

RESOLUTION 2019-76

**A RESOLUTION TO ADOPT THE AMENDED WILLIAMSON COUNTY
MULTI-HAZARD MITIGATION PLAN**

WHEREAS, the City of Franklin recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and thereby save taxpayer dollars; and

WHEREAS, in order to receive certain federal grants for hazard mitigation, local governments are required to adopt a Multi-Hazard Mitigation Plan; and

WHEREAS, the City of Franklin participated jointly in the planning process with other local governments within the County to prepare the Williamson County Multi Hazard Mitigation Plan, which was previously adopted by the City by Resolution 2013-06; and

WHEREAS, the Williamson County Multi-Hazard Mitigation Plan has been amended and the amended plan was adopted by the Williamson County Board of Commissioners on October 8, 2018; and

WHEREAS, the Board of Mayor and Aldermen find it is in the best interest of the citizens of the City of Franklin to adopt the amended Multi-Hazard Mitigation Plan.

NOW, THEREFORE, BE IT RESOLVED that the Board of Mayor and Aldermen for the City of Franklin, Tennessee, hereby adopts the Williamson County Multi-Hazard Mitigation Plan adopted by the Williamson County Board of Commissioners on October 8, 2018, as its official hazard mitigation plan; and

BE IT FURTHER RESOLVED that the Mayor and/or City Administrator are hereby authorized to execute any documents necessary to signify the City of Franklin's approval and adoption of this amended Multi-Hazard Mitigation Plan.

Approved this _____ day of _____, 2019.

ATTEST:

CITY OF FRANKLIN, TENNESSEE:

By: _____
Eric S. Stuckey
City Administrator

By: _____
Dr. Ken Moore
Mayor

Approved as to form:

William E. Squires
Assistant City Attorney

1 **Williamson County**
2 **Emergency Management Agency**
3 **294-NH**



4
5 **2017**

6 **Prepared By:**
7 **Williamson County Hazard Mitigation Committee**
8 **Williamson County Emergency Management Agency**
9 **Tennessee Emergency Management Agency**

Executive Summary

Over the past two decades, hazard mitigation has gained increased national attention due to the large number of natural disasters that have occurred throughout the U.S. and the rapid rise in costs associated with those disaster recoveries. Money spent mitigating potential impacts of a disaster event can result in substantial savings of life and property. The Disaster Mitigation Act of 2000 calls for local governments to develop mitigation plans (*44 CFR 201*). In 2005, the Multihazard Mitigation Council (MMC) conducted a widely cited study, [*Natural Hazard Mitigation Saves*](#), which documented that every \$1 spent on mitigation saves society an average of \$4.

The purpose of a local hazard mitigation plan is to identify the community's notable risks and specific vulnerabilities, and then to create/implement corresponding mitigation projects to address those areas of concern. This methodology helps reduce human, environmental and economical costs from natural and man-made hazards through the creation of long-term mitigation initiatives.

The advantages of developing a local hazard mitigation plan are numerous including improved post-disaster decision making, education on mitigation approaches, an organizational method for prioritizing mitigation projects, etc. It has been noted that communities who successfully complete and maintain a mitigation plan receive larger amounts of federal and state funding to be used on mitigation projects and receive these funds faster than communities who do not have a plan. Such funding sources that the plan caters to are Pre-Disaster Mitigation, Flood Mitigation Assistance, Severe Repetitive Loss and Hazard Mitigation Grant Programs.

The 2017 Williamson County Hazard Mitigation Plan was created to act as a comprehensive guide to be used by and for the people of Williamson County. For this plan to be successful, each jurisdiction within the county participated in the drafting and preparation of the plan. These participating jurisdictions include:

- Williamson County (unincorporated)
- City of Spring Hill
- City of Franklin
- City of Brentwood
- Town of Nolensville
- Town of Thompsons Station
- City of Fairview

In reference to federal code title *44 CFR 201*, the plan is required to be submitted to both TEMA (State) and FEMA (Federal) for review to be approved. When the plan is deemed "approval pending adoption" by FEMA (*44 CFR 201.6(c)5*), each of the participating jurisdictions will adopt the plan through a local resolution.

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96 **Section 1: Planning Process**

97 **Planning Process**

98 The previous Williamson County Hazard Mitigation Plan was approved by FEMA in 2012. Per
99 federal requirements stated in *44 CFR 201*, all local hazard mitigation plans are required to go
100 through a FEMA update review every five years to remain eligible for hazard mitigation grants.
101 To ensure risks are regularly re-evaluated and mitigation projects continue to effectively reduce
102 community vulnerabilities, Williamson County reviews the mitigation plan annually and updates
103 the plan at least every five years. Furthermore, the approved 2012 Williamson County Hazard
104 Mitigation Plan was integrated into the Basic Emergency Operations Plan (BEOP) due to the
105 differing format than what is currently being presented. The BEOP covers and is accepted by all
106 cities and towns within the County, so this was the accepted integration method. Moving
107 forward, the new format will be able to be accepted into multiple sources and plans for each
108 city and town within the county.

109 Williamson County Emergency Management Agency (EMA) continually leads the development,
110 review and update process for the Plan. Williamson County EMA planners and the regional
111 TEMA planner met on Monday, April 17, 2017 to begin coordination of the future meetings with
112 the Williamson County Hazard Mitigation Committee¹. It was important to note during this
113 initial meeting, the process and purpose of each future meeting was defined in order to create
114 an organized process for the committee members. At this meeting, it was decided that
115 stakeholders would be invited by email initially and would continue to receive email
116 notifications as the meetings continued. Also, those who were able to attend the meetings were
117 given invitations as an announcement, which reflected what was communicated in email.

118 Williamson County EMA coordinated directly with county and local officials to establish the
119 Williamson County Hazard Mitigation Committee. Throughout the process, the Mitigation
120 Committee provided guidance and input for the plan and mitigation actions and projects.
121 Williamson County EMA ensured all county jurisdictions were represented by at least one
122 person on the committee.

123 The development of the plan were broken into two stages:

- 124 1. the brainstorming and drafting stage
- 125 2. the reviewing stage

126 During the brainstorming and drafting stage, the committee identified hazards, evaluated risks,
127 calculated and located each jurisdiction's vulnerable areas, identified the county's critical
128 facilities, determined the county's mitigation goals/objectives, created and sponsored mitigation
129 projects, and prioritized those mitigation projects. During the review stage the committee

¹ Committee list found in Appendix I

130 evaluated the written drafts of the plan. Also, in this process each jurisdiction reviewed written
131 drafts that specifically addressed aspects of their jurisdiction (i.e., each jurisdiction's individual
132 risks and vulnerabilities).

133 The regular five year review meeting took place on May 23, 2017² at the Williamson County
134 Emergency Operations Center (EOC). In this meeting with the help from the TEMA regional
135 planner, the mitigation plan process was reviewed and stages explained to committee
136 members. The Williamson County EMA planner emphasized the need for stakeholder
137 participation from each jurisdiction. Also, representatives from the TEMA mitigation department
138 spoke to the committee in regards to the specific mitigation grant funding opportunities
139 available with an active mitigation plan.

140 The second Mitigation Committee meeting was held on June 13, 2017, at the Williamson County
141 EOC. At this meeting, the committee provided updates to the risk and vulnerability information
142 for their respected jurisdiction and began to discuss potential projects. The risk and vulnerability
143 process was also explained to committee members in how it relates to the project list
144 development. Prior to this meeting, Williamson County EMA announced the date and time
145 during the monthly LEPC meeting in order to get maximum awareness and participation within
146 the community³.

147 The third Mitigation Committee meeting was held on June 22, 2017, at the Williamson County
148 EOC. At this meeting, committee members discussed the threat of sinkholes in Williamson
149 County, as well as began looking at the project list which was included in the previous FEMA
150 approved Natural Hazard Mitigation Plan. The members took a list of projects organized under
151 each hazard and were told to identify which projects were completed and which projects
152 needed to be transferred onto the new project list⁴.

153 The fourth meeting, held Tuesday, June 27, 2017, continued work on the project list and
154 resembled more of a working session. Some jurisdictions were able to research and provide the
155 projects which have been completed, as well as projects which needed to be brought over into
156 the new plan. Other jurisdictions continued work within their groups to identify the current
157 status of projects.

158 The fifth meeting was held July 6, 2017, at the Williamson County EOC. This continued to be a
159 working session for the jurisdictions within the committee. They continued identifying which
160 projects needed to be brought into the new plan, as well as which projects were completed.
161 Also, the jurisdictions were able to communicate new plans they wanted to include into the
162 project list, but several project lists remained in rough draft form. The jurisdictions were then

² Meeting information found in Appendix B

³ Meeting details found in Appendix C

⁴ Meeting details found in Appendix D

163 told to have in the completed lists with a target end date of July 28, 2017, for a completed
164 project list.

165 Through the next several weeks, the Williamson County EMA planner reminded the jurisdictions
166 to hand in their project lists by email communication, as well as answered any questions as the
167 groups worked. She was able to compile everything using one source of communication and
168 complete the project list in time to discuss with Williamson County Emergency Management
169 leadership on July 27, 2017.

170 **Public Participation**

171 To encourage public involvement, the Mitigation Committee advertised their sixth committee
172 meeting for October 16, 2017 in the Williamson Herald, a newspaper of general circulation. This
173 notice occurred on September 28, 2017, and was placed near other public notices within the
174 Williamson Herald circulation on that day. This meeting provided the opportunity for the public
175 to comment on the plan during drafting stages, to contribute in project proposals, and to
176 participate in project prioritization. The notice presents the purpose of the meeting, the time
177 and date of the meeting, the exact location of the meeting, and stated that all are invited to
178 attend⁵.

179 There were no members of the public that showed up for this meeting, however it was attended
180 by several members of the mitigation committee. If anyone from the public did attend this
181 meeting, they would have been provided the opportunity to add any details to the project list,
182 as well as make any additions to hazard descriptions. Williamson County will continue public
183 outreach and incorporation throughout all future planning processes. Upon receiving the
184 “Approval Pending Adoption” designation from FEMA, the public will be given a chance to
185 comment on the final draft of the plan prior to its adoption by each local jurisdiction. This
186 opportunity will take place at a local elected board meeting for each jurisdiction before the plan
187 adoption decision takes place. The opportunity for final public comment will therefore be
188 documented through the receipt of a signed adoption resolution.

190 **Review of Existing Information**

191 A preliminary review of existing plans, reports and information was conducted during the initial
192 phase of creating the Williamson County Hazard Mitigation Plan. The primary purpose of
193 reviewing this information was to identify local hazards and risks, and understanding different
194 local vulnerabilities. The following list of sources identifies some of the existing studies that
195 were reviewed:

- 196 • Williamson County Basic Emergency Operations Plan (BEOP)

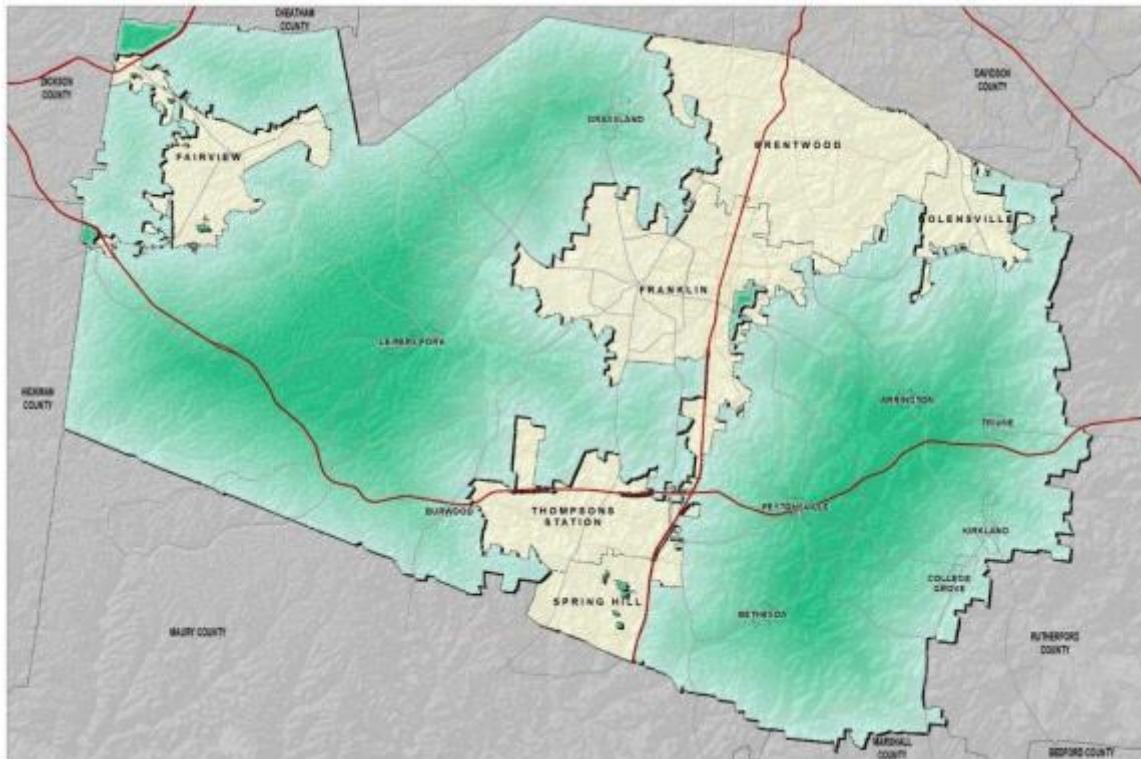
⁵ See Appendix J for meeting’s attendance sheet and a copy of the public notice for the meeting.

197 • City of Spring Hill, City of Fairview, City of Franklin, City of Nolensville, City of
198 Brentwood, Town of Nolensville, Town of Thompsons Station:
199 ○ Building Codes and Regulations
200 ○ Zoning Ordinances
201 ○ Storm water Regulations
202 • U.S. Census Bureau
203 • USDA Census of Agriculture
204 • FEMA Mitigation “How to” Guides
205 • NOAA National Climatic Data Center (NCDC) storm reports
206
207 All of the listed plans, studies and data sources were incorporated into the Williamson County
208 Hazard Mitigation Plan. These sources helped develop the plan’s hazard, risk, and vulnerability
209 assessment sections that in return led to the establishment of meaningful mitigation actions.

Section 2: County Profile

Development Trends

Williamson County contains six cities and towns. The City of Brentwood lies at the northern border of Williamson County near the county line of Davidson County. The City of Fairview is situated in the northwestern corner of Williamson County and is bordered by Dickson, Cheatham, and Hickman Counties. The City of Franklin is located in the center of the county, just south of the City of Brentwood. The Town of Nolensville is located at the northeastern corner of Williamson County, bordered by Davison and Rutherford Counties. The City of Spring Hill is located at the southwestern portion of Williamson County. The City of Spring Hill straddles both Williamson County and Maury county lines. The Town of Thompson Station can be found on the northern side of the City of Spring Hill in Williamson County.



Source: Williamson County Emergency Management Agency GIS Department

Williamson County's population, according to the latest official numbers (2010) by the US Census Bureau, is 183,182. This number is also located in the HAZUS report scenario.

Williamson County's top employers are large corporations such as Nissan North America, Mars, and Community Health Systems Inc. and Tractor Supply. In fact, 12 of the top 25 largest publicly traded companies in the Nashville region are located within Williamson County. Also, according to the Williamson County Chamber of Commerce (williamsonchamber.com), 21% of Williamson County residents are entrepreneurs.

Future developments in Williamson County are estimated to grow as the population and labor force also grows. Within the next five years, there are several commercial real estate projects to meet the growing need of Williamson County growth. A majority of these will be in the Franklin and Brentwood cities of Williamson County. This growth is found in industries with great earning potential (i.e. healthcare, scientific and technical services).

With this economic growth, neighboring counties will see a change as well. Rutherford County to the east will see a 99% population growth by the year 2040, according to the Williamson County Chamber of Commerce.

To counter any potential negative effects associated with future developments all jurisdictions are taking actions through instituting governmental mitigation mechanisms.

Jurisdictional Capabilities

Currently, all jurisdictions enforce building codes to ensure that structures are built in accordance to national standards. Williamson County enforces floodplain ordinances as part of adopting into the National Flood Insurance Program (NFIP). Additionally, Williamson County jurisdictions have zoning codes to lead to sensible growth and land development patterns. These instituted planning mechanisms help guide growth away from floodplains and other identified hazardous areas, thus reducing vulnerabilities to the jurisdictions.

Legal & Regulatory Capability

Regulatory Tools/Plans	Regulatory Type: Ordinance Resolution Codes Plans, Etc.	Williamson County	Franklin	Brentwood	Spring Hill	Nolensville	Fairview	Thompsons Station
Building Codes	Municipal Code	Y	Y	Y	Y	Y	Y	Y
Zoning	Ordinance	Y	Y	Y	Y	Y	Y	Y
Emergency Response Plan	Basic Emergency Operations Plan (BEOP)	Y	Y	Y	Y	Y	Y	Y
National Flood Insurance Program Participant	Mapping	Y	Y	Y	Y	Y	Y	Y
Post-Disaster Recovery Plan	BEOP	Y	Y	Y	Y	Y	Y	Y

Section 3: Risk Assessment

Hazard Identification

To assess Williamson County's risk to natural hazards and identify the community's areas of highest vulnerability, the mitigation committee had to identify which hazards have or could impact the county. This hazard identification process began with researching previous hazard events which have occurred in Williamson County using Williamson County Emergency Management records, researching news sources and recalling personal experiences. From there, EMA staff analyzed hazard events which could occur in the county by reviewing scientific studies and consulting the State of Tennessee Hazard Mitigation Plan. The National Fire Protection Association (NFPA) 1600 code was also consulted, using this document to crosswalk with the state list of hazards. Williamson County EMA leadership decided on the prime hazards to include in the county's mitigation plan.

The following hazards have been identified as hazards of concern by the Mitigation Committee.

Flooding

Flooding events occur when excess water from rivers and other bodies of water overflow onto riverbanks and adjacent floodplains. In addition, lower lying regions can collect water from rainfall and poorly drained land can accumulate rainfall through ponding on the surface. Floods in Williamson County are usually caused by rainfall, but may also be caused by snowmelt and man-made incidents. The below charts explain common ways flooding occurs and common factors that contribute toward the severity of floods.

Common Ways Flooding Occurs	
Methods	Description
Overland Flow (a) Infiltration (b) Saturation	-Excess overland flow occurs when the rain is falling more rapidly than it infiltrates into the soil. -Excess overland flow occurs when soil spaces are so full of water that no more rain can be absorbed.
Throughflow	-Rainwater which has infiltrated into unsaturated soil can move horizontally to the river channel. This process is slower than overland flow but faster than baseflow.
Baseflow	-Rainwater which has percolated to the aquifer can seep into the river channel. This is the slowest process.

Source: The Field Studies Council

Common Causes of Flooding	
Factor	Effect on Flooding
Geology	Impermeable rocks are saturated more quickly than porous and pervious rocks. Saturation-excess overland flow is more common. Sandy soils have larger pore spaces than clay soils. Infiltration is most rapid in sandy soils.
Relief	Water reaches the channel more rapidly in a steeper basin as water is travelling more quickly downhill.
Vegetation	Vegetation intercepts a large proportion of rainfall. Where trees are deciduous, discharge is higher in a forested basin in winter as there is less interception.
Meteorological Factors	Where rain is falling faster than the infiltration rate there is infiltration-excess overland flow. This is common after a summer storm. Snow does not reach the channel but is stored on the ground surface. As snow melts, the meltwater will reach the channel quickly as infiltration is impeded if the ground is still frozen.
Catchment Shape	It takes less time for water to reach the channel in a circular basin as all extremities are roughly equidistant from the channel.
Land Use	Surface runoff is higher in urban areas because there are more urban surfaces (concrete & tarmac) and sewers take water rapidly to rivers. There is less interception and evapotranspiration and more surface runoff in a deforested catchment.
Catchment Size	Water reaches the channel more rapidly in a smaller basin as water has a shorter distance to travel.
Antecedent Conditions	The level of discharge before the storm is called the antecedent discharge. Even a small amount of rain can lead to flooding.

Source: The Field Studies Council

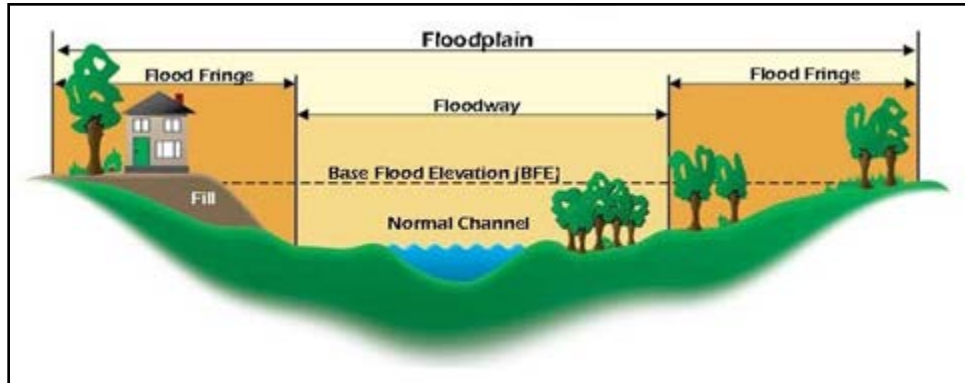
In Williamson County, some areas are more flood-prone than others. One of the easiest ways of identifying these flood-prone areas is through reviewing the county flood maps. These maps display the base floodplain, commonly referred to as to the 100-year floodplain, which is the national standard used by the National Flood Insurance Program (NFIP) and all Federal agencies for the purposes of requiring the purchase of flood insurance and regulating new development. On NFIP maps, areas within the base floodplain are called the Special Flood Hazard Area (SFHA). The base floodplain or SFHA describes an area with a flood risk that has a 1% chance of being equaled or exceeded in magnitude every year. NFIP flood maps are available for public viewing and use online via the FEMA Map Service Center (<https://msc.fema.gov/portal>).

