Members" | Regulation | Goal | Update/amend the goals of the Citizens Committee in order to incorporate a mission for hazard awareness and education in their official guiding document. |
| Hazard Mitigation Grant Program (HMGP) | Funding | Action | Identify actions that can be funded through new and existing grant awards. |
| Pre-Disaster Mitigation (PDM) | Funding | Action | Identify actions that can be funded through new and existing grant awards. |
| Flood Mitigation Assistance (FMA) | Funding | Action | Identify actions that can be funded through new and existing grant awards. |
| TWDB Flood Protection Planning (FPP) Grant | Funding | Action | Identify actions that can be funded through new and existing grant awards. |
| TWDB Clean Water State Revolving Fund (CWSRF) | Funding | Action | Identify actions that can be funded through new and existing grant awards. |
| Texas Water Development Fund (DFund) | Funding | Action | Identify actions that can be funded through new and existing loans. |

# Section 4: Finalize Plan Update (Review, Evaluation and Implementation)

## Changes in Development

The Village of Bear Creek's only changes in development have been remodels of existing structures. None were substantially improved and none were located in the Special Flood Hazard Area. There have been no other types of development. Any future build within the community will be residential. The community is nearing full development with over 90% having been built out.

## Past Mitigation Action Progress Reports Summary - Completed and Canceled

| 2011 Action Number | Hazard | Title | Lead Department |
|---|---|---|---|
| 5 | All hazards | Development and maintenance of Countywide and individual community HMP plans | Village of Bear Creek |
| **Cost Estimate/Funding** | | **Schedule** | **Status as of 2017** |
| Existing Staff Resources | | Original plan adopted on April 20, 2004- update in 2011 | Canceled. No longer an objective for the community. |
| **Cost Effectiveness** | | | |
| Not independently cost-effective | | | |

| 2011 Action Number | Hazard | Title | Lead Department |
|---|---|---|---|
| 7 | Extreme Heat | Reduce Impacts of Extreme Heat on Elderly, Disabled, Low-Income and Infants. | Hays County OEM |
| **Cost Estimate/Funding** | | **Schedule** | **Status as of 2017** |
| $2,000 to purchase and distribute 100 box fans $3,000 estimated cost for a/c repairs; Funding source: United Way, Rotary Clubs, Lions Clubs, Red Cross, Churches and charitable organizations, Power Companies | | Periods of Extreme heat; May be annually | Canceled. Not a jurisdiction specific project. |
| **Cost Effectiveness** | | | |
| Not independently cost-effective | | | |

| 2011 Action Number | Hazard | Title | Lead Department |
|---|---|---|---|
| 9 | Wildfire | Map Wildfire Hazard Areas | Village of Bear Creek |
| **Cost Estimate/Funding** | | **Schedule** | **Status as of 2017** |
| $500 | | TBD; likely initiated in 2011 | Canceled. Firewise efforts from Hays County are meeting this need and the Texas Wildfire Risk Assessment Portal also provides this data for free. |
| **Cost Effectiveness** | | | |
| Not independently cost-effective, but essential in minimizing loss of life and injuries during significant events. | | | |



| 2011 Action Number | Hazard | Title | Lead Department |
|---|---|---|---|
| 12 | Extreme heat | Evaluate Excess Heat Risks | Village of Bear Creek |
| **Cost Estimate/Funding** | | **Schedule** | **Status as of 2017** |
| No additional cost- uses existing staff resources | | TBD; probably initiated in 2011 | Canceled. Number of high risk residents is low and this hazard is not a high priority. |
| **Cost Effectiveness** | | | |
| Not independently cost effective, but needed to develop risk reduction efforts | | | |