The term "100-year flood" has caused much confusion for people not familiar with statistics. Commonly, people interpret the 100-year flood definition to mean "once every 100 years." This is wrong. You could experience a 100-year flood two times in the same year, two years in a row, or four times over the course of 100 years. You could also not experience a 100-year flood over the course of 200 or more years. To avoid confusion, the NFIP uses the term "base flood." A 100-year base flood is defined as having a 1% chance of being reached or exceeded in any single year. Thus, the 100-year flood also is called the "1% annual chance flood."

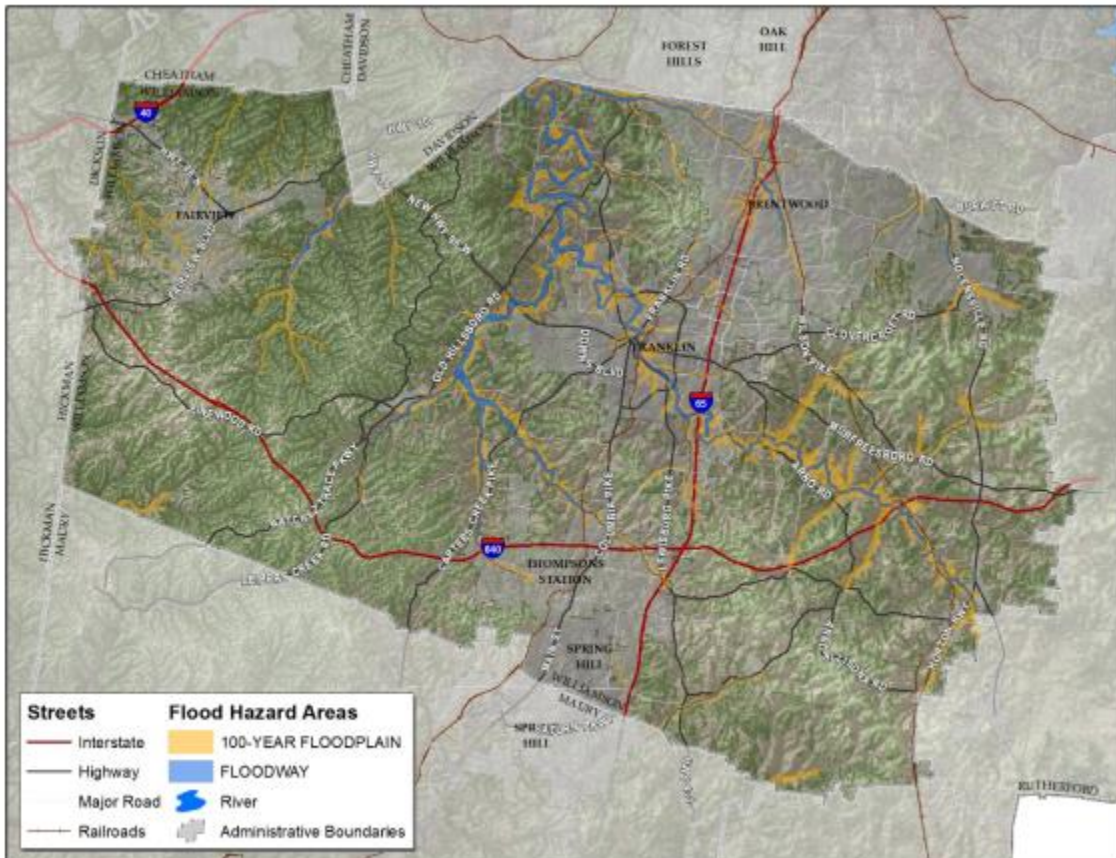
Another way to look at flood risk is to think of the odds that a 100-year flood will happen sometime during the life of a 30-year mortgage—a 26% chance for a structure located in the SFHA. Even these numbers do not convey the true flood risk because they focus on the larger, less frequent, floods. If a house is low enough, it may be subject to the 10- or 25-year flood event. During a 30-year mortgage, it may have a 26% chance of being hit by the 100-year flood, but the odds are 96% (nearly guaranteed) that it will be hit by a 10-year

flood. Compare those odds to the only 1-2% chance that the house will catch fire during the same 30-year mortgage.

Characteristics of a Floodplain



Source: FEMA



Source: Williamson County Emergency Management GIS Department

In Williamson County, all jurisdictions have 100-year floodplains located within their boundaries and all jurisdictions are susceptible to smaller localized flooding outside of the 100-year floodplains. Within those jurisdictions, Williamson County's building stock, worth approximately

\$26 million dollars in approximate replacement value, can be broken down into the following percentage categories: 82.8% residential, 12.2% commercial, 2.2% industrial, 0.3% agricultural, 0.3% governmental, 1.3% religious, and 0.9% educational.⁶

Williamson County has had many flood events in the past. Based on NOAA NCDC data, the following charts provide a list of flood events occurring in Williamson County from January 2011 - December 2016 and a list of floods with descriptions of their impacts imposed on the community.

Flood Events in Williamson County

January 1, 2011 – December 31, 2016

Location	Date	Time	T.Z.	Type
MALLORYS	7/7/2011	13:55	CST-6	Flash Flood
LEIPERS FORK	3/15/2012	15:16	CST-6	Flash Flood
LEIPERS FORK	3/15/2012	16:08	CST-6	Flash Flood
CRAIGFIELD	3/17/2012	14:46	CST-6	Flash Flood
BERRYS CHAPEL	1/13/2013	13:52	CST-6	Flash Flood
NOLENSVILLE	4/27/2013	11:30	CST-6	Flash Flood
FOREST HOME	4/27/2013	22:00	CST-6	Flash Flood
LEIPERS FORK	4/28/2014	9:00	CST-6	Flash Flood
DUPLEX	9/2/2014	22:00	CST-6	Flash Flood
NEW HOPE	10/13/2014	20:00	CST-6	Flash Flood
MUDSINK	6/8/2015	17:00	CST-6	Flash Flood
MALLORYS	6/23/2015	23:00	CST-6	Flash Flood
MUDSINK	7/7/2016	5:58	CST-6	Flash Flood
FOREST HOME	2/4/2014	12:40	CST-6	Flood
BOSTON	2/21/2015	16:00	CST-6	Flood
FOREST HOME	5/31/2015	17:00	CST-6	Flood

Source: <http://www.ncdc.noaa.gov/>

⁶ source: Williamson County HAZUS Flood Study – table 1 in Appendix F

Flood Impacts in Williamson County

January 1, 2011 – December 31, 2016

Location	Date	Deaths	Injuries	Property Damage	CrD
MALLORYS	7/7/2011	0	0	50.00K	3.00K
LEIPERS FORK	3/15/2012	0	0	1.00K	1.00K
LEIPERS FORK	3/15/2012	0	0	1.00K	1.00K
CRAIGFIELD	3/17/2012	0	0	1.00K	1.00K
BERRYS CHAPEL	1/13/2013	0	0	3.00K	1.00K
NOLENSVILLE	4/27/2013	0	0	5.00K	0.00K
FOREST HOME	4/27/2013	0	0	0.00K	0.00K
LEIPERS FORK	4/28/2014	0	0	0.00K	0.00K
DUPLEX	9/2/2014	0	0	0.00K	0.00K
NEW HOPE	10/13/2014	0	0	0.00K	0.00K
MUDSINK	6/8/2015	0	0	0.00K	0.00K
MALLORYS	6/23/2015	0	0	10.00K	0.00K
MUDSINK	7/7/2016	0	0	0.00K	0.00K
FOREST HOME	2/4/2014	0	0	0.00K	0.00K
BOSTON	2/21/2015	0	0	0.00K	0.00K
FOREST HOME	5/31/2015	0	0	0.00K	0.00K

Source: <http://www.ncdc.noaa.gov/>

Small localized flood events are likely to occur several times a year in Williamson County. When 2-4 inches are called for in Williamson County, the National Weather Service (NWS) is normally prompted to issue a flood watch. This is because localized flooding is often experienced throughout the county when rainfall is within this amount.

Flooding remains one of the biggest threats for Williamson County, due to the local Harpeth River and its branching creeks. According to the NWS Advanced Hydrologic Prediction Service, the Harpeth River near the city of Franklin reaches Flood Stage at 30 ft. The gauge for this measurement is located off Murfreesboro Road, near Pinkerton Park. In this area, even when Flood Stage is not reached, there are local impacts:

- 30 ft.: Flooding of Pinkerton Park begins, including walking trails and picnic areas.
- 28 ft.: Flooding of properties adjacent to the river begins near Hillsboro Road and Mack Hatcher Memorial Parkway.
- 24 ft.: Flooding will affect areas along the Harpeth River from Franklin to Bellevue. In Franklin, water will reach the city park, 4th Street, and portions of Highway 431.
- 23 ft.: Water begins to inundate low lying areas along the banks, including the nursery at Hillsboro Road and Fulton Greer Lane.
- 22 ft.: Flood waters reach Highway 431 (Lewisburg Pike) in Franklin.

According to the same source at the NWS, further rising levels above Flood Stage in this area could see the following:

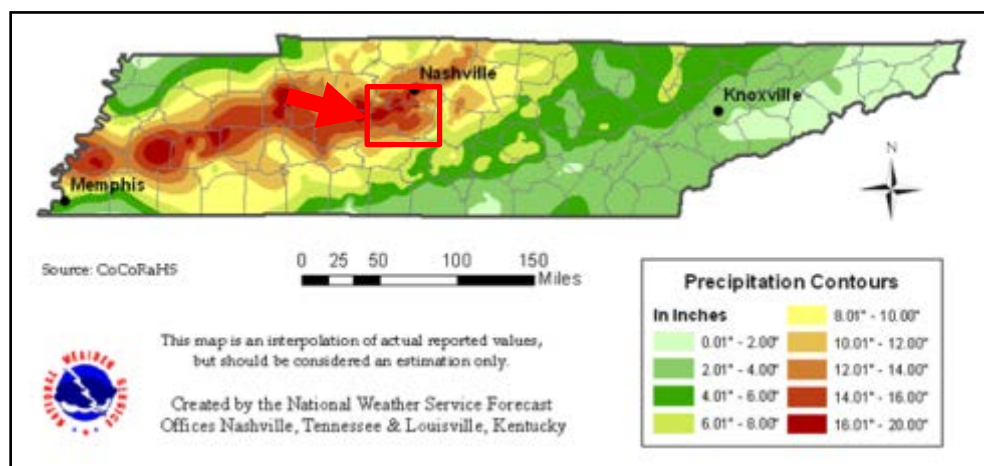
- 38 ft.: Water may approach properties and structures near the river on Third Avenue South, First Avenue South, and East Main Street. These roads and others in the area may be subject to closure at higher river levels.
- 35 ft.: Flooding of Hillsboro Rd and Mack Hatcher Memorial Parkway begins, and may close these major roads at higher river levels.
- 34 ft.: Pinkerton Park is completely flooded.
- 32 ft.: Flooding of properties and structures adjacent to the river near Hillsboro Road and Mack Hatcher Memorial Parkway intersection can be expected.

The Harpeth River also has impacts below the City of Franklin. The gauge location for this area is located off Hillsboro Rd and Judge Fulton Greer Park. The flood stage at this location is 27 ft. Below is a list of flooding above and below the Flood Stage which highlights specific areas of issue:

- 33 ft.: Water approaches Hillsboro Road and Mack Hatcher Memorial Parkway, and may subject these major roads to closure at higher stages.
- 30 ft.: Significant flooding of properties and structures adjacent to the river can be expected, especially near Hillsboro Road and Mack Hatcher Memorial Parkway.
- 27 ft.: Flooding of properties adjacent to the river begins near Hillsboro Road and Mack Hatcher Memorial Parkway.
- 22 ft.: Water begins to inundate low lying areas along the banks, including the nursery at Hillsboro Road and Fulton Green Lane.

As seen with the May 2010 Tennessee Flood Event (*DR-1909*), it is possible for 20 inches or more of rainfall to amass within two days. (see following map).

Tennessee May Flood- Precipitation for May 1st & 2nd 2010



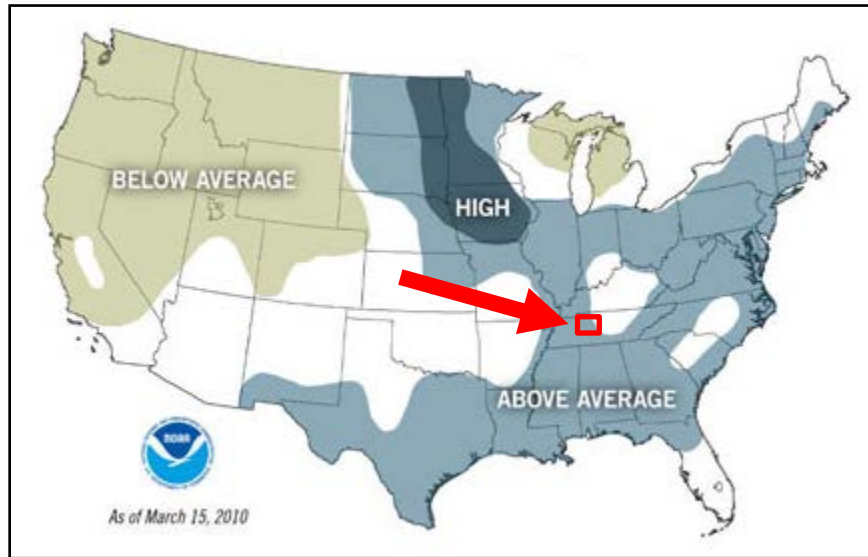
Source: National Weather Service <http://www.srh.noaa.gov/ohx/?n=may2010epicfloodevent>

119

120 According to a NOAA Flood Risk Map, (see map below), the majority of Tennessee was located
121 in an “above average” risk of flooding zone during spring 2010. This proposed vulnerability is
122 coupled with the fact that on average Tennessee usually receives over 50-60 inches of rainfall a
123 year (see following map).

124

Flood Risk Map

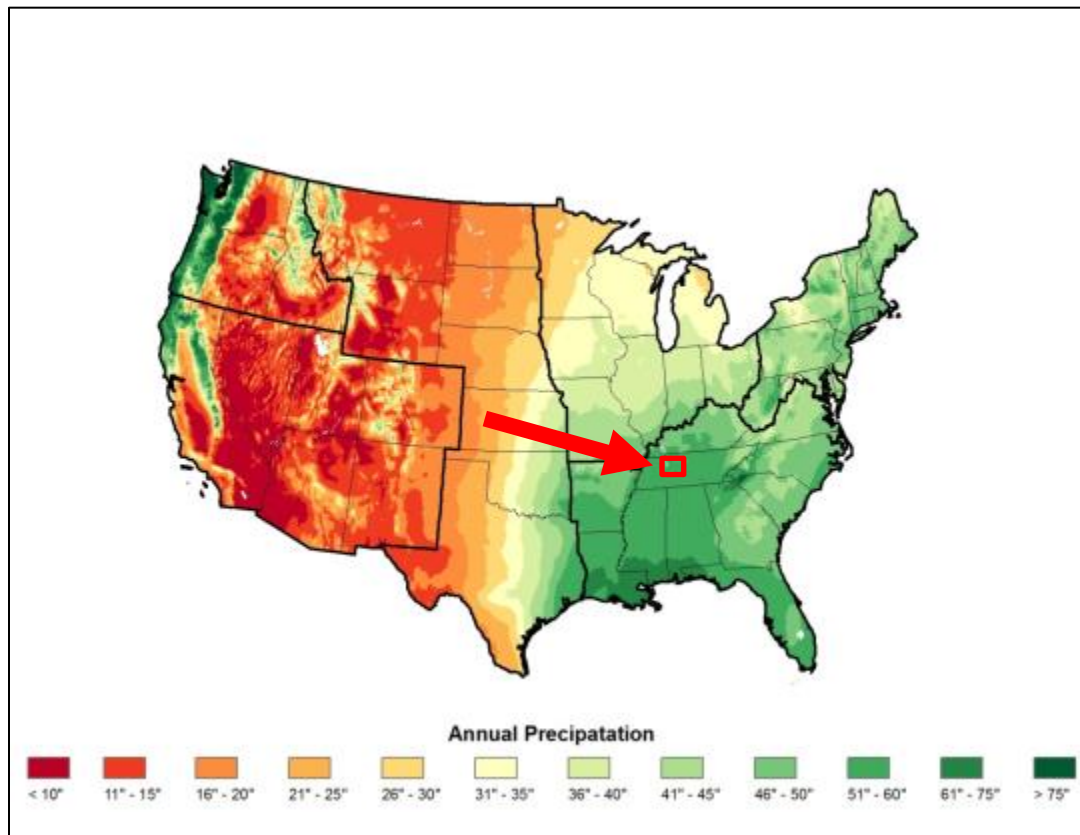


125

126 Source: NOAA

127 <https://www.climate.gov/news-features/featured-images/above-average-flood-risk-forecast-one-third-us>

Average Annual Precipitation (1981-2010)



129

130

Source:

131

http://scenarios.globalchange.gov/sites/default/files/b/figures/UnitedStates/US_Annual_Precipitation.jpg

132

Williamson County uses a simple system known as a [Vulnerability Calculator](#) to determine each

133

jurisdiction's vulnerability to hazard events. The Vulnerability Calculator applies simple

134

arithmetic to analyze probability and potential impacts of events to calculate a risk ranking for

135

each jurisdiction for each hazard.

136 **Source:** Calculation of Planning Committee Input using the [Vulnerability Calculator](#)

Event: Flood	Human 1-5	Property 1-5	Business 1-5	Average	Probability 1-5	Risk Score = [(H+P+B)/3] + P	35.67
City of Franklin	2	4	2	2.67	5	8	
City of Nolensville	3	3	2	2.67	4	7	
Town of Thompson Station	2	4	2	2.67	3	6	
City of Brentwood	3	5	2	3.33	2	5	
Williamson County	2	4	1	2.33	2	4	
City of Spring Hill	2	3	1	2.00	2	4	
City of Fairview	1	1	1	1.00	1	2	

137

Human		Scale	
<i>Risk of injuries and deaths from the hazard</i>		Low	2-3.6
1	Death very unlikely, injuries are unlikely	Moderate	3.7-5.2
2	Death unlikely, injuries are minimal	Medium	5.3-6.8
3	Death unlikely, injuries may be substantial	High	6.9-8.4
4	Death possible, injuries may be substantial	Severe	8.5-10
5	Deaths probable, injuries will likely be substantial		

Property	
<i>Amount of residential property damage associated from the hazard</i>	
1	Less than \$500 in damages
2	\$500-\$10,000 in damages
3	\$10,000-\$500,000 in damages
4	\$500,000-\$2,000,000 in damages
5	More than \$2,000,000 in damages

Business	
<i>Amount of business damage associated from the hazard</i>	
1	Less than 3 businesses closed for only a day
2	More than 3 businesses closed for a week
3	More than 3 businesses closed for a few months
4	More than 3 businesses closed indefinitely or relocated
5	A top-10 local employer closed indefinitely

Probability	
<i>Likelihood of the hazard occurring within a given span of years</i>	
1	Less than once every 10 years
2	About once every 5-10 years
3	About once every 2-5 years
4	About once a year
5	More than once a year

138

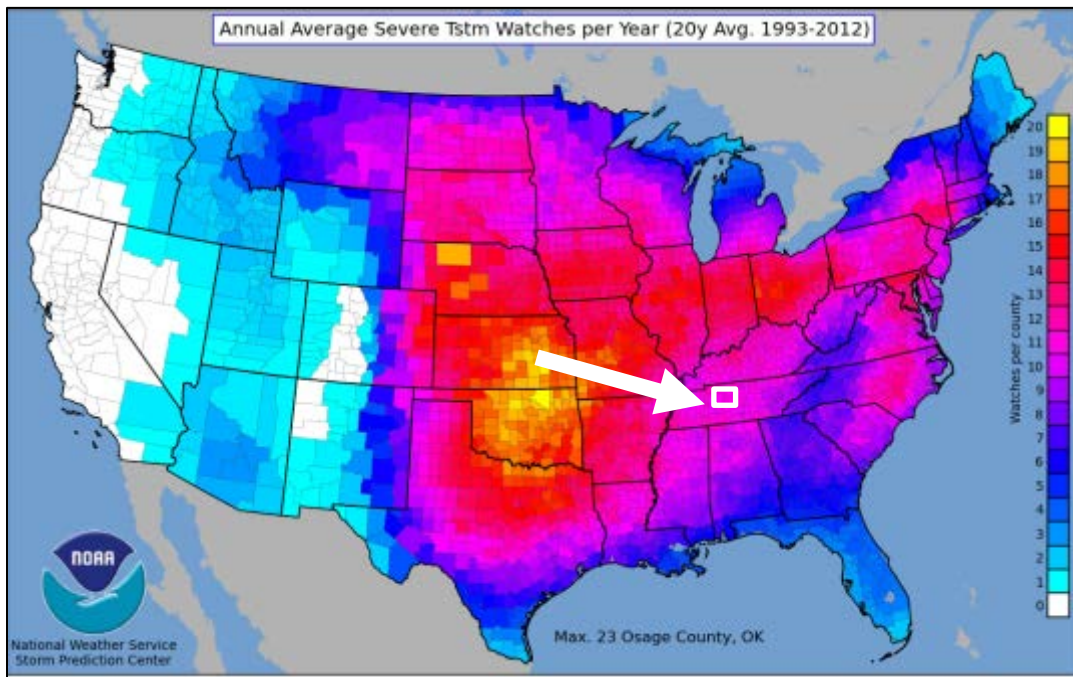
139 For further information about flooding hazards in Williamson County, see the HAZUS flood study
 140 in Appendix F.

141

Tornadoes/Severe Storms

According to NWS, to consider a storm severe it must encompass one of three traits: produce winds greater than 58 miles per hour (50.4 knots), produce hail $\frac{3}{4}$ of an inch or greater in diameter, or produce tornadoes. On average, a typical county in Tennessee has about 10 severe storm watches per year (see map below).

Average Severe Storm Watches Per Year (1999-2008)



Source: <http://www.spc.noaa.gov/wcm/20ysvra.png>

Wind Zones in the United States



Source: FEMA

Based on NOAA NCDC data, the following charts provide a list of tornado events occurring in Williamson County from January 2011 to December 2016 and a description of each tornado's impacts within the county.

Tornado Events in Williamson County

January 1, 2011 – December 31, 2016

Location	Date	Time	T.Z.	Type
FRANKLIN	4/26/2012	18:00	CST-6	Tornado
BENDING CHESTNUT	1/30/2013	3:01	CST-6	Tornado
EWINGVILLE	1/30/2013	3:18	CST-6	Tornado
COLLEGE GROVE	1/30/2013	3:41	CST-6	Tornado
KINGFIELD	4/3/2015	16:22	CST-6	Tornado

Source: <http://www.ncdc.noaa.gov/>

Tornado Impacts in Williamson County

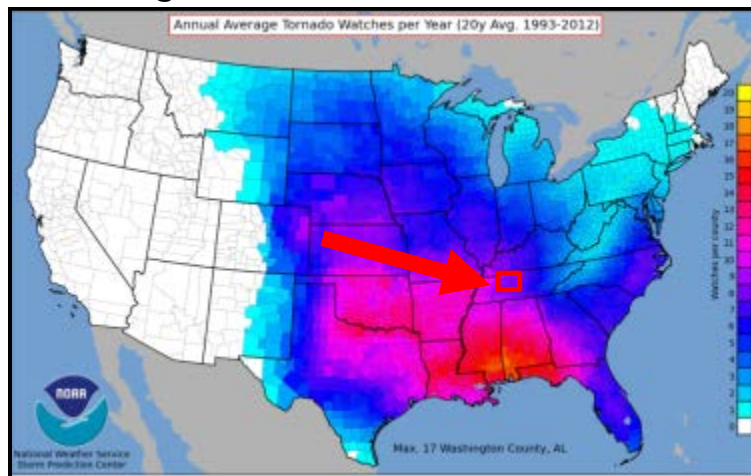
January 1, 2011 – December 31, 2016

Location	Date	Time	Type	Mag	Deaths	Injuries	Property Damage	CrD
FRANKLIN	4/26/2012	18:00	Tornado	EF0	0	6	75.00K	0.00K
BENDING CHESTNUT	1/30/2013	3:01	Tornado	EF0	0	0	60.00K	10.00K
EWINGVILLE	1/30/2013	3:18	Tornado	EF0	0	0	100.00K	10.00K
COLLEGE GROVE	1/30/2013	3:41	Tornado	EF0	0	0	80.00K	25.00K
KINGFIELD	4/3/2015	16:22	Tornado	EF0	0	0	20.00K	0.00K

Source: <http://www.ncdc.noaa.gov/>

Based on historical records, Williamson County is at risk of tornado events several months each year.

Average Number of Tornadoes Per Year



Source: <http://www.spc.noaa.gov/wcm/20ytora.png>

The severity of tornadoes that may occur in the county is measured using the Enhanced Fujita Scale for tornadoes (see chart below). Based on historical events, in a worst-case scenario it is possible for the extent of a tornado to exceed an EF4 ranking. The EF4 tornado that impacted the Rebel Meadows area of Franklin to the Brenthaven area of Brentwood on December 24, 1988 is the largest tornado event ever recorded in Williamson County. The tornado traveled 6 miles with a path width of 150 yards. The destruction left \$50 million in damages and led to 1 death caused by a roof collapse.

182

Fujita Scale/Enhanced Fujita Scale for Tornadoes

Fujita Scale/Enhanced Fujita Scale for Tornadoes				
F-Scale	Fastest Quarter Mile Wind Speed	Typical Impacts	Enhanced Scale: 3 Sec Wind Gust Speed	Enhanced F-Scale
F0	40-72 mph	Some damage to chimney; breaks branches off trees; pushes over shallow-rooted trees; damages sign boards.	65-85 mph	EF0
F1	73-112 mph	Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.	86-110 mph	EF1
F2	113-157 mph	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.	111-135 mph	EF2
F3	158-206 mph	Roof and some walls torn off well constructed houses; trains overturned; most trees in forest uprooted.	136-165 mph	EF3
F4	207-260 mph	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.	166-200 mph	EF4
F5	261-318 mph	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel reinforced concrete structures badly damaged.	Over 200 mph	EF5

183

184

Source: [NOAA National Weather Service](#); [The Tornado Project](#)

185 Hail is the frozen form of precipitation, falling as small spheres of solid ice. Even though the risk
 186 from hail is relatively low, all jurisdictions have the possibility of hail causing some window and
 187 roof damage. Historically, hail events occur several times a year in Williamson County. The
 188 severity of hail is measured by the diameter of the hail itself, commonly using the TORRO Hail
 189 Index (see following chart). Williamson County's largest hail extent is reported at 1.75 inches
 190 (H5). Most of the county's hail events reported causing minor roof damage to several homes
 191 and vehicles.

192

TORRO Hail Index

TORRO Hail Index			
Scale	Max Diameter	Comparisons	Typical Impacts
H0	5-9mm	Pea	No damage.
H1	10-15mm	Mothball	Slight general damage to plants, crops.
H2	16-20mm	Marble	Significant damage to fruit, crops, vegetation.
H3	21-30mm	Walnut	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored.
H4	31-40mm	Pigeon's Egg	Widespread glass damage, vehicle bodywork damage.
H5	41-50mm	Golf Ball	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries.
H6	51-60mm	Hen's Egg	Bodywork of grounded aircraft dented, brick walls pitted.
H7	61-75mm	Tennis Ball	Severe roof damage, risk of serious injuries.
H8	76-90mm	Soft Ball	Severe damage to aircraft bodywork.
H9	91-100mm	Grapefruit	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open.

193

194

Source: [The Tornado & Storm Research Organization](#) (<http://www.torro.org.uk/hscale.php>)

195 The following chart provides hail event information for Williamson County between January
 196 2011 and December 2016.

197

Hail Events in Williamson County

198

January 1, 2011 – December 31, 2016

Location	Date	Time	T.Z.	Type	Mag
MALLORYS	4/15/2011	19:10	CST-6	Hail	1.00 in.
LAMPLEY STORE	3/14/2012	16:25	CST-6	Hail	1.00 in.
MUDSINK	3/14/2012	17:02	CST-6	Hail	1.50 in.
MALLORYS	3/14/2012	17:10	CST-6	Hail	0.88 in.
MALLORYS	3/14/2012	17:10	CST-6	Hail	1.25 in.
MUDSINK	3/14/2012	17:18	CST-6	Hail	1.00 in.
BOSTON	3/15/2012	13:10	CST-6	Hail	1.50 in.
KINGFIELD	3/15/2012	13:10	CST-6	Hail	1.75 in.
FAIRVIEW	3/15/2012	13:50	CST-6	Hail	1.00 in.
BERRYS CHAPEL	3/15/2012	15:35	CST-6	Hail	1.25 in.
PARRY	3/15/2012	15:58	CST-6	Hail	0.75 in.
MALLORYS	4/5/2012	14:09	CST-6	Hail	1.00 in.
MALLORYS	4/26/2012	17:59	CST-6	Hail	1.25 in.
FRANKLIN	4/26/2012	18:11	CST-6	Hail	1.00 in.
FRANKLIN	4/26/2012	18:11	CST-6	Hail	1.75 in.
BERRYS CHAPEL	5/6/2012	16:29	CST-6	Hail	0.75 in.
MALLORYS	5/6/2012	17:45	CST-6	Hail	1.00 in.
MALLORYS	5/6/2012	17:50	CST-6	Hail	1.00 in.
NOLENSVILLE	5/19/2012	17:45	CST-6	Hail	1.00 in.
THOMPSONS STATION	6/1/2013	15:15	CST-6	Hail	0.88 in.
MALLORYS	6/10/2013	13:37	CST-6	Hail	0.75 in.
TRIUNE	6/10/2013	13:55	CST-6	Hail	1.00 in.
THOMPSONS STATION	6/10/2013	14:05	CST-6	Hail	0.88 in.
REEDS STORE	6/10/2013	14:32	CST-6	Hail	0.88 in.
FRANKLIN	6/7/2014	17:10	CST-6	Hail	0.75 in.
DOUGLAS	10/6/2014	16:38	CST-6	Hail	1.00 in.
FRANKLIN	6/8/2015	15:24	CST-6	Hail	1.00 in.
FRANKLIN	6/8/2015	15:27	CST-6	Hail	1.25 in.
FOREST HOME	7/14/2015	13:18	CST-6	Hail	1.75 in.
BERRYS CHAPEL	7/14/2015	13:25	CST-6	Hail	1.75 in.
NEW HOPE	5/1/2016	16:15	CST-6	Hail	1.00 in.
TRINITY	6/3/2016	20:10	CST-6	Hail	0.88 in.
BERRYS CHAPEL	7/6/2016	15:56	CST-6	Hail	0.75 in.
LEIPERS FORK	7/6/2016	16:06	CST-6	Hail	0.75 in.

199

200

Source: <http://www.ncdc.noaa.gov/>

201

202 Severe storm winds most commonly occur as straight-line winds, a downburst of wind created
203 by an area of significantly rain-cooled air that spreads out in all directions after hitting the
204 ground. All jurisdictions are vulnerable to receiving damage from these severe storm winds.
205 Current data states severe storm wind events occur on average 22 times a year within the past
206 six years in Williamson County. The severity of severe storm winds is measured by wind speed
207 (knots or mph). The highest severe storm wind event in Williamson County between January
208 2011 and December 2016 was recorded in College Grove on January 30, 2013. This event had
209 wind speeds clocked at 70 knots and reports cite there were \$30,000 in property damage.
210 Further issues were seen as Middle Tennessee Electric dealt with 2,100 power outages in and
211 around the city of Franklin.

212 The following chart provides severe storm wind event information for Williamson County
213 between January 2011 and December 2016.

Wind Events in Williamson County

January 1, 2011 – December 31, 2016

Location	Date	Time	T.Z.	Type	Mag
WILLIAMSON (ZONE)	1/30/2013	2:26	CST-6	High Wind	55 kts. EG
WILLIAMSON (ZONE)	10/31/2013	12:00	CST-6	High Wind	52 kts. EG
WILLIAMSON (ZONE)	1/1/2011	0:30	CST-6	Strong Wind	43 kts. EG
WILLIAMSON (ZONE)	12/13/2015	22:15	CST-6	Strong Wind	39 kts. EG
FAIRVIEW	2/24/2011	21:30	CST-6	Thunderstorm Wind	55 kts. EG
MALLORYS	2/24/2011	21:55	CST-6	Thunderstorm Wind	55 kts. EG
MUDSINK	4/4/2011	13:10	CST-6	Thunderstorm Wind	55 kts. EG
BERRYS CHAPEL	4/4/2011	13:10	CST-6	Thunderstorm Wind	55 kts. EG
BERRYS CHAPEL	4/11/2011	16:15	CST-6	Thunderstorm Wind	55 kts. EG
MUDSINK	4/27/2011	4:05	CST-6	Thunderstorm Wind	55 kts. EG
DOUGLAS	7/21/2011	14:15	CST-6	Thunderstorm Wind	55 kts. EG
FAIRVIEW	1/23/2012	1:15	CST-6	Thunderstorm Wind	50 kts. EG
BERRYS CHAPEL	1/23/2012	1:30	CST-6	Thunderstorm Wind	50 kts. EG
FAIRVIEW	1/23/2012	2:02	CST-6	Thunderstorm Wind	50 kts. EG
HARPETH	1/26/2012	19:46	CST-6	Thunderstorm Wind	50 kts. EG
ASH HILL	3/15/2012	16:00	CST-6	Thunderstorm Wind	55 kts. EG
ASH HILL	3/15/2012	16:05	CST-6	Thunderstorm Wind	55 kts. EG
KIRKLAND	3/15/2012	16:05	CST-6	Thunderstorm Wind	55 kts. EG
TRINITY	7/5/2012	17:35	CST-6	Thunderstorm Wind	55 kts. EG
ARRINGTON	7/5/2012	18:45	CST-6	Thunderstorm Wind	55 kts. EG
BERRYS CHAPEL	7/6/2012	15:41	CST-6	Thunderstorm Wind	55 kts. EG
BERRYS CHAPEL	7/6/2012	15:45	CST-6	Thunderstorm Wind	55 kts. EG
BERRYS CHAPEL	7/6/2012	15:52	CST-6	Thunderstorm Wind	55 kts. EG
BERRYS CHAPEL	7/6/2012	16:02	CST-6	Thunderstorm Wind	55 kts. EG
LEIPERS FORK	7/6/2012	16:20	CST-6	Thunderstorm Wind	55 kts. EG
FAIRVIEW	7/8/2012	15:17	CST-6	Thunderstorm Wind	55 kts. EG
NEW HOPE	8/16/2012	21:30	CST-6	Thunderstorm Wind	48 kts. EG
EWINGVILLE	8/16/2012	21:36	CST-6	Thunderstorm Wind	52 kts. EG

Location	Date	Time	T.Z.	Type	Mag
WEST HARPETH	9/7/2012	23:43	CST-6	Thunderstorm Wind	55 kts. EG
FAIRVIEW	1/30/2013	3:05	CST-6	Thunderstorm Wind	55 kts. EG
EWINGVILLE	1/30/2013	3:15	CST-6	Thunderstorm Wind	61 kts. EG
FRANKLIN	1/30/2013	3:19	CST-6	Thunderstorm Wind	52 kts. EG
REEDS STORE	1/30/2013	3:34	CST-6	Thunderstorm Wind	70 kts. EG
FRANKLIN	5/21/2013	11:24	CST-6	Thunderstorm Wind	50 kts. EG
FOREST HOME	6/10/2013	13:25	CST-6	Thunderstorm Wind	52 kts. EG
BERRYS CHAPEL	6/10/2013	13:30	CST-6	Thunderstorm Wind	52 kts. EG
CLOVERCROFT	6/10/2013	13:42	CST-6	Thunderstorm Wind	56 kts. EG
TRIUNE	6/10/2013	14:00	CST-6	Thunderstorm Wind	52 kts. EG
THOMPSONS STATION	6/10/2013	14:05	CST-6	Thunderstorm Wind	56 kts. EG
HARPETH	6/10/2013	14:05	CST-6	Thunderstorm Wind	52 kts. EG
DUPLEX	6/10/2013	14:10	CST-6	Thunderstorm Wind	65 kts. EG
FOREST HOME	7/10/2013	18:05	CST-6	Thunderstorm Wind	50 kts. EG
MALLORYS	7/10/2013	18:15	CST-6	Thunderstorm Wind	50 kts. EG
MUDSINK	7/10/2013	18:20	CST-6	Thunderstorm Wind	60 kts. EG
MUDSINK	7/10/2013	18:20	CST-6	Thunderstorm Wind	60 kts. EG
MUDSINK	7/10/2013	18:25	CST-6	Thunderstorm Wind	60 kts. EG
MUDSINK	7/10/2013	18:25	CST-6	Thunderstorm Wind	60 kts. EG
MUDSINK	7/10/2013	18:25	CST-6	Thunderstorm Wind	60 kts. EG
MUDSINK	7/10/2013	18:25	CST-6	Thunderstorm Wind	60 kts. EG
MUDSINK	7/10/2013	18:25	CST-6	Thunderstorm Wind	60 kts. EG
BERRYS CHAPEL	7/10/2013	18:30	CST-6	Thunderstorm Wind	60 kts. EG
HARPETH	8/23/2013	16:12	CST-6	Thunderstorm Wind	52 kts. EG
FAIRVIEW	10/31/2013	21:00	CST-6	Thunderstorm Wind	57 kts. MC
NOLENSVILLE	10/31/2013	21:56	CST-6	Thunderstorm Wind	52 kts. EG
REEDS STORE	10/31/2013	22:15	CST-6	Thunderstorm Wind	52 kts. EG
FAIRVIEW	12/21/2013	21:02	CST-6	Thunderstorm Wind	52 kts. EG
FAIRVIEW	12/21/2013	21:03	CST-6	Thunderstorm Wind	52 kts. EG
MALLORYS	12/21/2013	21:30	CST-6	Thunderstorm Wind	56 kts. MC
EPWORTH	12/21/2013	21:40	CST-6	Thunderstorm Wind	52 kts. EG
FAIRVIEW	2/20/2014	19:33	CST-6	Thunderstorm Wind	52 kts. EG
BOSTON	2/20/2014	19:50	CST-6	Thunderstorm Wind	52 kts. EG
FRANKLIN	2/20/2014	20:00	CST-6	Thunderstorm Wind	52 kts. EG
EWINGVILLE	2/20/2014	20:00	CST-6	Thunderstorm Wind	56 kts. EG
MALLORYS	2/20/2014	20:05	CST-6	Thunderstorm Wind	56 kts. EG
NOLENSVILLE	2/20/2014	20:13	CST-6	Thunderstorm Wind	52 kts. EG
KIRKLAND	2/20/2014	20:14	CST-6	Thunderstorm Wind	52 kts. EG
COLLEGE GROVE	2/20/2014	20:15	CST-6	Thunderstorm Wind	52 kts. EG
MUDSINK	4/4/2014	4:53	CST-6	Thunderstorm Wind	52 kts. EG

Location	Date	Time	T.Z.	Type	Mag
PARRY	6/5/2014	0:30	CST-6	Thunderstorm Wind	61 kts. EG
HARPEETH	6/9/2014	21:00	CST-6	Thunderstorm Wind	52 kts. EG
EWINGVILLE	6/9/2014	21:08	CST-6	Thunderstorm Wind	52 kts. EG
FAIRVIEW	6/21/2014	13:45	CST-6	Thunderstorm Wind	52 kts. EG
BINGHAM	6/21/2014	13:48	CST-6	Thunderstorm Wind	52 kts. EG
MALLORYS	7/14/2014	15:51	CST-6	Thunderstorm Wind	50 kts. EG
MALLORYS	7/14/2014	16:00	CST-6	Thunderstorm Wind	50 kts. EG
TRINITY	7/14/2014	16:02	CST-6	Thunderstorm Wind	50 kts. EG
FAIRVIEW	8/7/2014	18:00	CST-6	Thunderstorm Wind	52 kts. EG
REEDS STORE	8/23/2014	16:28	CST-6	Thunderstorm Wind	52 kts. EG
BOSTON	10/13/2014	17:05	CST-6	Thunderstorm Wind	52 kts. EG
CALLE	10/13/2014	19:55	CST-6	Thunderstorm Wind	52 kts. EG
DOUGLAS	10/13/2014	19:57	CST-6	Thunderstorm Wind	48 kts. EG
EWINGVILLE	10/13/2014	20:00	CST-6	Thunderstorm Wind	48 kts. EG
LIBERTY HILL	4/2/2015	15:10	CST-6	Thunderstorm Wind	52 kts. EG
LAMPLEY STORE	4/3/2015	16:15	CST-6	Thunderstorm Wind	52 kts. EG
MUDSINK	4/20/2015	0:10	CST-6	Thunderstorm Wind	52 kts. EG
LEIPERS FORK	6/8/2015	15:15	CST-6	Thunderstorm Wind	52 kts. EG
TRIUNE	6/8/2015	15:48	CST-6	Thunderstorm Wind	52 kts. EG
MALLORYS	7/14/2015	13:51	CST-6	Thunderstorm Wind	52 kts. EG
MUDSINK	7/28/2015	15:25	CST-6	Thunderstorm Wind	52 kts. EG
NOLENSVILLE	7/28/2015	15:30	CST-6	Thunderstorm Wind	52 kts. EG
FRANKLIN	7/28/2015	15:35	CST-6	Thunderstorm Wind	52 kts. EG
MALLORYS	8/19/2015	14:07	CST-6	Thunderstorm Wind	48 kts. EG
FAIRVIEW	4/6/2016	15:37	CST-6	Thunderstorm Wind	52 kts. EG
FOREST HOME	4/6/2016	16:00	CST-6	Thunderstorm Wind	56 kts. EG
BERRYS CHAPEL	6/1/2016	16:40	CST-6	Thunderstorm Wind	52 kts. EG
ARRINGTON	6/3/2016	20:05	CST-6	Thunderstorm Wind	52 kts. EG
MALLORYS	6/15/2016	15:19	CST-6	Thunderstorm Wind	52 kts. EG
FRANKLIN	6/15/2016	15:21	CST-6	Thunderstorm Wind	50 kts. EG
NOLENSVILLE	6/28/2016	16:40	CST-6	Thunderstorm Wind	48 kts. EG
CRAIGFIELD	7/6/2016	15:13	CST-6	Thunderstorm Wind	48 kts. EG
LEIPERS FORK	7/6/2016	16:00	CST-6	Thunderstorm Wind	50 kts. EG
BETHESDA	7/6/2016	16:00	CST-6	Thunderstorm Wind	48 kts. EG
EWINGVILLE	7/7/2016	5:30	CST-6	Thunderstorm Wind	50 kts. EG
NEW HOPE	7/7/2016	6:05	CST-6	Thunderstorm Wind	48 kts. EG
NEW HOPE	7/8/2016	19:33	CST-6	Thunderstorm Wind	48 kts. EG
FOREST HOME	7/8/2016	19:45	CST-6	Thunderstorm Wind	50 kts. EG
FAIRVIEW	7/8/2016	19:49	CST-6	Thunderstorm Wind	50 kts. EG
FAIRVIEW	7/8/2016	19:52	CST-6	Thunderstorm Wind	56 kts. MG

Location	Date	Time	T.Z.	Type	Mag
BERRYS CHAPEL	7/8/2016	19:58	CST-6	Thunderstorm Wind	52 kts. EG
MALLORYS	7/8/2016	20:01	CST-6	Thunderstorm Wind	50 kts. EG
EWINGVILLE	7/8/2016	20:02	CST-6	Thunderstorm Wind	60 kts. EG
MALLORYS	7/8/2016	20:04	CST-6	Thunderstorm Wind	52 kts. EG
MALLORYS	7/8/2016	20:05	CST-6	Thunderstorm Wind	50 kts. EG
MALLORYS	7/8/2016	20:05	CST-6	Thunderstorm Wind	50 kts. EG
NOLENSVILLE	7/8/2016	20:06	CST-6	Thunderstorm Wind	50 kts. EG
CALLE	7/8/2016	20:10	CST-6	Thunderstorm Wind	50 kts. EG
PEYTONSVILLE	7/8/2016	20:15	CST-6	Thunderstorm Wind	50 kts. EG
MALLORYS	7/19/2016	12:54	CST-6	Thunderstorm Wind	56 kts. EG
WEST HARPETH	8/5/2016	13:30	CST-6	Thunderstorm Wind	55 kts. EG
LITTLE TEXAS	8/20/2016	14:53	CST-6	Thunderstorm Wind	48 kts. EG
FAIRVIEW	9/10/2016	15:26	CST-6	Thunderstorm Wind	52 kts. EG
FOREST HOME	9/10/2016	15:35	CST-6	Thunderstorm Wind	52 kts. EG
LEIPERS FORK	9/10/2016	15:35	CST-6	Thunderstorm Wind	48 kts. EG
FOREST HOME	9/10/2016	15:36	CST-6	Thunderstorm Wind	52 kts. EG
BERRYS CHAPEL	9/10/2016	15:40	CST-6	Thunderstorm Wind	48 kts. EG
BERRYS CHAPEL	9/10/2016	15:40	CST-6	Thunderstorm Wind	52 kts. EG
BERRYS CHAPEL	9/10/2016	15:42	CST-6	Thunderstorm Wind	52 kts. EG
FRANKLIN	9/10/2016	15:43	CST-6	Thunderstorm Wind	48 kts. EG
BERRYS CHAPEL	9/10/2016	15:43	CST-6	Thunderstorm Wind	48 kts. EG
MALLORYS	9/10/2016	15:45	CST-6	Thunderstorm Wind	48 kts. EG
EWINGVILLE	9/10/2016	15:47	CST-6	Thunderstorm Wind	52 kts. EG
CROSS KEYS	9/10/2016	16:05	CST-6	Thunderstorm Wind	48 kts. EG
MALLORYS	12/17/2016	23:25	CST-6	Thunderstorm Wind	43 kts. EG

Source: <http://www.ncdc.noaa.gov/>

Throughout the county all buildings and infrastructure are vulnerable to tornadoes and severe storm impacts, including lightning. Impacts could range from slight roof damages caused by hail to total structure flattening caused by strong tornadoes. In the county, manufactured homes, electrical lines, and older barns are some of the most vulnerable features.