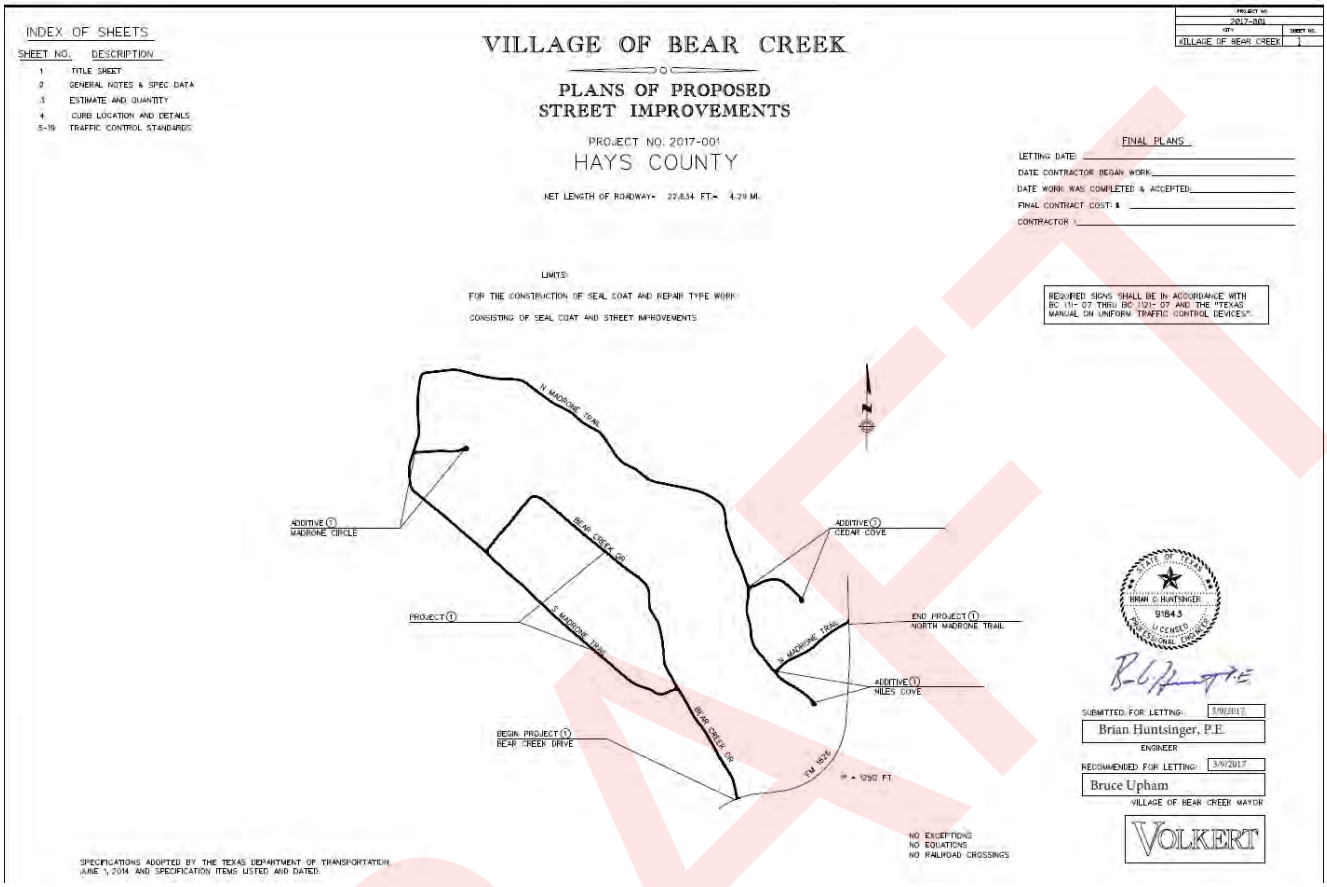
| 2011 Action Number | Hazard | Title | Lead Department |
|---|---|---|---|
| 15 | Tornadoes, thunderstorm, wind, winter storm, hail, seismic | Upgrades to at-risk structures | Village of Bear Creek |
| **Cost Estimate/Funding** | | **Schedule** | **Status as of 2017** |
| Varies depending on measure. Funding from General Fund or FEMA grant program/s | | TBD based on study | Canceled. Not a feasible action for a community of this size. |
| **Cost Effectiveness** | | | |
| Cost-effectiveness will vary with level of risk and project cost | | | |

| 2011 Action Number | Hazard | Title | Lead Department |
|---|---|---|---|
| 16 | Tornadoes, thunderstorm, wind, winter storm, hail, seismic | Structural/Engineering Study for Bear Creek Public facilities to ensure soundness | Village of Bear Creek |
| **Cost Estimate/Funding** | | **Schedule** | **Status as of 2017** |
| To be determined, but if initiated probably from General Fund | | Not yet established- to be commenced only if funding is available | Canceled. The Village of Bear Creek has 0 public facilities. Their village hall is run out of the homes of the elected officials and village secretary. |
| **Cost Effectiveness** | | | |
| Not independently cost-effective but the initial step in identifying appropriate mitigation measures | | | |

## Changes in Priorities

Since the last mitigation plan update, the Village of Bear Creek has shifted focus and priorities toward road resurfacing efforts and culvert maintenance in the community. This has resulted in the initiation of a new project to improve the community roads in 2017. In addition, the Village is focused on supporting the Bear Creek citizens as they work through the introduction of new FEMA Flood Insurance Rate Maps.

## *Figure BC.16, Village of Bear Creek Street Improvement Plans*



INDEX OF SHEETS

| SHEET NO. | DESCRIPTION |
|---|---|
| 1 | TITLE SHEET |
| 2 | GENERAL NOTES & SPEC DATA |
| 3 | ESTIMATE AND QUANTITY |
| 4 | CURB LOCATION AND DETAILS |
| 5-19 | TRAFFIC CONTROL STANDARDS |

VILLAGE OF BEAR CREEK

PLANS OF PROPOSED
STREET IMPROVEMENTS

PROJECT NO: 2017-001
HAYS COUNTY

NET LENGTH OF ROADWAY= 22,634 FT.= 4.29 MI.

PROJECT NO. 2017-001
CITY: VILLAGE OF BEAR CREEK
SHEET NO. 1

FINAL PLANS

LETTING DATE:
DATE CONTRACTOR BEGAN WORK:
DATE WORK WAS COMPLETED & ACCEPTED:
FINAL CONTRACT COST: $
CONTRACTOR:

LIMITS:

FOR THE CONSTRUCTION OF SEAL COAT AND REPAIR TYPE WORK

CONSISTING OF SEAL COAT AND STREET IMPROVEMENTS

REQUIRED SIGNS SHALL BE IN ACCORDANCE WITH BC (1)-07 THRU BC (12)-07 AND THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES".



NO EXCEPTIONS
NO EQUATIONS
NO RAILROAD CROSSINGS

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, JUNE 1, 2014 AND SPECIFICATION ITEMS LISTED AND DATED.

STATE OF TEXAS
BRIAN C HUNTSINGER
91843
LICENSED
PROFESSIONAL ENGINEER

SUBMITTED FOR LETTING: 3/9/2017
Brian Huntsinger, P.E.
ENGINEER

RECOMMENDED FOR LETTING: 3/9/2017
Bruce Upham
VILLAGE OF BEAR CREEK MAYOR

VOLKERT

# Section 5: Approval and Adoption



***Table BC.31, Municipal Jurisdiction Adoption Date***

| Municipality | APA Date | Adoption Date |
|---|---|---|
| Village of Bear Creek | | |

Jurisdiction Adoption Documentation Placeholder

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