On January 30, 2015, Middle Tennessee experienced the largest outbreak of tornadic activity in its history. In Williamson County during this outbreak, an EF0 tornado touched down near the intersection of Pinewood Road and Walker Hill Road in southwestern Williamson County where approximately 30 trees were snapped or uprooted and one outbuilding lost part of its roof. The path continued across Highway 840 into an inaccessible portion of Williamson County north of Highway 46. The tornado was reported to be 2.3 miles long and 75 yards wide.

Williamson County uses a simple system known as a [Vulnerability Calculator](#) to determine each jurisdiction's vulnerability to hazard events. The Vulnerability Calculator applies simple

234 arithmetic to analyze probability and potential impacts of events to calculate a risk ranking for
 235 each jurisdiction for each hazard.

236 **Source:** Calculation of Planning Committee Input using the [Vulnerability Calculator](#).

237

Event: Tornado	Human 1-5	Property 1-5	Business 1-5	Average	Probability 1-5	Risk Score = [(H+P+B)/3] + P	44.33
City of Franklin	4	5	3	4.00	5	9	
City of Brentwood	5	5	2	4.00	3	7	
Williamson County	4	4	2	3.33	3	6	
City of Spring Hill	4	4	2	3.33	3	6	
City of Fairview	3	3	1	2.33	3	5	
City of Nolensville	4	3	2	3.00	2	5	
Town of Thompson Station	4	4	2	3.33	2	5	

238

Event: Wind Event	Human 1-5	Property 1-5	Business 1-5	Average	Probability 1-5	Risk Score = [(H+P+B)/3] + P	50
City of Brentwood	4	4	1	3.00	5	8	
City of Franklin	2	4	2	2.67	5	8	
City of Nolensville	3	3	2	2.67	5	8	
City of Spring Hill	4	3	2	3.00	4	7	
Town of Thompson Station	2	3	2	2.33	5	7	
Williamson County	3	3	2	2.67	4	7	
City of Fairview	3	3	2	2.67	3	6	

239

Human		Scale	
Risk of injuries and deaths from the hazard		Low	2-3.6
1	Death very unlikely, injuries are unlikely	Moderate	3.7-5.2
2	Death unlikely, injuries are minimal	Medium	5.3-6.8
3	Death unlikely, injuries may be substantial	High	6.9-8.4
4	Death possible, injuries may be substantial	Severe	8.5-10
5	Deaths probable, injuries will likely be substantial		

Property	
Amount of residential property damage associated from the hazard	
1	Less than \$500 in damages
2	\$500-\$10,000 in damages
3	\$10,000-\$500,000 in damages
4	\$500,000-\$2,000,000 in damages
5	More than \$2,000,000 in damages

Business	
Amount of business damage associated from the hazard	
1	Less than 3 businesses closed for only a day
2	More than 3 businesses closed for a week
3	More than 3 businesses closed for a few months
4	More than 3 businesses closed indefinitely or relocated
5	A top-10 local employer closed indefinitely

Probability	
Likelihood of the hazard occurring within a given span of years	
1	Less than once every 10 years
2	About once every 5-10 years
3	About once every 2-5 years
4	About once a year
5	More than once a year

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Lightning occurs in all thunderstorms and poses a serious threat to human life and property. All lightning originates around 15,000 to 20,000 feet above sea level when raindrops are carried upward until some will convert to ice. A cloud-to-ground lightning flash originates in this mixed water/ice region. The charge then moves downward in 50 yard sections call step leaders. It keeps moving toward the ground in these steps and produces a channel along which charge is deposited. Eventually, it encounters something on the ground that is a good connection. At this point the circuit is complete and the charge is lowered from the cloud to the ground. Most cloud-to-ground lightning strikes come from the negatively charged bottom of the cloud traveling to the positively charged ground below. Cloud-to-ground lightning bolts strike tall objects, like trees and buildings. These lightning strikes can cause fire and property damage.

The return strike is a flow of charge (current), which produces luminosity much brighter than the part that comes down. This entire event usually takes less than a half a second. According to the NOAA, over the last 20 years, the United States averaged 51 annual lightning strike fatalities.

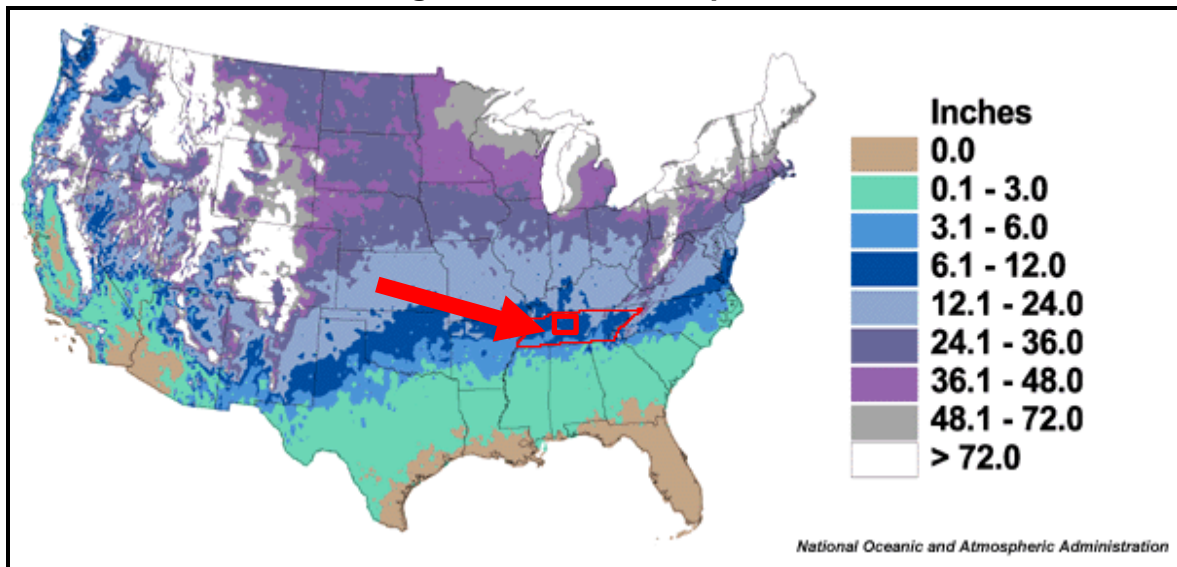
Freezes/Winter Storms

A freeze occurs when temperatures are below 32 degrees Fahrenheit for a period of time. These temperatures can damage agricultural crops, burst water pipes, and create layers of “black ice.” Winter storms are events that can range from a few hours of moderate snow to blizzard-like circumstances that can affect driving conditions and impact communications, electricity, and other services. In Williamson County, all jurisdictions are vulnerable to freezes and moderate winter storms, but not to the severity level seen in much of the northern U.S.

Based on previous occurrences, Williamson County usually experiences five major winter storm events per year, according to the data received between January 1, 2011 and December 31, 2016. The severity of winter storms is commonly measured by inches of snowfall. In February 2016, a two-day snow event occurred which ranged from 1-inch in the Town of Nolensville and 3-inches of snowfall in the City of Franklin.

267

Average Mean Snowfall per Year



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Source: NOAA

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Williamson County can experience temperatures between 12 to 6 degrees Fahrenheit, thus

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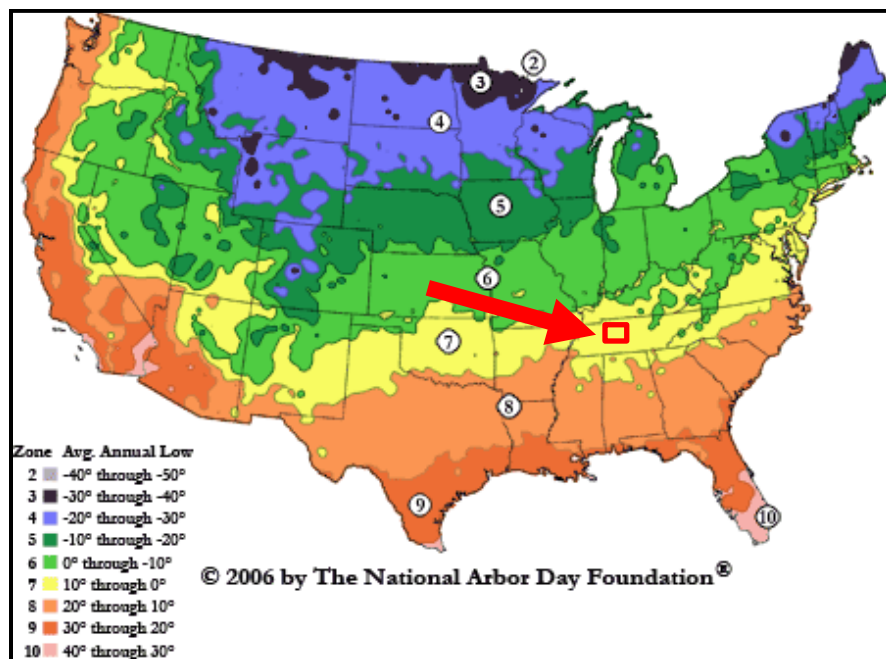
causing multiple freeze conditions during the winter months (see the following map for other

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average lows).

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Average Annual Low Temperatures



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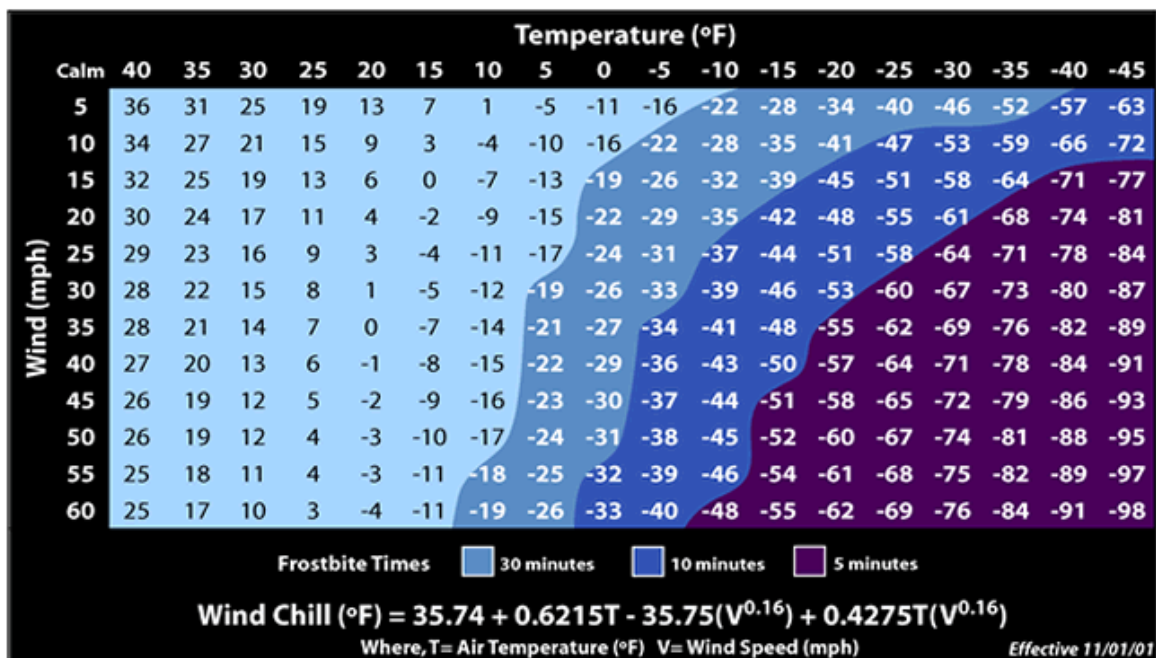
Source: NOAA

Throughout the county many buildings and the majority of infrastructure networks can be vulnerable to winter storm impacts. Many of these structures would not receive direct impacts from winter storms but they could receive indirect impacts such as downed electrical lines that cut off electricity to the structures, frozen pipelines that crack, destroyed agriculture crops and customers not being able to access travels to the structures due to ice covered roads. In the county, road traveling conditions, electrical lines and agricultural functions are some of the most vulnerable features.

In a freeze or winter storm, exposure to extreme cold can cause frostbite or hypothermia, which can become life threatening. However, what constitutes extreme cold varies in different parts of the country. In the South, near freezing temperatures are considered extreme cold. These temperatures can cause severe damage to certain crops and other vegetation. Pipes may freeze or burst in homes with poor insulation, causing severe home damage. Wind chill is also a factor of extreme cold. Wind chill is how the combined wind and cold feel on a person's exposed skin. As the wind increases, body heat is carried away and essentially lowers body temperature. Animals are also affected by this aspect of extreme cold, which could put livestock in danger.



Wind Chill Chart



Source: National Weather Service

In February 2015 winter storm Octavia left thousands without power for several days in Tennessee as well as other surrounding states. During winter storm Octavia temperatures dropped below 20 degrees, which ultimately made the salt used to de-ice roads ineffective. The devastation of this one storm garnered national news and coverage. The storm contributed to

297 two deaths in the City of Franklin, as a motorist and her son were struck by a tractor-trailer
298 while they exited their vehicle to aid other stranded motorists on snowy roads.

299 The following chart provides winter storm event information for Williamson County between
300 January 1, 2011 to December 31, 2016.

301 **Winter Events in Williamson County**

302 **January 1, 2011 – December 31, 2016**

Location	Date	Time	T.Z.	Type	Deaths	Injuries	Property Damage
WILLIAMSON (ZONE)	1/15/2013	17:00	CST-6	Ice Storm	0	0	0.00K
WILLIAMSON (ZONE)	3/2/2014	19:00	CST-6	Winter Storm	0	0	0.00K
WILLIAMSON (ZONE)	2/16/2015	0:00	CST-6	Winter Storm	0	0	100.00K
WILLIAMSON (ZONE)	3/4/2015	15:00	CST-6	Winter Storm	0	0	0.00K
WILLIAMSON (ZONE)	1/21/2016	21:00	CST-6	Winter Storm	0	0	0.00K
WILLIAMSON (ZONE)	1/20/2011	15:30	CST-6	Winter Weather	0	0	0.00K
WILLIAMSON (ZONE)	2/7/2011	10:00	CST-6	Winter Weather	0	0	0.00K
WILLIAMSON (ZONE)	2/9/2011	15:00	CST-6	Winter Weather	0	0	0.00K
WILLIAMSON (ZONE)	1/12/2012	15:00	CST-6	Winter Weather	0	0	0.00K
WILLIAMSON (ZONE)	2/19/2012	8:00	CST-6	Winter Weather	0	0	0.00K
WILLIAMSON (ZONE)	12/29/2012	12:00	CST-6	Winter Weather	0	0	0.00K
WILLIAMSON (ZONE)	1/14/2013	15:36	CST-6	Winter Weather	0	0	2.00K
WILLIAMSON (ZONE)	1/14/2013	18:56	CST-6	Winter Weather	0	0	3.00K
WILLIAMSON (ZONE)	1/14/2013	18:58	CST-6	Winter Weather	0	0	30.00K
WILLIAMSON (ZONE)	1/15/2013	19:00	CST-6	Winter Weather	0	0	4.00K
WILLIAMSON (ZONE)	1/31/2013	21:30	CST-6	Winter Weather	0	0	0.00K
WILLIAMSON (ZONE)	1/31/2013	21:30	CST-6	Winter Weather	0	0	0.00K
WILLIAMSON (ZONE)	2/2/2013	4:00	CST-6	Winter Weather	0	0	0.00K
WILLIAMSON (ZONE)	3/1/2013	18:00	CST-6	Winter Weather	0	0	0.00K
WILLIAMSON (ZONE)	3/25/2013	8:00	CST-6	Winter Weather	0	0	0.00K
WILLIAMSON (ZONE)	12/7/2013	21:00	CST-6	Winter Weather	0	0	0.00K
WILLIAMSON (ZONE)	12/9/2013	21:00	CST-6	Winter Weather	0	0	0.00K
WILLIAMSON (ZONE)	1/5/2014	19:00	CST-6	Winter Weather	0	0	0.00K
WILLIAMSON (ZONE)	2/12/2014	6:00	CST-6	Winter Weather	0	0	0.00K
WILLIAMSON (ZONE)	1/23/2015	18:00	CST-6	Winter Weather	0	0	0.00K
WILLIAMSON (ZONE)	2/18/2015	1:00	CST-6	Winter Weather	0	0	0.00K
WILLIAMSON (ZONE)	2/20/2015	12:00	CST-6	Winter Weather	0	0	0.00K
WILLIAMSON (ZONE)	2/25/2015	12:00	CST-6	Winter Weather	0	0	0.00K
WILLIAMSON (ZONE)	1/20/2016	0:00	CST-6	Winter Weather	0	0	0.00K
WILLIAMSON (ZONE)	2/8/2016	12:00	CST-6	Winter Weather	0	0	0.00K
WILLIAMSON (ZONE)	12/18/2016	6:07	CST-6	Winter Weather	0	0	0.00K

303
304 Source: <http://www.ncdc.noaa.gov/>

Williamson County uses a simple system known as a [Vulnerability Calculator](#) to determine each jurisdiction's vulnerability to hazard events. The Vulnerability Calculator applies simple arithmetic to analyze probability and potential impacts of events to calculate a risk ranking for each jurisdiction for each hazard.

Source: Calculation of Planning Committee Input using the [Vulnerability Calculator](#)

Event: Winter Weather	Human 1-5	Property 1-5	Business 1-5	Average	Probability 1-5	Risk Score = [(H+P+B)/3] + P	34.67
City of Franklin	4	3	2	3.00	4	7	
Williamson County	2	3	1	2.00	4	6	
City of Spring Hill	2	2	2	2.00	3	5	
City of Brentwood	2	3	1	2.00	3	5	
City of Fairview	2	2	1	1.67	3	5	
Town of Thompson Station	2	2	1	1.67	3	5	
City of Nolensville	1	2	1	1.33	1	2	

Human	
<i>Risk of injuries and deaths from the hazard</i>	
1	Death very unlikely, injuries are unlikely
2	Death unlikely, injuries are minimal
3	Death unlikely, injuries may be substantial
4	Death possible, injuries may be substantial
5	Deaths probable, injuries will likely be substantial

Scale	
Low	2-3.6
Moderate	3.7-5.2
Medium	5.3-6.8
High	6.9-8.4
Severe	8.5-10

Property	
<i>Amount of residential property damage associated from the hazard</i>	
1	Less than \$500 in damages
2	\$500-\$10,000 in damages
3	\$10,000-\$500,000 in damages
4	\$500,000-\$2,000,000 in damages
5	More than \$2,000,000 in damages

Business	
<i>Amount of business damage associated from the hazard</i>	
1	Less than 3 businesses closed for only a day
2	More than 3 businesses closed for a week
3	More than 3 businesses closed for a few months
4	More than 3 businesses closed indefinitely or relocated
5	A top-10 local employer closed indefinitely

Probability	
<i>Likelihood of the hazard occurring within a given span of years</i>	
1	Less than once every 10 years
2	About once every 5-10 years
3	About once every 2-5 years
4	About once a year
5	More than once a year

Extreme Heat and Drought

A significant portion of Middle Tennessee suffers from events of extreme heat and drought. Williamson County is strongly agricultural and highly populated. If an incident of extreme heat and/or drought were to occur, economic and life safety issues may occur.

Extreme summer weather is characterized by a combination of very high temperatures and exceptionally humid conditions. While not as dramatic as other kinds of severe weather, extreme heat can be a life threatening condition. Because extreme summer heat can affect large numbers of people as well as wide geographical areas, special assistance in responding to the more destructive elements associated with extreme summer weather may be necessary. Heat waves occur when an area of high atmospheric pressure stalls over a region, slowly spiraling down and outward for thousands of miles from a radiant, cloudless sky.

Prolonged periods of heat challenge the county's infrastructure, residents, commuters and visitors. Higher temperatures lead to increased energy and water usage. In Williamson County, electrical demand soars during periods of "peak usage", between 10 a.m. and 2 p.m. in commercial areas and between 7 p.m. and 11 p.m. in residential areas. Increased demand strains the county's electrical distribution systems and may result in power disruptions that can last a few hours, days or weeks. The elderly, people with medical problems or those who are taking certain medications are particularly at risk because they may not be able to adequately keep cool using air conditioners or fans. In addition to increased electrical demand, extreme heat can result in lower water pressure due to illegal operation of fire hydrants, increased demand for water or pump failure due to loss of electricity. This situation can hamper the county's fire and rescue suppression capabilities.

Droughts do not occur spontaneously. They evolve due to lower-than-normal precipitation levels. Urban droughts generally affect areas dependent on reservoirs for water. Droughts usually lead to restrictions on non-essential water use, such as lawn watering and car washing. Because no two droughts have the same characteristics, no single probability profile can be identified in advance that would generally apply to the declaration of a drought emergency.

During drought, the potential for wildfires can increase. This is due to the dry conditions making trees, grass and brush easier to burn. A wildfire is an unplanned, unwanted fire burning in a natural area, such as a forest, grassland or prairie. As building development expands into these areas, homes and business may be situated in or near areas susceptible to wildfires. This is called the wildland urban interface. Wildfires can damage natural resources, destroy homes and threaten the safety of the public and the firefighters who protect forests and communities. Whereas a majority of wildfires are caused by humans, some can begin by natural causes, such as lightning. They can start in remote wilderness areas, in national parks, or even in residential back yards.

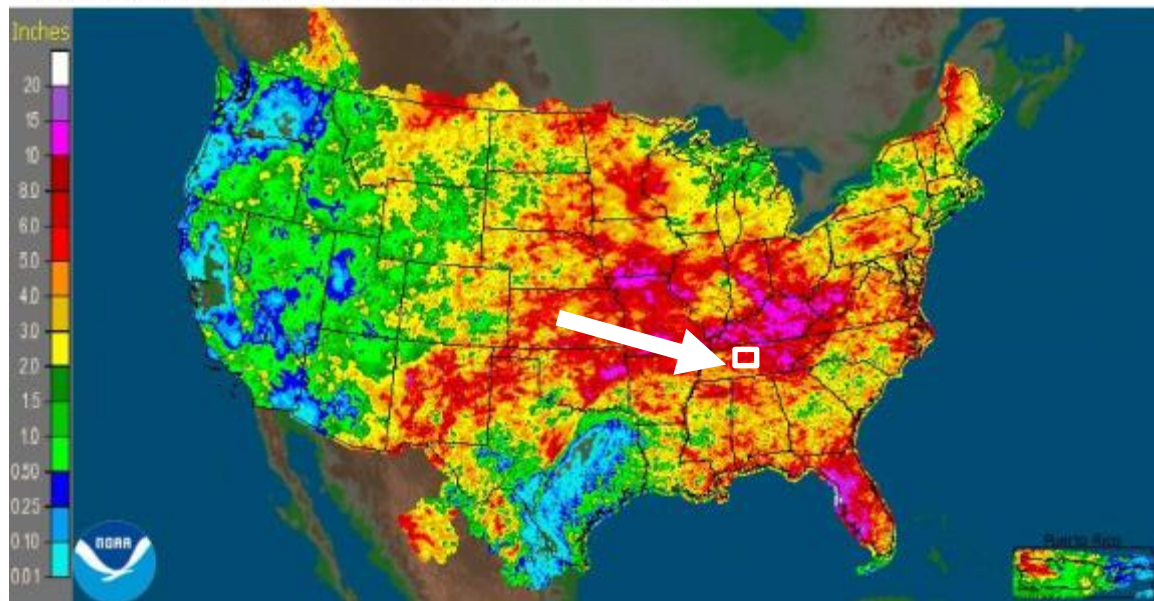
Drought is being added to this plan revision to document changes in conditions statewide that could potentially result in hazards requiring mitigation. Extended periods of drought contributed to wildfires in East Tennessee on November 28, 2016, resulting in 14 fatalities and damage to more than 2,400 structures in Sevier County.

Although historical data in Williamson County is limited, drought is being added to this plan revision since the rural nature of the county creates an economic dependence related to this hazard.

A drought is a period of unusually constant dry weather that persists long enough to cause deficiencies in water supply (surface or underground). Droughts are slow-onset hazards, but, over time, they can severely affect crops, municipal water supplies, recreational resources and wildlife.

If drought conditions extend over a number of years, the direct and indirect economic impacts can be significant. High temperatures, high winds and low humidity can worsen drought conditions and also make areas more susceptible to wildfire. In addition, human actions and demands for water resources can accelerate drought-related impacts.

CONUS + Puerto Rico: Current Month to Date Observed Precipitation
Valid at 7/31/2015 1200 UTC- Created 7/31/15 18:27 UTC



Source: NOAA

The following chart provides drought event information for Williamson County between January 1, 2011 – December 31 2016.

Drought Events in Williamson County

January 1, 2011 – December 31, 2016

Location	Date	Time	T.Z.	Type	Mag	Deaths	Injuries	Property Damage	CrD
WILLIAMSON (ZONE)	7/3/2012	0:00	CST-6	Drought		0	0	0.00K	0.00K
WILLIAMSON (ZONE)	11/1/2016	0:00	CST-6	Drought		0	0	0.00K	0.00K
WILLIAMSON (ZONE)	12/1/2016	0:00	CST-6	Drought		0	0	0.00K	0.00K

Source: <http://www.ncdc.noaa.gov/>

Williamson County uses a simple system known as a [Vulnerability Calculator](#) to determine each jurisdiction's vulnerability to hazard events. The Vulnerability Calculator applies simple arithmetic to analyze probability and potential impacts of events to calculate a risk ranking for each jurisdiction for each hazard.

Source: Calculation of Planning Committee Input using the [Vulnerability Calculator](#)

Event: Drought	Human 1-5	Property 1-5	Business 1-5	Average	Probability 1-5	Risk Score = [(H+P+B)/3] + P	23.67
City of Franklin	1	2	1	1.33	3	4	
City of Brentwood	1	3	1	1.67	2	4	
Williamson County	1	2	1	1.33	2	3	
City of Fairview	1	1	2	1.33	2	3	
City of Nolensville	1	1	1	1.00	2	3	
City of Spring Hill	1	1	1	1.00	2	3	
Town of Thompson Station	1	1	1	1.00	2	3	

Human		Scale	
Risk of injuries and deaths from the hazard		Low	2-3.6
1	Death very unlikely, injuries are unlikely	Moderate	3.7-5.2
2	Death unlikely, injuries are minimal	Medium	5.3-6.8
3	Death unlikely, injuries may be substantial	High	6.9-8.4
4	Death possible, injuries may be substantial	Severe	8.5-10
5	Deaths probable, injuries will likely be substantial		

Property	
Amount of residential property damage associated from the hazard	
1	Less than \$500 in damages
2	\$500-\$10,000 in damages
3	\$10,000-\$500,000 in damages
4	\$500,000-\$2,000,000 in damages
5	More than \$2,000,000 in damages

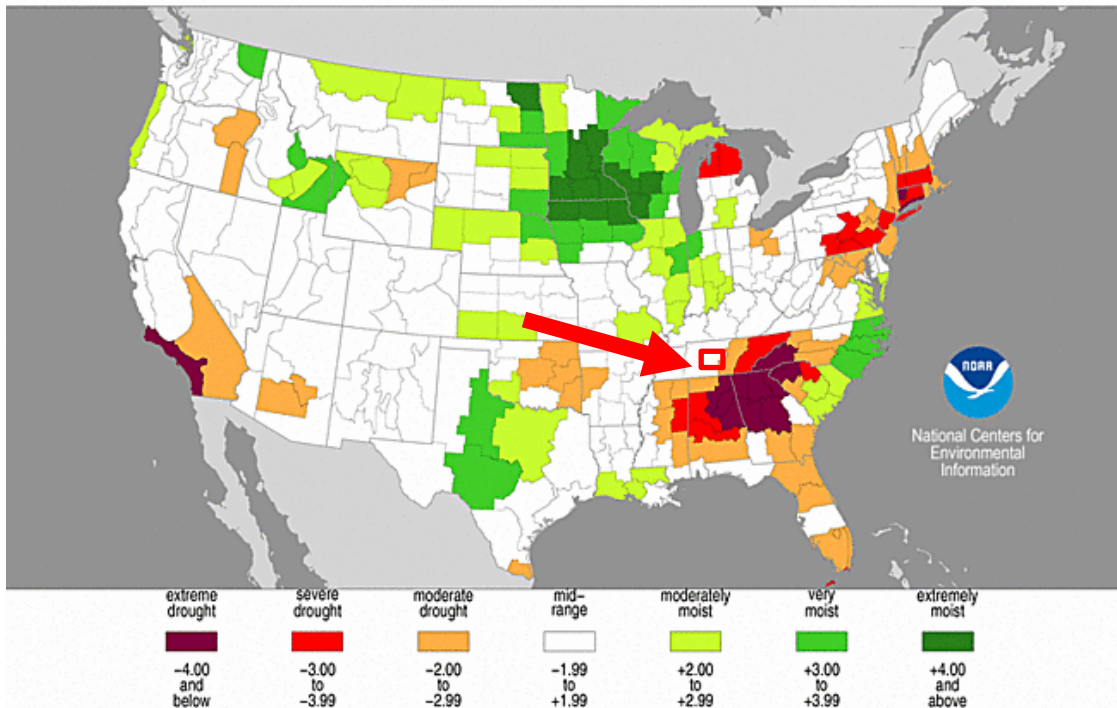
Business	
Amount of business damage associated from the hazard	
1	Less than 3 businesses closed for only a day
2	More than 3 businesses closed for a week
3	More than 3 businesses closed for a few months
4	More than 3 businesses closed indefinitely or relocated
5	A top-10 local employer closed indefinitely

Probability	
Likelihood of the hazard occurring within a given span of years	
1	Less than once every 10 years
2	About once every 5-10 years
3	About once every 2-5 years
4	About once a year
5	More than once a year

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Palmer Drought Severity Index December, 2016



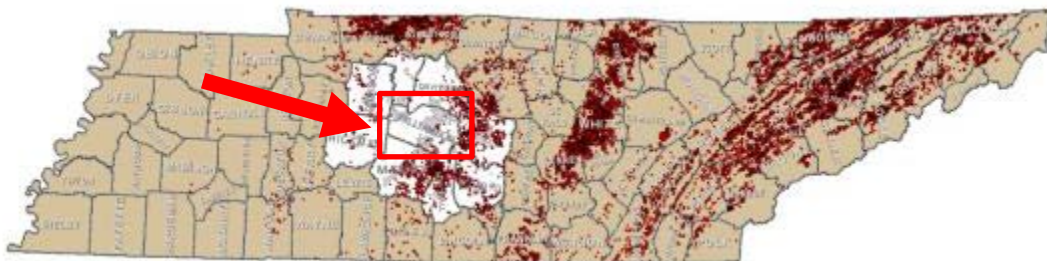
Source: National Centers for Environmental Information – Historical Palmer Drought Indices

Geologic

A sinkhole is a hole in the ground that forms when water dissolves surface rock. Often, this surface rock is limestone, which is easily eroded, or worn away, by the movement of water.

In a landscape where limestone sits underneath the soil, water from rainfall collects in cracks in the stone. These cracks are called joints. Slowly, as the limestone dissolves and is carried away, the joints widen until the ground above them becomes unstable and collapses. The collapse often happens suddenly and without warning.

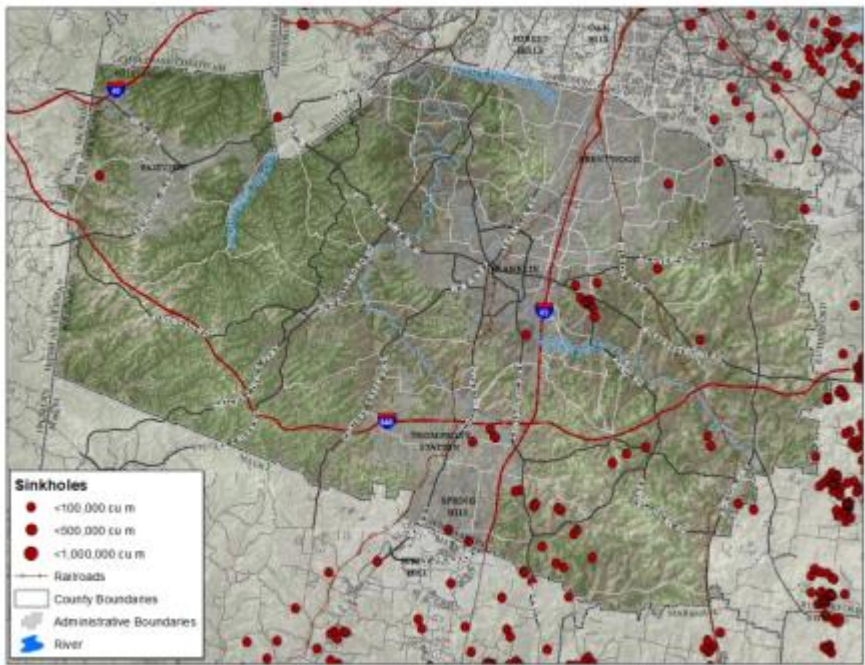
Tennessee Sinkholes



Source: Williamson County Emergency Management GIS Department

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Tennessee Sinkholes



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Source: Williamson County Emergency Management GIS Department

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Sinkholes also form when the roofs of caves collapse. Sinkholes are often funnel-shaped with the wide end open at the surface and the narrow end at the bottom of the pool. They vary from shallow holes about 3 feet deep to pits more than 165 feet deep. Sinkholes can occur naturally, especially where there is abundant rainfall.

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Williamson County uses a simple system known as a [Vulnerability Calculator](#) to determine each jurisdiction’s vulnerability to hazard events. The Vulnerability Calculator applies simple arithmetic to analyze probability and potential impacts of events to calculate a risk ranking for each jurisdiction for each hazard.

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Source: Calculation of Planning Committee Input using the [Vulnerability Calculator](#)

Event: Geologic	Human 1-5	Property 1-5	Business 1-5	Average	Probability 1-5	Risk Score = [(H+P+B)/3] + P	21
City of Franklin	4	4	3	3.67	1	5	
City of Brentwood	1	4	1	2.00	1	3	
City of Fairview	2	3	1	2.00	1	3	
City of Nolensville	2	3	1	2.00	1	3	
City of Spring Hill	1	3	1	1.67	1	3	
Town of Thompson Station	1	3	1	1.67	1	3	
Williamson County	1	1	1	1.00	1	2	

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Human		Scale	
<i>Risk of injuries and deaths from the hazard</i>		Low	2-3.6
1	Death very unlikely, injuries are unlikely	Moderate	3.7-5.2
2	Death unlikely, injuries are minimal	Medium	5.3-6.8
3	Death unlikely, injuries may be substantial	High	6.9-8.4
4	Death possible, injuries may be substantial	Severe	8.5-10
5	Deaths probable, injuries will likely be substantial		

Property	
<i>Amount of residential property damage associated from the hazard</i>	
1	Less than \$500 in damages
2	\$500-\$10,000 in damages
3	\$10,000-\$500,000 in damages
4	\$500,000-\$2,000,000 in damages
5	More than \$2,000,000 in damages

Business	
<i>Amount of business damage associated from the hazard</i>	
1	Less than 3 businesses closed for only a day
2	More than 3 businesses closed for a week
3	More than 3 businesses closed for a few months
4	More than 3 businesses closed indefinitely or relocated
5	A top-10 local employer closed indefinitely

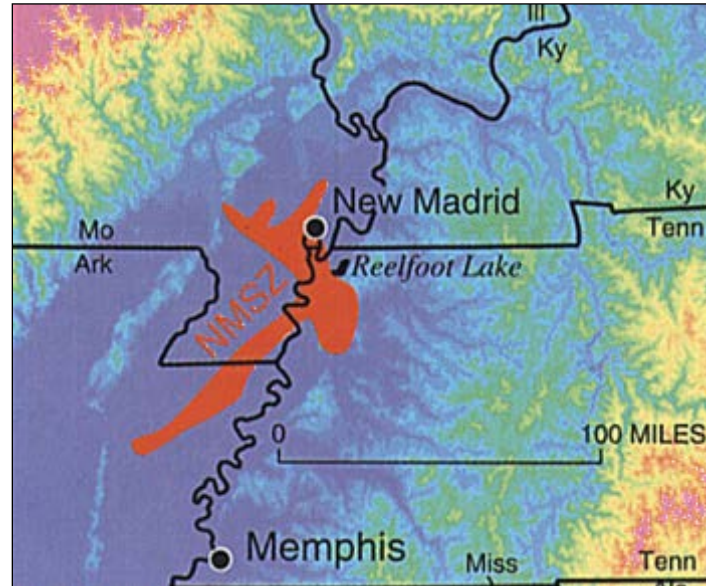
Probability	
<i>Likelihood of the hazard occurring within a given span of years</i>	
1	Less than once every 10 years
2	About once every 5-10 years
3	About once every 2-5 years
4	About once a year
5	More than once a year

Earthquakes

Williamson County is in close proximity to the major intraplate (within a tectonic plate) seismic zone known as the New Madrid Seismic Zone (NMSZ). The NMSZ is an approximately 120-mile long fault system that stretches across five states including Western Tennessee.

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New Madrid Seismic Zone



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423 Historically the zone is known for producing four of the largest North American earthquakes in
 424 recorded history, all in which would have had been felt in Williamson County. This includes the
 425 noted three-month period between December 1811 and February 1812 that had quakes
 426 reaching Richter Scale magnitudes into the 7.0 through 8.6 ranges.

427 Source: http://earthquake.usgs.gov/learn/topics/mag_vs_int.php

Magnitude / Intensity Comparison	
Magnitude (Richter)	Typical Maximum Modified Mercalli Intensity
1.0 - 3.0	I
3.0 - 3.9	II - III
4.0 - 4.9	IV - V
5.0 - 5.9	VI - VII
6.0 - 6.9	VII - IX
7.0 and higher	VIII or higher

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429 Source: <http://earthquake.usgs.gov/learn/topics/mercalli.php>

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The Modified Mercalli Intensity Scale		
Intensity	Shaking	Description/Damage
I	<i>Not felt</i>	Not felt except by a very few under especially favorable conditions.
II	<i>Weak</i>	Felt only by a few persons at rest, especially on upper floors of buildings.
III	<i>Weak</i>	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	<i>Light</i>	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	<i>Moderate</i>	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	<i>Strong</i>	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	<i>Very strong</i>	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	<i>Severe</i>	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	<i>Violent</i>	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	<i>Extreme</i>	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

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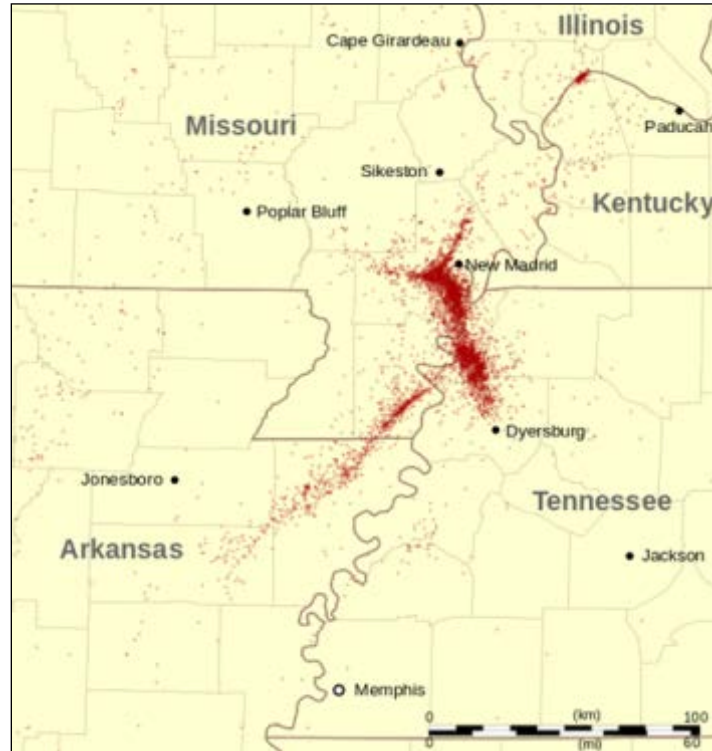
434 Since the 1812 earthquakes, the largest recorded quakes from this zone were the October 1895
435 6.6 magnitude quake (epicenter Charleston, MO) and the November 1968 5.5 magnitude quake
436 (epicenter in Dale, IL). From the time when seismic measurement instruments were installed in
437 and around the zone in the 1970s, more than 4,000 small earthquakes have been recorded, with
438 the vast majority being too small to be felt.

439

440

441

NMSZ Earthquakes Recorded Since 1974



442

443 According to a FEMA report filed in 2008, a serious earthquake in the NMSZ could result in the
444 highest economic loss due to a natural disaster in U.S. history, causing widespread and
445 catastrophic damage across a seven-state radius with most of the worst impacts taking place in
446 Western Tennessee (includes Williamson County). Based on this report, a 7.7 magnitude quake
447 in the NMSZ would result in thousands of fatalities, tens of thousands of damages to structures,
448 and total disruption of vital infrastructure in Western Tennessee.

449 Williamson County is not part of the 20-county impact zone expected if there is a large
450 earthquake along the New Madrid Seismic Zone. However, Williamson County has the potential
451 for large damage. Furthermore, Williamson County would most likely provide shelter and
452 assistance to those who have had damage and loss due to the earthquake.

453 Throughout the county many buildings and the majority of infrastructure networks could be
454 vulnerable to earthquake impacts. As mentioned previously, Williamson County's building stock,
455 worth approximately \$26 million in approximate replacement value, can be broken down into
456 the following percentage categories⁷:

⁷ source: Williamson County Hazus Flood Study – table 1 in [Appendix E](#).

457

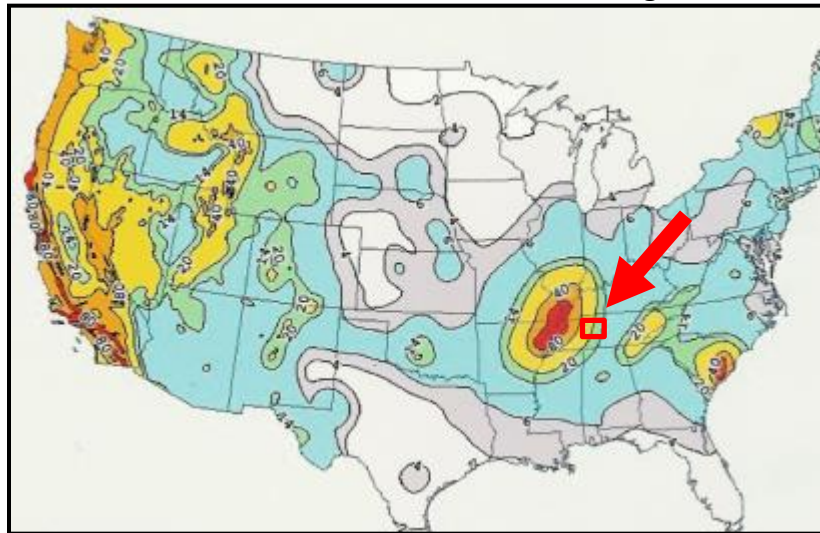
- 458 • 82.8% residential
- 459 • 12.2% commercial
- 460 • 2.2% industrial
- 461 • 0.3% agricultural
- 462 • 0.3% governmental
- 463 • 1.3% religious
- 464 • 0.9% educational

465

466

467

National Seismic Hazard Map
Ground Motions with a 2% Chance of Occurring in 50 Years



468

469

Source: <http://earthquake.usgs.gov/hazards/products/>

470 The current lack of apparent land movement along the NMSZ has long puzzled scientists.
471 Currently GPS measurements show that the NMSZ faults are moving no more than 0.0079
472 inches a year. In contrast the San Andreas Fault in California moves up to 1.5 inches a year. This
473 has led some researchers to believe that the fault may be “shutting down” while others say it is
474 a “sleeping giant.” These differing views have made it difficult for public policy makers to decide
475 on if and how much to prepare for and spend on mitigating a potential large scale earthquake.

476 Williamson County uses a simple system known as a [Vulnerability Calculator](#) to determine each
477 jurisdiction’s vulnerability to hazard events. The Vulnerability Calculator applies simple
478 arithmetic to analyze probability and potential impacts of events to calculate a risk ranking for
479 each jurisdiction for each hazard.

480 **Source:** Calculation of Planning Committee Input using the [Vulnerability Calculator](#)

481

Event: Earthquake	Human 1-5	Property 1-5	Business 1-5	Average	Probability 1-5	Risk Score = [(H+P+B)/3] + P	29.67
City of Franklin	4	5	3	4.00	1	5	
City of Spring Hill	4	4	3	3.67	1	5	
Williamson County	4	4	2	3.33	1	4	
City of Fairview	3	4	3	3.33	1	4	
Town of Thompson Station	3	4	2	3.00	1	4	
City of Brentwood	2	4	2	2.67	1	4	
City of Nolensville	2	4	2	2.67	1	4	

482

483

Human		Scale	
<i>Risk of injuries and deaths from the hazard</i>		Low	2-3.6
1	Death very unlikely, injuries are unlikely	Moderate	3.7-5.2
2	Death unlikely, injuries are minimal	Medium	5.3-6.8
3	Death unlikely, injuries may be substantial	High	6.9-8.4
4	Death possible, injuries may be substantial	Severe	8.5-10
5	Deaths probable, injuries will likely be substantial		

Property	
<i>Amount of residential property damage associated from the hazard</i>	
1	Less than \$500 in damages
2	\$500-\$10,000 in damages
3	\$10,000-\$500,000 in damages
4	\$500,000-\$2,000,000 in damages
5	More than \$2,000,000 in damages

Business	
<i>Amount of business damage associated from the hazard</i>	
1	Less than 3 businesses closed for only a day
2	More than 3 businesses closed for a week
3	More than 3 businesses closed for a few months
4	More than 3 businesses closed indefinitely or relocated
5	A top-10 local employer closed indefinitely

Probability	
<i>Likelihood of the hazard occurring within a given span of years</i>	
1	Less than once every 10 years
2	About once every 5-10 years
3	About once every 2-5 years
4	About once a year
5	More than once a year

484

Williamson County Presidential Declared Disaster
Chart:

<https://www.fema.gov/disasters/grid/state-tribal-government/53>

2000	DR-1331; Public Assistance	2007	
2001		2008	
2002		2009	DR-1821; Public Assistance
2003	DR-1464; Individual & PA	2010	DR-1909; Individual & PA
2004		2011	DR-1974 & DR-1979; PA
2005		2011	
2006		2012	
2007		2013	
2008		2014	DR-4171; Public Assistance
2015		2016	DR-4293; Individual & PA

Section 4: Mitigation Strategy

Mitigation Goals

The purpose for developing a set of goals is to clearly state the community's overall vision for hazard mitigation and to provide a path towards building a safer, more resilient community.

The Mitigation Committee identified the following goals to be the forefront in the overall development of this plan. All actions and projects recommended as mitigation efforts for the Hazard Mitigation Plan must first meet or further at least one of these goals. The goals are provided in a ranked order where the first goal is paramount.

Goal 1: Protect the lives and health of citizens from the effects of natural hazards.

Goal 2: Emphasize mitigation planning to decrease vulnerability of existing and new structures.

Goal 3: Encourage public support and commitment to hazard mitigation by communicating risks and mitigation benefits.

Identification and Prioritization of Mitigation Projects

Williamson County has developed a comprehensive range of mitigation projects. These projects were solicited and identified by the different entities that make up the Mitigation Committee. Once the proposed projects attained a sponsoring agency and the details of the projects were discussed by the committee, the committee then proceeded to prioritize the mitigation projects.

The prioritization process was important since most mitigation projects represent a large investment of financial and personal resources. By evaluating each project's degree of feasibility and the level of costs versus benefits, Williamson County was able to determine when and which projects should be implemented based on available funding and time.

The Mitigation Committee used the SAFE-T method to prioritize these projects. This approach was adopted from the successful methodology used by other counties in FEMA Region 4. This rating system uses five variables to evaluate the overall feasibility and appropriateness:

- **S**ocietal
- **A**dministrative
- **F**inancial
- **E**nvironmental
- **T**echnical

A focus on this methodology emphasizes the use of a cost-benefit review to maximize benefits.

Committee members ranked the projects as a group by determining the value for each variable and then by adding the variables rates up for a project sum value. All the project rankings can be seen on the Williamson County Hazard Mitigation Project List.

Project Prioritization Method: SAFE-T			
Variable		Rank	Description
S	Societal: The public must support the overall implementation strategy and specified mitigation actions. The projects will be evaluated in terms of community acceptance and societal benefits.	1	Low community support or few societal benefits
		2	Moderate community support or some societal benefits
		3	High community support or many societal benefits
A	Administrative: The projects will be evaluated for anticipated staffing and maintenance requirements to determine if the jurisdiction has the personnel and administrative capabilities necessary to implement the project or whether outside help will be needed.	1	High staff requirements - outside staffing required
		2	Some outside staffing may be needed
		3	Low staffing requirements – no outside staffing required
F	Financial: The projects will be evaluated on general cost-effectiveness and whether additional outside funding will be required.	1	Low cost-effectiveness <i>or</i> mostly outside funding required
		2	Moderate cost-effectiveness <i>or</i> some outside funding required
		3	High cost-effectiveness <i>or</i> no outside funding required
E	Environmental: The projects will be evaluated for any immediate or long-term negative environmental impacts caused by their construction or operation.	1	Many negative environmental impacts, some long-term
		2	Some negative environmental impacts, possibly long-term
		3	Few negative environmental impacts, none long-term
T	Technical: The projects will be evaluated on their ability to reduce losses in the long-term, whether there are secondary impacts, and whether the proposed project solves the associated problem or if additional components are necessary.	1	Additional actions will be needed or short-term fix
		2	Additional actions may be needed
		3	Long-term fix or no other actions needed

527 The following Project List provides an overview of all the Mitigation Committee projects. This
528 includes potential funding sources, implementation timeframes, the project's responsible
529 agency and other information. The Project List will remain active and may be updated
530 throughout the five-year life-cycle of the plan. Please note that sinkholes and earthquakes were
531 discussed, but due to priority the funding was discussed to be used elsewhere in each city and
532 town participating in the committee. There are currently no proposed projects directly
533 addressing sinkholes or earthquakes due to the low probability of these events impacting
534 Williamson County. However, should this change, the changes will be reflected during the five-
535 year life-cycle of the plan.

536 Updating the Project List to add or remove a project may be necessary after a disaster or other
537 event. Updates could include adding or modifying projects to address unforeseen issues or
538 removing projects that are no longer feasible or relevant. The Mitigation Committee will notify
539 TEMA of additions or changes to the Project List. TEMA will notify FEMA to ensure that official
540 copies of the Williamson County Hazard Mitigation Plan on file with TEMA and FEMA are
541 updated appropriately.

542 **Williamson County Project List**

Mitigation Projects											
Project Number	Numerical Priority	Priority Rank (High, Moderate, Low)	Action/Project	Hazard Mitigated	Jurisdictions Benefitted & Represented	Addresses New or Existing Buildings/ Infrastructure	Estimated Cost	Responsible Agency	Possible Funding Source(s)	Population Affected	Estimated Timeframe
1	1	HIGH	Purchase 5 properties located in the floodway/floodplain	Flooding	City of Franklin	New	\$1,720,900	City of Franklin	Fed/State/City	15	5 yr
2	2	HIGH	Purchase of snow chains for patrol cars for the purpose of increase mobility on snow and ice covered roads	Winter Weather	City of Spring Hill	New	\$1,500	City of Spring Hill, Police Dept.	General Funds	City Wide	1 yr
3	3	HIGH	Participation in the NFIP and CRS with initial FIRMS dated November 1981; updates in	Flooding	Williamson County Unincorporated	Both	Variable	Williamson County Government	Operational Budget	7,500	continuous

			1989, 1993, 2003, 2006, and 2016								
4	4	HIGH	Need for a truck with dump capabilities, spreader capabilities, and a backhoe with a front end loader	Winter Weather	Town of Nolensville	New	\$200,000	Town of Nolensville Public Works Department	Operational Budget	7,580	2 yr
5	5	HIGH	Replace aging/damaged snow removal equipment	Winter Weather	City of Brentwood	Existing	\$50,000	City of Brentwood, Public Works Department	General Funds	42,500	2 yr
6	6	HIGH	Convert three manual stream gauges to automated / monitored	Flooding	City of Brentwood	New	\$30,000 total	City of Brentwood	Operational Budget	42,500	2 yr
7	7	HIGH	Designate Community Shelter Location	Tornados	Town of Thompsons Station	New	\$0	Town of Thompson's Station	General Funds	5,000	1 yr

8	8	HIGH	Enforcement of updated Floodplain Regulation	Flooding	Town of Thompsons Station	Existing	\$-	Town of Thompson's Station Planning & Zoning	General Funds	5,000	continuous
9	9	HIGH	Purchase New Snow Removal Equipment (Truck, Plow, Salt Spreader)	Winter Weather	Town of Thompsons Station	New	\$75,000	Thompson's Station Maintenance Dept.	Operational Budget	5,000	2 yr
10	10	HIGH	Institute a ban on all fireworks within the City	Drought and Extreme Heat	City of Spring Hill	New	\$10,000	City of Spring Hill	General Funds	37,000	2 yr
11	11	HIGH	Institute a social media awareness program via twitter, facebook, etc informing residents what actions to take to minimize health concerns	Drought and Extreme Heat	City of Spring Hill	New	\$10,000	City of Spring Hill	General Funds	37,000	continuous

12	12	HIGH	Continuous cleaning of drainage ditches and drainage way to help alleviate flooding	Flooding	City of Spring Hill	New	Approximately \$100,000 per year	City of Spring Hill	M54 Funds	City Wide	continuous
13	13	HIGH	Develop and Adopt a Snow and Ice Control Plan	Winter Weather	City of Spring Hill	New	\$1,000	City of Spring Hill	General Funds	City Wide	2 yr
14	14	HIGH	Voluntary acquisition and removal of qualified properties as disaster declarations make grant funding available. Current repetitive loss properties do not meet benefit cost requirements.	Flooding	Williamson County Unincorporated	Existing	Unknown	Williamson County, State of Tennessee, and FEMA	General Funds	7,500	2 yr

15	15	HIGH	Impose water restrictions based on Brentwood's Drought Mitigation Plan	Drought and Extreme Heat	City of Brentwood	Existing	Unknown	City of Brentwood	General Funds	42,500	continuous
16	16	HIGH	Maintain/Update Snow Removal Routes	Winter Weather	City of Brentwood	New	\$-	City of Brentwood, Public Works Department	Operational Budget	42,500	continuous
17	17	HIGH	Re-establish riparian buffer zones at all applicable water resources owned by the City of Franklin	Flooding	City of Franklin	New	\$2,000.00 Yearly costs	City of Franklin, Parks Department	Unknown	75,000	continuous
18	18	HIGH	Adopt new storm water regulations sizing storm water detention ponds to 100 year.	Flooding	City of Spring Hill	New	\$1000 per year	City of Spring Hill	M54 Funds	City Wide	2 yr

19	19	HIGH	Participation in NFIP	Flooding	City of Spring Hill	New	Approx. \$1,000 per year	City of Spring Hill	M54 Funds	City Wide	continuous
20	20	HIGH	Fund and Construct Tornado Shelters at High Use Parks	Tornados	City of Spring Hill	New	\$500,000	City of Spring Hill	CIP Program	37,000	5 yr
21	21	HIGH	Establish Salt Inventory and Storage Area	Winter Weather	Town of Thompsons Station	New	\$5,000	Thompson's Station Maintenance Dept.	Operational Budget	5,000	3 yr
22	22	HIGH	Reinforce critical infrastructure at Water Treatment Plant	Tornados	City of Franklin	New	Unknown	City of Franklin, Water	Unknown	75,000	2 yr
23	23	HIGH	Install pumps at lift stations bypass pumping during power outages	Tornados	City of Franklin	New	Unknown	City of Franklin, Water	Unknown	75,000	2 yr
24	24	HIGH	Tornado shelters at all staffed City facilities	Tornados	All Jurisdictions	New	Unknown	All Cities, Towns	Unknown	5,000	5 yr

25	25	HIGH	Recoupment of funds due to drought/fire damage	Drought and Extreme Heat	Town of Nolensville	New	\$100,000	Town of Nolensville Public Works Department	Operational Budget	7,580	5 yr
26	26	HIGH	Purchase dump truck for clearing of underbrush and dead trees along the Harpeth River, Spencer Creek and future park properties along existing tributaries	Flooding	City of Franklin	New	\$116,000 for equipment purchase	City of Franklin Parks Department	Unknown	5,000	2 yr
27	27	HIGH	Distribute brochures to trail heads, park offices, and park properties on protecting residents near the river from tornados and flooding. Educating	Tornados	City of Franklin	New	\$40,000	City of Franklin, Parks Department	Unknown	25,000	1 yr

			citizens regarding steps to take to reduce hazard vulnerability, minimize future tornado and flooding damage								
28	28	HIGH	Clearing of ice and snow for emergency vehicles and citizens	Winter Weather	City of Franklin	Existing	Currently Budgeted	City of Franklin, Street Department	Unknown	75,000	continuous
29	29	HIGH	SW16002, Parkview Drainage Project.	Flooding	City of Franklin	New	\$2,020,000	City of Franklin, Stormwater	Stormwater	5,000	2 yr
30	30	HIGH	SW16003, 100 Block of Battle Avenue Drainage Improvement	Flooding	City of Franklin	New	\$1,200,000	City of Franklin, Stormwater	Stormwater	5,000	3 yr
31	31	HIGH	Hardening of Fleet Facility	Tornados	City of Franklin	New	Unknown	City of Franklin, Streets	Unknown	5,000	3 yr

32	32	HIGH	Maintain Dedicated Emergency Access Ways	Flooding	City of Brentwood	New	\$10,000	City of Brentwood	General Funds	42,500	continuous
33	33	HIGH	Stockpile 2,300 – 2,500 tons of salt at two weather protected strategic locations	Winter Weather	City of Brentwood	Existing	\$100,000	City of Brentwood, Public Works Department	Operational Budget	42,500	3 yr
34	34	HIGH	Fortify/harden existing school structures in order to withstand high winds/tornado impacts	Tornados	Williamson County School District, Franklin Special School District	New	Unknown	Williamson County School District, Franklin Special School District	General Funds	46,000	4 yr
35	35	HIGH	Annual service agreement for weather monitoring system and tornado sirens	Tornados	City of Brentwood	Existing	\$4,000 annually	City of Brentwood/ City of Franklin	Operational Budget	42,500	1 yr

36	1	MEDIUM	Harpeth River Bank Stabilization at WRF FY17-18	Flooding	City of Franklin	New	\$980,000	City of Franklin, Stormwater	Stormwater	10,000	1 yr
37	2	MEDIUM	Stockpile salt for roadways @ 1,500 tons annually	Winter Weather	Town of Nolensville	New	\$150,000	Williamson County Highway Department	Operational Budget	7,580	3 yr
38	3	MEDIUM	Construct new City Hall that includes tornado sheltering for 200+ employees and visitors during the day and provides for some sheltering during downtown special events.	Tornados	City of Franklin	New	Unknown	City of Franklin	Unknown	300	5 yr
39	4	MEDIUM	Annually, prior to winter, check/prepare all snow removal equipment	Winter Weather	City of Brentwood	Existing	\$25,000	City of Brentwood, Public Works Department	Operational Budget	42,500	continuous

40	5	MEDIUM	Continued application and enforcement of the Zoning ordinance (floodplain management) and Storm Water Management Regulations	Flooding	Williamson County Unincorporated	Both	Variable	Williamson County Government	Operational Budget	75,000	continuous
41	6	MEDIUM	Use GIS/FIRM mapping in engineering department to identify floodplain and floodway	Flooding	City of Spring Hill	New	\$10,000 per year	City of Spring Hill, City Engineer and Public Works	M54 Funds	City Wide	continuous
42	7	MEDIUM	Installation of fiber optic cable connecting City of Franklin, City of Brentwood, Williamson County, and Metro Nashville	Tornados	City of Franklin	New	TBD	City of Franklin MIT, City of Brentwood, Williamson County, and Metro Nashville	Unknown	75,000	3 yr

43	8	MEDIUM	Enforce maximum lot coverage requirement/Encourage Green Space	Flooding	City of Brentwood	Existing	Variable	City of Brentwood	General Funds	42,500	continuous
44	9	MEDIUM	Regular maintenance on ditches and culverts	Flooding	Town of Thompsons Station	Existing	\$ 10,000.00 per year	Town of Thompson's Station Maintenance Dept.	Operational Budget	5,000	continuous
45	10	MEDIUM	Evaluate structure vulnerability to wildfire events at parks, work with Franklin Fire Department. Protection of buildings in natural settings from wild fires with good landscaping practices	Drought and Extreme Heat	City of Franklin	New	\$-	City of Franklin, Parks Department in coordination with City of Franklin Fire Department.	Unknown	75,000	continuous

46	11	MEDIUM	Construct Fire Station 7 that includes tornado sheltering for its occupants	Tornados	City of Franklin	New	\$4,000,000	City of Franklin, Fire	Facilities Tax Fund	20	
47	12	MEDIUM	Procure a 4000+ fuel truck	Tornados	City of Franklin	New	\$100,000	City of Franklin, Streets	Unknown	15	2 yr
48	13	MEDIUM	Establish and Maintain Riparian Buffers per Tennessee Department of Environment and Conservation (TDEC)	Flooding	Town of Thompsons Station	Existing	\$0	Town of Thompson's Station Planning & Zoning	General Funds	5,000	continuous
49	14	MEDIUM	Promote the use of Social Media, Text Messaging, Twitter, etc for public announcement of tornado warning and watches similar	Tornados	City of Spring Hill	New	\$5,000	City of Spring Hill	General Funds	37,000	continuous

			to Amber Alerts / Nixle								
50	15	MEDIUM	Specify and adopt native plants, shrubbery and trees for incorporation into the City's new Uniform Development Code.	Drought and Extreme Heat	City of Spring Hill	New	N/A	City of Spring Hill, Planning Dept	General Funds	City Wide	1 yr
51	16	MEDIUM	Enforcement of the State of Tennessee Forestry Department Burn Permitting and Burn Banning Program	Drought and Extreme Heat	City of Brentwood	Existing	Unknown	City of Brentwood	General Funds	42,500	continuous
52	17	MEDIUM	Fortify new jail structure to withstand weather impacts	Tornados	Williamson County Sherriff's Office	New	Unknown	Williamson County Sherriff's Office	Operational Budget	500	5 yr

			from high winds/tornados								
53	18	MEDIUM	Clean and improve drainage ditches and retention areas within the park system, as well as protection of property from flood events	Flooding	City of Franklin	Existing	\$3,000	City of Franklin, Parks Department	Unknown	15,000	continuous
54	19	MEDIUM	Hardening of sheds for heavy equipment storage or underground storage of key vehicle assets	Tornados	City of Franklin	New	Unknown	City of Franklin, Streets/Solidwaste/Water	Unknown	500	3 yr
55	20	MEDIUM	A study of how to and/or mitigation of flooding along Lewisburg Pike and Heath Place at Carnton	Flooding	City of Franklin	New	Unknown	City of Franklin, Stormwater	Stormwater	30,000	3 yr

56	21	MEDIUM	Procure AVL capabilities for all city vehicles enabling real time vehicle asset tracking for more accurate deployment of resources	Flooding	City of Franklin	New	Unknown	City of Franklin	Unknown	500	2 yr
57	22	MEDIUM	Stage Trucks Pre-loaded with salt prior to expected winter weather events	Winter Weather	City of Brentwood	Existing	\$5,000	City of Brentwood, Public Works Department	Operational Budget	42,500	when needed
58	23	MEDIUM	Elevate Waste Water lift station control panels to prevent loss from flooding	Flooding	City of Franklin	New	Unknown	City of Franklin, Water	Unknown	75,000	3 yr
59	24	MEDIUM	A study of how to and/or mitigation of flooding of the Cool Springs Mall and nearby stream	Flooding	City of Franklin	New	Unknown	City of Franklin, Stormwater	Stormwater	5,000	3 yr

60	25	MEDIUM	Removal of dead trees, shrubbery, and stumps and evaluation, treatment and trimming of trees in area parks and other park properties	Winter Weather	City of Franklin	New	\$4,000 Yearly costs	City of Franklin, Parks Department	Unknown	15,000	continuous
61	26	MEDIUM	Conduct inspections on stormwater detention ponds to ensure they are maintained and function properly	Flooding	City of Spring Hill	New	\$10,000 per year	City of Spring Hill	M54 Funds	City Wide	continuous
62	27	MEDIUM	Enforcement of the State of Tennessee Forestry Department Burn Permitting and Burn Banning Program	Drought and Extreme Heat	Town of Thompsons Station	Existing	\$0	Town of Thompson's Station, Building and Planning	Operational Budget	5,000	continuous

63	28	MEDIUM	Imposed water restrictions in drought conditions in accordance with the city's Emergency Response Plan and Drought Management Plan.	Drought and Extreme Heat	City of Spring Hill	Existing	N/A	City of Spring Hill, Water Department	Water Dept	37,000	5 yr
64	1	LOW	Upgrade 800MHz Radio System to latest software release for better communications with other agencies	Tornados	City of Franklin	Existing	\$1,500,000	City of Franklin MIT	Unknown	1,000	1 yr
65	2	LOW	Undertake a new Development Drainage Study	Flooding	City of Franklin	New	Unknown	City of Franklin, Stormwater	Unknown	75,000	2 yr
66	3	LOW	Continuous cleaning of drainage ditches	Flooding	Town of Nolensville	Existing	Approx. \$5,000 per year	Town of Nolensville Public Works Department	Operational Budget	7,580	continuous

			to help alleviate flooding								
67	4	LOW	Expansion of current storage shed for salt stockpile to double current size (current size - 65 tons)	Winter Weather	City of Fairview	Existing	\$20,000	City of Fairview, Street Dept	General Funds	8,200	2 yr
68	5	LOW	In brown-out situations, provide fans to social service agencies for distribution to homeless shelters and locations designated by Spring Hill Social Services.	Drought and Extreme Heat	City of Spring Hill	New	\$15,000	City of Spring Hill and Spring Hill Social Services	General Funds	1,000	5 yr
69	6	LOW	Milcrofton Long Lane water line	Flooding	City of Franklin	New	\$200,000	City of Franklin, Water	Unknown	35,000	3 yr

			connection project								
70	7	LOW	Jordan Branch (Cool Springs E) Stream Restoration FY17	Flooding	City of Franklin	New	\$780,000	City of Franklin, Stormwater	Stormwater	15,000	1 yr
71	8	LOW	Complete remaining fiber to connect critical infrastructure	Tornados	City of Franklin	New	Unknown	City of Franklin, IT	Unknown	45,000	5 yr
72	9	LOW	Complete fiber and WiFi installation to alleviate dependencies on outside vendors in case of major events. Complete fiber to radio tower sites, camera system to monitor all sites	Tornados	City of Franklin	New	\$1,000,000	City of Franklin MIT	Unknown	75,000	3 yr

73	10	LOW	Ralston Creek at Liberty Hills Stream Restoration	Flooding	City of Franklin	New	Unknown	City of Franklin, Stormwater	Stormwater	5,000	3 yr
74	11	LOW	Figuers Drive Area Drainage Improvements FY 17-19	Flooding	City of Franklin	New	\$1,250,000	City of Franklin, Stormwater	Stormwater	10,000	2 yr
75	12	LOW	Establish an open space prioritization and acquisition program to endure maximum success with limited funds	Flooding	City of Franklin	New	\$50,000	City of Franklin, Parks Department	Unknown	75,000	continuous
76	13	LOW	Purchase a Wildland Fire Truck with a CAF system	Drought and Extreme Heat	City of Franklin	New	\$416,000	City of Franklin, Fire	General Fund	75,000	3 yr
77	14	LOW	Clearing of underbrush and dead trees along the Harpeth	Drought and Extreme Heat	City of Franklin	Existing	\$50,000	City of Franklin, Parks and	Unknown	75,000	continuous

			River of city owned properties					Recreation Department			
78	15	LOW	Utilize GIS Mapping to better determine floodplain & floodway	Flooding	City of Brentwood	Existing	Unknown	City of Brentwood	Operational Budget	42,500	2 yr
79	16	LOW	Enforce strict detention requirements	Flooding	City of Brentwood	Existing	Variable	City of Brentwood and downstream communities	General Funds	42,500	continuous
80	17	LOW	Enforcement of the State of Tennessee Forestry Department Burn Permitting and Burn Banning Program	Drought and Extreme Heat	Town of Nolensville	Existing	\$-	State Forestry Department with the Nolensville Volunteer Fire Department and Williamson County Emergency Communications	Operational Budget	7,580	continuous

								cooperation and enforcement at the local level			
81	18	LOW	Trimming of trees along roadway to protect Middle Tennessee Electric Membership Cooperation power lines	Winter Weather	Town of Thompsons Station	Existing	\$10,000 Annually	Thompson's Station and Middle Tennessee Electric Membership Cooperation	Operational Budget	5,000	when needed

543

544 *Note: Cost estimate and population affected information satisfies the requirement that the plan have basic cost benefit review of projects. 44 CFR*
545 *201.6 (c)(3)(iii). Also, all timeframe estimates are based on amount of time to complete the project if funding were secured*

546

Project List Update

After reviewing the original list of mitigation projects seen in the 2012 Williamson County Hazard Mitigation Plan, the mitigation committee has determined that some of the listed “mitigation” projects were actually “preparedness” projects. Preparedness projects assist people to react or respond more efficiently to threats (*example: putting a fire extinguisher in a room so someone could use it to react to a fire threat*) **whereas** mitigation projects are meant to be long-term projects that utilities the built environment in a way that does not necessarily require people to react because the project itself does the reacting (*example: putting fire retardant material in the walls of a room*). The Mitigation Committee has chosen to remove those projects in the updated mitigation action list in order for the plan to focus on mitigation opportunities in our growing community.

- Williamson County has transferred 58 projects from the original plan to the updated plan. These projects have remained deferred for several reasons, such as funding issues and changing priorities within the jurisdictions.

The Mitigation Committee has decided to cancel the original 2012 list due to older methodology which did not reflect the heavy changes in our County which have occurred within the past 5 years. However, in the course of the 5 years, Williamson County at this time has **completed** 16 projects listed in the previous plan. Please note some of these projects were listed within each jurisdiction, so whereas it may be listed once below, it was completed within all six jurisdictions.

- Enforcement of burn permitting and burn banning program during drought and extreme heat
- Winter weather purchases, such as snow blades for trucks and road salt, as well as salt storage facilities
- Establishment and communication of available shelter areas
- Creation of continuous routine for washing/cleaning of draining basins
- Bridge replacement from flood damage
- Storm water flow capacity
- Drainage improvements
- Clearing of underbrush and dead trees along the Harpeth River of city owned properties
- Evaluate structure vulnerability to wildfire events at parks
- Protection of buildings in natural settings from wild fires with good landscaping practices
- Use of GIS mapping to identify floodplain
- Identify problem areas and monitor flood levels to modify response guidelines
- Purchase of swift water boat and swift water rescue response and training equipment
- Training, Policy and continued monitoring of flood levels through communications and mapping

- Install auto chains on all large fire apparatus
- Distributed brochures to trail heads, park offices, and park properties on protecting residents near the river from tornados and flooding

Williamson County has also added a number of new projects to the listing as seen on the project list.

National Flood Insurance Program Compliance

The National Flood Insurance Program (NFIP) is a pre-disaster flood hazard mitigation and insurance protection program which has reduced the increasing cost of disasters. The intent of the program is to require new and substantially improved structures be designed and constructed to minimize or eliminate future flood damage; provide floodplain residents and business owners with financial insurance assistance in the form of insurance after floods; and it transfers most of the cost of private property flood losses from the taxpayers to floodplain property owners through flood insurance premiums. Participation in the NFIP is based on an agreement between communities and FEMA.

Currently, all of Williamson County are NFIP participants. FEMA has listed these jurisdictions to have current effective map dates, which are listed below along with each jurisdiction's NFIP identification number. Also, below is an overview of NFIP policy and loss data for Williamson County.

City/Town	CID#	Effective Map Date
Williamson County Unincorporated	470204C	12/22/2016
City of Franklin	470206C	12/22/2016
City of Brentwood	470205C	12/22/2016
City of Fairview	470242C	12/22/2016
Town of Thompsons Station	470424	9/29/2006
Town of Nolensville	470425	9/29/2006
City of Spring Hill	470278	4/16/2007

Source: Federal Emergency Management Agency Community Status Book Report

Policies In-force: 1,527

Insurance In-force whole: \$426,958,100

Written Premium In-force: \$1,699,855

Total Losses: 831

Closed Losses: 701

Open Losses: 0

CWOP Losses: 130

Total Payments: \$21,417,328.62

According to the NFIP, repetitive flood loss is defined as a facility or structure that has experienced **two or more** insurance claims of at least \$1,000 in any given 10 year period since

1978. Within the NFIP, repetitive flood loss properties are usually considered the most vital structures to mitigate. In Williamson County, the total amount paid out for repetitive flood loss is approximately \$8.8 million. The chart below provides a summary of repetitive losses for Williamson County.

Williamson County Repetitive Loss Properties						
Jurisdiction	Structure Type	Flood Zone	Number of Losses	Total Building Payment	Total Contents Payment	Total Paid
City of Brentwood	Single Family	AE	10	\$ 98,904.37	\$ 39,809.39	\$ 138,713.76
City of Brentwood	Single Family	AE	7	\$ 176,413.27	\$ 43,142.58	\$ 219,555.85
City of Franklin	Single Family	AE	4	\$ 116,651.16	\$ 24,111.97	\$ 140,763.13
City of Brentwood	Single Family	AE	4	\$ 99,555.15	\$ -	\$ 99,555.15
City of Brentwood	Single Family	AE	5	\$ 181,757.47	\$ 31,500.00	\$ 213,257.47
City of Brentwood	Single Family	AE	5	\$ 39,973.89	\$ -	\$ 39,973.89
City of Franklin	Single Family	AE	4	\$ 31,789.21	\$ 22,795.60	\$ 54,584.81
City of Franklin	Single Family	X	4	\$ 39,358.04	\$ 17,293.88	\$ 56,651.92
City of Franklin	Single Family	AE	12	\$ 157,929.65	\$ 58,409.46	\$ 216,339.11
City of Brentwood	Single Family	AE	10	\$ 98,904.37	\$ 39,809.39	\$ 138,713.76
City of Franklin	Other-Nonres	A10	2	\$ 10,894.73	\$ 6,751.87	\$ 17,646.60
Town of Nolensville	Single Family	A	2	\$ 8,475.43	\$ 35.08	\$ 8,510.51
City of Franklin	Single Family	EMG	2	\$ 4,669.97	\$ 4,201.97	\$ 8,871.94
City of Franklin	Single Family	A10	2	\$ 3,578.25	\$ 949.61	\$ 4,527.86
City of Brentwood	Single Family	A07	2	\$ 15,547.49	\$ 5,000.00	\$ 20,547.49
City of Franklin	Single Family	AE	6	\$ 153,426.52	\$ 8,591.78	\$ 162,018.30
City of Brentwood	Single Family	EMG	2	\$ 18,125.62	\$ -	\$ 18,125.62
Town of Nolensville	Single Family	A	2	\$ 6,841.03	\$ 5,795.02	\$ 12,636.05
City of Franklin	Single Family	A10	5	\$ 108,842.12	\$ 43,858.21	\$ 152,700.33
City of Franklin	Single Family	B	5	\$ 212,056.92	\$ 46,000.83	\$ 258,057.75
City of Franklin	Other-Nonres	AE	3	\$ 55,268.20	\$ 327,134.00	\$ 382,402.20
City of Brentwood	Single Family	AE	7	\$ 176,413.27	\$ 43,142.58	\$ 219,555.85
City of Franklin	Assmd Condo	A	5	\$ 536,626.99	\$ 280,366.56	\$ 816,993.55
City of Franklin	Assmd Condo	A	3	\$ 41,584.05	\$ -	\$ 41,584.05
City of Franklin	Single Family	A10	4	\$ 234,199.40	\$ 8,179.46	\$ 242,378.86
City of Franklin	Single Family	X	7	\$ 37,318.33	\$ 15,871.76	\$ 53,190.09
City of Franklin	Single Family	AE	4	\$ 116,651.16	\$ 24,111.97	\$ 140,763.13
City of Brentwood	Single Family	A	4	\$ 147,951.29	\$ -	\$ 147,951.29
City of Brentwood	Single Family	AE	4	\$ 99,555.15	\$ -	\$ 99,555.15
City of Brentwood	Single Family	A05	4	\$ 14,490.66	\$ 281.00	\$ 14,771.66
City of Franklin	Single Family	AE	3	\$ 55,819.53	\$ -	\$ 55,819.53
City of Brentwood	Single Family	AE	5	\$ 181,757.47	\$ 31,500.00	\$ 213,257.47

City of Brentwood	Single Family	AE	5	\$	39,973.89	\$	-	\$	39,973.89
City of Brentwood	Single Family	AE	4	\$	247,444.04	\$	16,624.27	\$	264,068.31
City of Brentwood	Single Family	A	3	\$	61,889.58	\$	-	\$	61,889.58
City of Brentwood	Single Family	A05	3	\$	84,871.05	\$	17,646.89	\$	102,517.94
City of Franklin	Single Family	AE	3	\$	49,953.35	\$	-	\$	49,953.35
City of Brentwood	Single Family	A05	3	\$	175,148.42	\$	-	\$	175,148.42
City of Franklin	Single Family	AE	4	\$	31,789.21	\$	22,795.60	\$	54,584.81
City of Franklin	Single Family	AE	3	\$	36,919.59	\$	8,022.75	\$	44,942.34
City of Brentwood	Single Family	AE	4	\$	166,364.60	\$	3,300.00	\$	169,664.60
City of Brentwood	Single Family	A	2	\$	15,261.05	\$	1,600.68	\$	16,861.73
City of Franklin	Single Family	AE	3	\$	29,473.25	\$	-	\$	29,473.25
City of Brentwood	Single Family	A05	3	\$	138,363.67	\$	42,693.88	\$	181,057.55
City of Brentwood	Single Family	AE	2	\$	18,208.86	\$	-	\$	18,208.86
City of Brentwood	Single Family	A	3	\$	141,529.05	\$	39,559.64	\$	181,088.69
City of Franklin	Other-Nonres	X	2	\$	6,290.75	\$	-	\$	6,290.75
City of Franklin	Single Family	X	4	\$	39,358.04	\$	17,293.88	\$	56,651.92
City of Franklin	Single Family	AE	3	\$	36,169.51	\$	-	\$	36,169.51
City of Franklin	Single Family	AE	2	\$	20,133.86	\$	4,813.81	\$	24,947.67
City of Brentwood	Single Family	AE	2	\$	281,402.22	\$	9,494.43	\$	290,896.65
Town of Nolensville	Other-Nonres	AE	3	\$	68,928.30	\$	-	\$	68,928.30
City of Franklin	Single Family	A	2	\$	630,009.49	\$	-	\$	630,009.49
City of Franklin	Single Family	X	2	\$	91,766.88	\$	20,932.11	\$	112,698.99
City of Franklin	Single Family	AE	4	\$	49,385.15	\$	18,079.56	\$	67,464.71
City of Brentwood	Single Family	AE	3	\$	158,057.64	\$	-	\$	158,057.64
City of Franklin	Assmd Condo	X	2	\$	41,325.07	\$	9,853.67	\$	51,178.74
City of Brentwood	Single Family	B	2	\$	42,291.69	\$	-	\$	42,291.69
City of Franklin	Single Family	A	2	\$	16,238.02	\$	-	\$	16,238.02
City of Franklin	Single Family	X	2	\$	76,105.00	\$	7,198.52	\$	83,303.52
City of Franklin	Single Family	X	2	\$	53,642.87	\$	2,588.82	\$	56,231.69
City of Franklin	Single Family	AE	2	\$	26,264.34	\$	-	\$	26,264.34
City of Franklin	Single Family	A	3	\$	33,863.37	\$	5,868.55	\$	39,731.92
City of Brentwood	Single Family	AE	2	\$	9,439.35	\$	-	\$	9,439.35
City of Brentwood	Single Family	AE	2	\$	106,807.55	\$	187.97	\$	106,995.52
City of Brentwood	Single Family	AE	2	\$	52,699.85	\$	-	\$	52,699.85
City of Franklin	Single Family	A	3	\$	56,541.42	\$	2,037.19	\$	58,578.61
City of Brentwood	Single Family	A	2	\$	106,431.72	\$	7,433.92	\$	113,865.64
City of Brentwood	Single Family	X	2	\$	90,612.57	\$	109,343.66	\$	199,956.23
City of Franklin	Single Family	AE	2	\$	40,087.66	\$	-	\$	40,087.66
City of Franklin	Single Family	X	2	\$	34,522.99	\$	21,372.24	\$	55,895.23
City of Franklin	Single Family	AE	2	\$	25,993.29	\$	-	\$	25,993.29
City of Brentwood	Single Family	X	2	\$	79,775.49	\$	98,669.15	\$	178,444.64
City of Brentwood	Single Family	AE	2	\$	165,367.05	\$	-	\$	165,367.05
City of Brentwood	Single Family	A04	2	\$	89,264.09	\$	-	\$	89,264.09
City of Brentwood	Single Family	X	2	\$	31,310.91	\$	-	\$	31,310.91
Town of Nolensville	Single Family	AE	2	\$	22,487.09	\$	1,843.98	\$	24,331.07
Town of Nolensville	Single Family	AE	2	\$	27,145.63	\$	992.24	\$	28,137.87
City of Franklin	Single Family	X	2	\$	71,795.43	\$	6,824.54	\$	78,619.97
Town of Nolensville	Single Family	A04	2	\$	12,839.26	\$	1,146.63	\$	13,985.89

625

626

627 To continue compliance with the NFIP, the jurisdictions have identified, analyzed and prioritized
628 three mitigation strategies to stay active with the program:

- 629 1.) Continue to evaluate improved standards that are proven to reduce flood damage.
630 2.) Maintaining supplies of FEMA/NFIP materials to help homeowners evaluate measures
631 to reduce damage.
632 3.) Maintaining a map of areas that flood frequently and prioritizing those areas for
633 inspection immediately following heavy rains or flooding event.

Section 5: Plan Maintenance

Monitoring, Evaluating, and Updating

The Mitigation Committee is designated to monitor and evaluate the mitigation plan. This committee is chaired by Williamson County Emergency Management Agency (EMA) who leads the monitoring, evaluating, and updating process.

Monitoring activities will involve Williamson County EMA setting up a committee meeting to be held on an annual basis. Williamson County EMA will prepare a brief annual report of the meeting's findings by addressing mitigation progress and shortfalls within the county.

The plan will be evaluated annually and after any significant disaster causing human, infrastructure and property losses. Following each annual informal evaluation EMA, any proposed revisions or recommendations will be brought before the Mitigation Committee to be incorporated into the plan. Potential updates to the plan will address changes to the hazard assessment, the critical facilities list, the repetitive loss list, the committee membership list and the project priority list.

The plan will be formally updated every five years in accordance to 44 CFR 201.6(d)3, which states that the plan shall be reviewed, revised, and resubmitted for approval within five years to continue eligibility for HMGP grant funding. For the five year update, Williamson County EMA will notify the jurisdictional governments and the Mitigation Committee approximately one year prior to the plan's expiration date. The review of the plan will include updating the planning process, the hazard profiles, the risk assessment, the vulnerability assessment, the mitigation strategies and the plan maintenance descriptions.

The five year plan update will also include soliciting other interested persons and/or agencies to join the Mitigation Committee and a review of what has been accomplished in the past five years. The Mitigation Committee's goal is to have at least five meetings within this time span. Dates, public notices and objectives for these meetings will be determined by Williamson County EMA.

Five months prior to the plan's expiration date, Williamson County EMA will submit the revised plan to the TEMA for preliminary review. Upon approval by the state, TEMA will submit the updated plan to FEMA for review.

Once Williamson County has attained the designation of the plan's approval pending adoption, each jurisdiction will adopt the plan through a resolution within a year.

Incorporation into Planning Mechanisms

By incorporating the Williamson County Hazard Mitigation Plan into other planning documents and mechanisms, information contained in the mitigation plan can help fill missing gaps in existing documents, can contribute to already existing mitigation-based projects and can create

669 a strengthen stance of mitigation implementation and awareness within the county and its
670 jurisdictions.

671 Some of the mechanisms into which the Williamson County Hazard Mitigation Plan could be
672 incorporated include Williamson County Basic Emergency Operations Plan (BEOP), city and town
673 zoning and floodplain ordinances, and Williamson County Schools and Franklin Special School
674 District Safety plans.

675

676 The process of incorporating the hazard mitigation plan into other plans will begin during the
677 other plan's update cycles. Williamson County EMA will first review the plans side-by-side, and
678 where deemed necessary, EMA will make notes on how mitigation concepts and actions can be
679 incorporated into the other plans. These recommendations will be submitted to the lead
680 agencies of the other planning mechanisms for them to place relevant information within the
681 documents.

682 **Continued Public Participation**

683 The Mitigation Committee will strive to involve the public in future mitigation activities. This will
684 be accomplished by continuing to post Mitigation Committee Meeting dates in local newspapers
685 of general circulation, by providing public access to copies of the Williamson County Hazard
686 Mitigation Plan in the local emergency management office and by soliciting other interested
687 persons to participate in the mitigation planning process. By implementing these methods, the
688 public will have an opportunity to comment on the plan during the update drafting stage and
689 prior to plan approval.

APPENDICES

- A. Planning Meeting 0 information**
 - i. Sign-In Sheet
- B. Planning Meeting 1 information**
 - i. Sign-In Sheet
- C. Planning Meeting 2 information**
 - i. Sign-In Sheet
 - ii. Pictures
- D. Planning Meeting 3**
 - i. Sign-In Sheet
- E. Planning Meeting 4**
 - i. Sign-In Sheet
- F. Planning Meeting 5**
 - i. Sign-In Sheet
- G. Flood Elevation Map – Williamson County**
- H. HAZUS Flood Model – Williamson County**
- I. Williamson County Hazard Mitigation Committee List**
- J. Public and Committee Meeting**
 - i. Sign-In Sheet
 - ii. Public Notice

713 **A: Planning Meeting 0: Sign-In Sheet**[illegible]

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717

718



Sign-In

Event: HazMit Plan **Date:** May 22, 2017

[illegible]

Appendix C:

C: Planning Meeting 2 Information

i. Sign-in Sheet - Meeting



Williamson County Emergency Management Agency

Sign-In

Event: Mitigation Meeting 2 Date: June 13, 2017



NAME	TITLE	MUNICIPALITY (if applicable)	PHONE	EMAIL
Duane Winingham	Planning/Ops Chief	Maury County OEM	931-375-6804	dwiningham@maurycounty-tn.gov
Scott Quinn	Franklin Police Officer	Franklin Police	615-794-2513	scott@franklin-tn.gov
John Almon	IT Director	City of Brentwood	615-371-7000	JohnAlmon@brentwoodtn.gov
Mike Harris	Director of Engage	City of Brentwood	615-371-0080	Mike.Harris@brentwoodtn.gov
Jeff Donagan	Director of Public Works	City of Brentwood	615-371-0080	Jeff.Donagan@brentwoodtn.gov
Chris Milton	Director Water Services	" "	" "	chris.milton@brentwoodtn.gov
Dawn Bunt	Director of Parks	City of Brentwood	615-371-2208	dawn.bunt@brentwoodtn.gov
Todd Petrowski	City Planner	City of Brentwood	615-371-2232	todd.petrowski@brentwoodtn.gov
John Penzitt	Asst. Director	City of Brentwood	931-486-2252	john.penzitt@brentwoodtn.gov
Floyd Heflin	County Engineer	SPRING HILL	615-790-5731	floyd.heflin@springhilltn.gov
Karen York	Asst. General Mgr	County	615-628-0237	KYork@mcud.org
Eddie Hartley	Field Supervisor	Mallory Valley Utility	615-628-0237	EHartley@mcud.org
Andrea Sipe	Planner	Mallory Valley Utility	615-716-1014	Andrea.Sipe@mcud.org
Steve Dohy	Planner	WCEMA	(615) 305-7765	sted@williamsontn.org



Williamson County Emergency Management Agency

Sign-In

Event: Mitigation Meeting 2 Date: June 13, 2017

NAME	TITLE	MUNICIPALITY (if applicable)	PHONE	EMAIL
Jim Svoboda	Principle Planner	Franklin	(615) 550-6734	jim.svoboda@franklin.tn.gov
Todd Horton	Peputy Fire Chief	Franklin	615-642-1772	todd@franklin.tn.gov
Allen Lewis	BUILDING OFFICIAL	FRANKLIN	615-550-6639	allen@franklin.tn.gov
Nate Ridley	Collections Manager	Franklin	(615) 390-0984	nate.ridley@franklin.tn.gov
FRED BANNER	IT DIRECTOR	FRANKLIN	615-289-2808	fred@franklin.tn.gov
Joseph Vioriz	Street Director	Franklin	615-550-6884	joe@franklin.tn.gov
Kris Phillips	Admin Asst	Franklin	415-550-6896	Kris.Phillips@Franklin.Tn.Gov
Gary Ball	WCHD		615-790-5596	gary@williamson-tn.org
Glenn Johnson	Deputy Fire Chief	Franklin	615-238-5755	glenn@franklin.tn.gov
LANCE BOWIE II	Williamson County GIS Manager	WCS GIS I.T.	615-790-6656	lance.bowie@tn-oes



Event: Mitigation Meeting 2 **Date: June 13, 2017**

Event: Mitigation Meeting 2 **Date: June 13, 2017**

[illegible]

728 **ii. Pictures – Meeting 2**

729



730

731 *Williamson County Hazard Mitigation Committee meeting in the Emergency Operations Center*
732 *(EOC).*



733

734 *City of Brentwood and City of Spring Hill representatives discuss issues during the hazard ranking*
735 *exercise using the Vulnerability Calculator.*



736

737 *Members discuss issues within their jurisdiction and how they relate to the Vulnerability*
738 *Calculator rankings.*

741 **i. Sign-in Sheet – Meeting**

[illegible]



Williamson County Emergency Management Agency

Sign-In

Event: Mitigation Meeting 3 **Date: June 22, 2017**

[illegible]



Sign-In

Date: June 22, 2017

[illegible]

748

i. Sign-in Sheet – Meeting 4

[illegible]



Williamson County Emergency Management Agency

Event: Mitigation Meeting 4 Date: June 27, 2017

[illegible]

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Appendix F:

F: Planning Meeting 5 Information

i. Sign-in Sheet - Meeting 5



Williamson County Emergency Management Agency

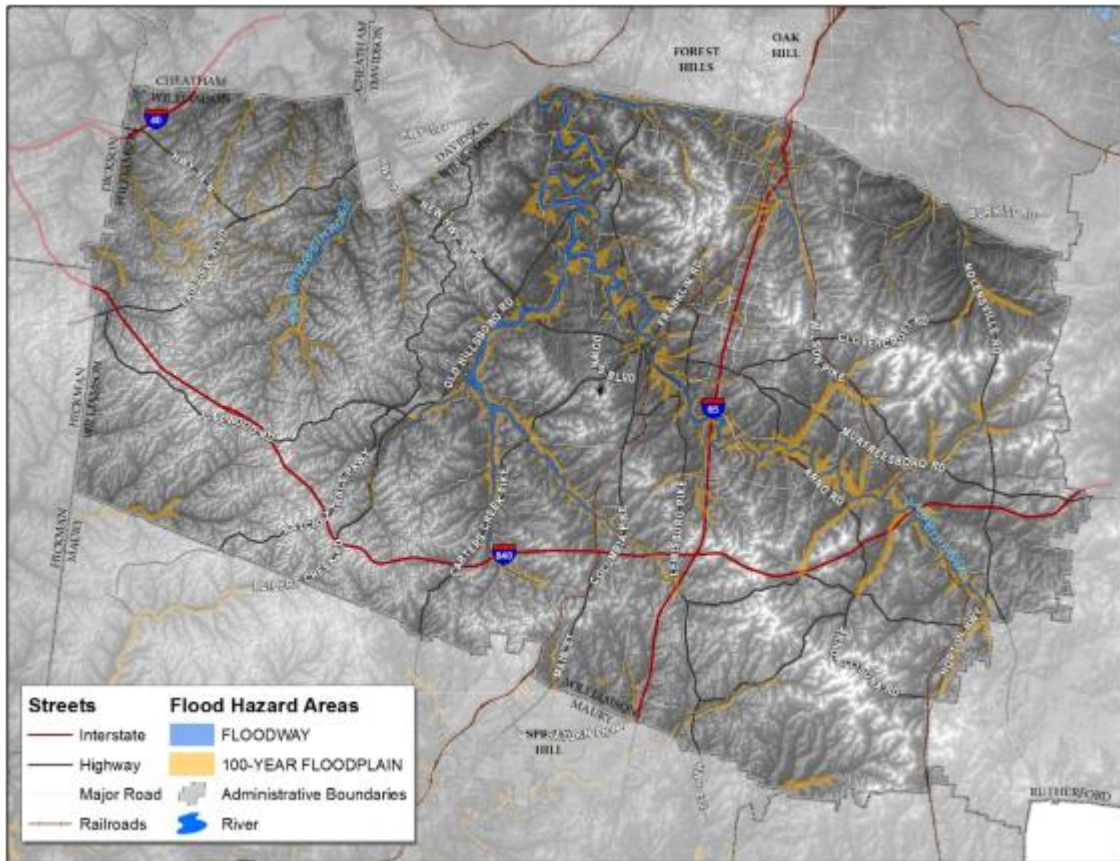


Event: Mitigation Meeting 5 Date: July 6, 2017

NAME	TITLE	MUNICIPALITY (if applicable)	PHONE	EMAIL
Frank Bonner	DIRECTOR	Franklin	615-289-2808	frank@franklin.gov
Robert Huelskamp	BOUNDO OFFICER	Franklin	615-550-6639	allan@franklin.gov
Kevin R. Benson	PH DIRECTOR	Williamson County	615-487-8250	JAMBE
Ricky McPeak	Asst. Director	CoF	615-794-4554	Rick@Franklin.gov
Wayne Sullivan	Supervisor	CoF	615-794-1516	bobby.sullivan@Franklin.gov
M. K. F. 777	Supervisor	CoF	615-794-1514	Michael.Fine@Franklin.gov
Karen Phillips	ADMIN ASSISTANT	CoF	615-550-6896	kar@Franklin.gov
Russell Peterson	EM Coordinator	CoB	615-371-0170	Russell.peterson@Franklin.gov
Ben Johnson	Dep Chief	City of Franklin	615-238-5755	glenn@Franklin.gov
John Reuter	615/17 DIRECTOR	CITY OF SPENCERVILLE	551-486-2252-485	john@Franklin.gov
Todd Petrowski	City Planner	CoB	615-371-2232	thepetrowski@Franklin.gov
Floyd Helton	Camp Engineer	County	615-533-2544	Floyd.H@Franklin.gov
Todd Horton	Deputy Chief	Franklin, fire	615-642-1172	th@Franklin.gov
Jim Suckadee	Principal Planner	Franklin	615-550-6734	jim.suckadee@Franklin.gov

Appendix G:

G: Flood Elevation Map – Williamson County

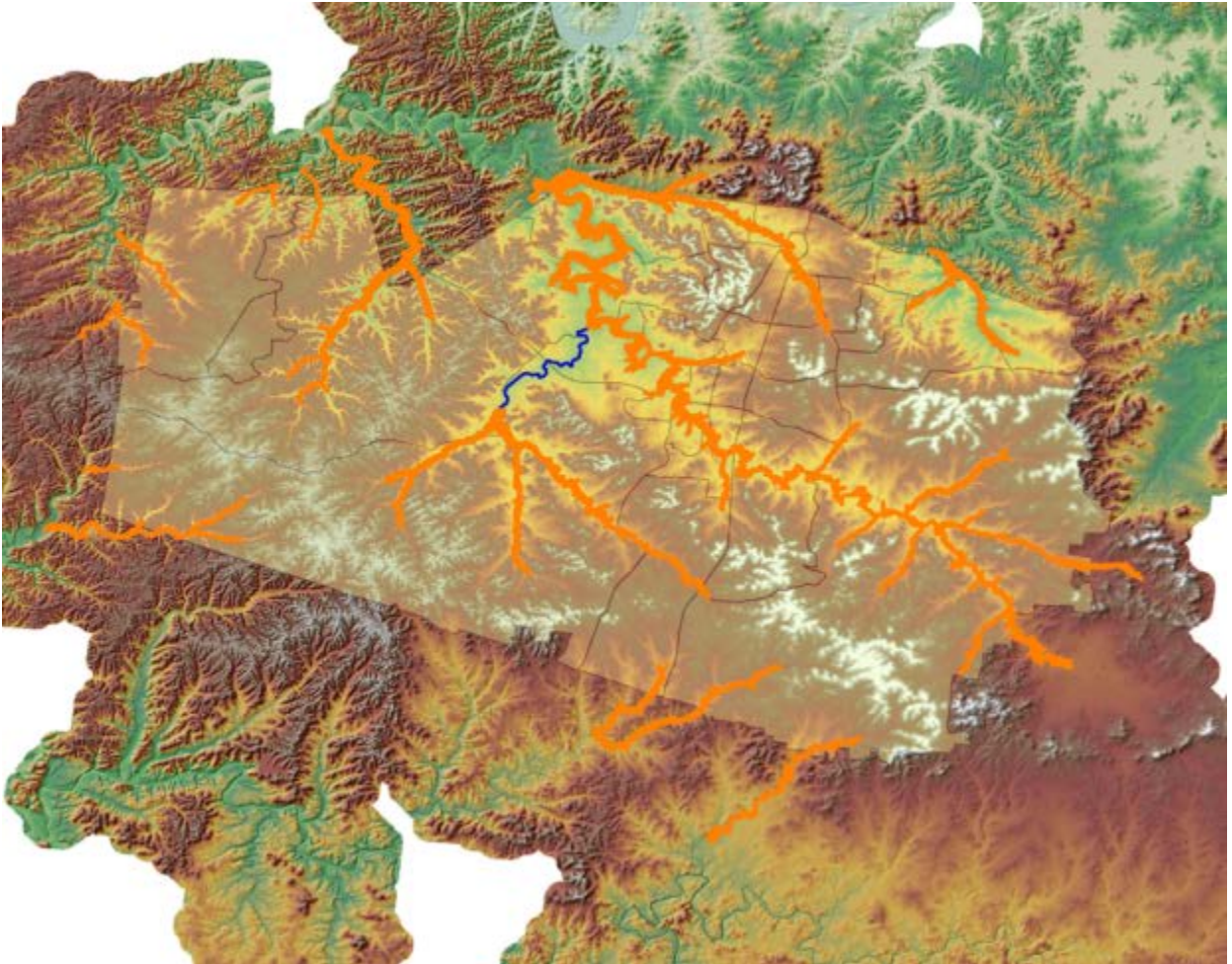


Note: Elevated areas are in white. Provided by Williamson County Emergency Management Agency.

Appendix H:

H: HAZUS Flood Model – Williamson County

HAZUS Thematic Map of Depth



Hazus-MH: Flood Event Report

Region Name: WilliamsonCoTN

Flood Scenario: 100-year flood study

Print Date: Friday, April 28, 2017

Disclaimer:

*This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.*

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Flood. These results can be improved by using enhanced inventory data and flood hazard information.

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General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Tennessee

Note:

Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 584 square miles and contains 4,535 census blocks. The region contains over 65 thousand households and has a total population of 183,182 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 67,085 buildings in the region with a total building replacement value (excluding contents) of 26,399 million dollars (2010 dollars). Approximately 91.80% of the buildings (and 82.83% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 67,085 buildings in the region which have an aggregate total replacement value of 26,399 million (2010 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure (\$1000)	Percent of Total
Residential	21,866,616	82.8%
Commercial	3,221,023	12.2%
Industrial	582,998	2.2%
Agricultural	86,448	0.3%
Religion	336,036	1.3%
Government	79,158	0.3%
Education	226,420	0.9%
Total	26,398,699	100.00%

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure (\$1000)	Percent of Total
Residential	4,001,119	83.0%
Commercial	522,705	10.8%
Industrial	117,076	2.4%
Agricultural	24,256	0.5%
Religion	75,007	1.6%
Government	2,520	0.1%
Education	79,193	1.6%
Total	4,821,876	100.00%

Essential Facility Inventory

For essential facilities, there are 1 hospitals in the region with a total bed capacity of 126 beds. There are 57 schools, 14 fire stations, 7 police stations and no emergency operation centers.

Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	WilliamsonCoTN
Scenario Name:	100-year flood study
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Building Damage

General Building Stock Damage

Hazus estimates that about 568 buildings will be at least moderately damaged. This is over 46% of the total number of buildings in the scenario. There are an estimated 144 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

Occupancy	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	3	75.00	1	25.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	71	11.13	159	24.92	102	15.99	94	14.73	68	10.66	144	22.57
Total	74		160		102		94		68		144	

Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	2	10.00	7	35.00	2	10.00	3	15.00	2	10.00	4	20.00
Steel	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Wood	70	11.18	154	24.60	100	15.97	92	14.70	68	10.66	142	22.68

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 126 hospital beds available for use. On the day of the scenario flood event, the model estimates that 126 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	14	0	0	0
Hospitals	1	0	0	0
Police Stations	7	0	0	0
Schools	57	2	0	2

If this report displays all zeros or is blank, two possibilities can explain this.

- (1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.
- (2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 8,834 tons of debris will be generated. Of the total amount, Finishes comprises 45% of the total, Structure comprises 30% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 353 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

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 displaced people that will require accommodations in temporary public shelters. The model estimates 1,667 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 3,728 people (out of a total population of 183,182) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the flood is 368.96 million dollars, which represents 7.65 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 367.94 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 73.11% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates
(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
<u>Building Loss</u>						
	Building	178.45	17.65	4.40	3.24	203.74
	Content	90.99	46.69	10.66	13.27	161.61
	Inventory	0.00	0.90	1.46	0.23	2.59
	Subtotal	269.44	65.25	16.51	16.74	367.94
<u>Business Interruption</u>						
	Income	0.00	0.25	0.00	0.03	0.28
	Relocation	0.25	0.03	0.00	0.01	0.29
	Rental Income	0.06	0.02	0.00	0.00	0.08
	Wage	0.01	0.25	0.00	0.12	0.38
	Subtotal	0.31	0.54	0.00	0.17	1.02
<u>ALL</u>	Total	269.76	65.79	16.51	16.90	368.96

Appendix A: County Listing for the Region

- Tennessee
 - Williamson

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Tennessee				
Williamson	183,182	21,866,616	4,532,083	26,398,699
Total	183,182	21,866,616	4,532,083	26,398,699
Total Study Region	183,182	21,866,616	4,532,083	26,398,699

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Appendix I:

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I: Williamson County Hazard Mitigation Committee

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Member	Representation	Title/Role
Floyd Heflin	Williamson County Engineer	Flood Plain Administrator
Greg Boll	Highway Dept	Accountant
Amy Herron	Williamson County Parks and Recreation	Research and Planning
Becky Caldwell	City of Franklin Sanitation Dept	Director of Sanitation
Todd Petrowski	Brentwood Planning Dept	City Planning
Steve Denny	Williamson County Emergency Management Agency	Planner
Russell Peterson	Brentwood Fire Dept	Emergency Management Coordinator
Tracey Davis	Tennessee Emergency Management Agency	Regional Planner
Mark Elrod	Williamson County Sherriff's Office	Lieutenant, Special Operations Division
Michael Fletcher	Williamson County Schools	Director, School Safety and Security
Celby Glass	Franklin Special School District	Supervisor of Attendance and Safety
John Pewitt	City of Spring Hill	GIS/IT Director
John Allman	City of Brentwood	IT Director
Mike Harris	City of Brentwood	Director of Engineering
Jeff Donegan	City of Brentwood	Director of Public Works
Chris Milton	City of Brentwood	Director of Water Service
Dave Bunt	City of Brentwood	Director of Parks
Karen York	Mallory Valley Utility	Asst. General Mgr
Eddie Hartley	Mallory Valley Utility	Field Supervisor
Jim Svoboda	City of Franklin	Principal Planner
Todd Horton	City of Franklin	Deputy Fire Chief
Allen Lewis	City of Franklin	Building Official
Nate Ridley	City of Franklin	Collections Manager
Jordan Shaw	City of Franklin	IT Director
Joseph York	City of Franklin	Street Director
Kris Phillips	City of Franklin	Administrative Assistance
Glenn Johnson	City of Franklin	Deputy Fire Chief
Lance Bowie II	Williamson County	GIS/IT Director

ii. Public Notice Copy

PUBLIC NOTICE

Notice is hereby given pursuant to the "Open Meeting Law of Tennessee", TCA Section 8-4-101, et seq., that the Williamson County Emergency Management Agency Hazard Mitigation Committee will meet on October 4, 2017 at 2:00 P.M. in room 112 of the Williamson County Public Safety Center at 304 Beasley Drive, Franklin, TN. Anyone requesting an accommodation due to a disability should contact Risk Management at 615-790-5466. This request, if possible, should be made three working days prior to the meeting.

CLASSIFIEDS

INTERNET CLASSIFIEDS SERVICE - GIVING YOUR LOCAL CLASSIFIED AD A WORLD WIDE REACH!

EMPLOYMENT	EMPLOYMENT	FOR SALE	GARAGE SALE
 <p>CITY OF FRANKLIN, TENNESSEE INVITES APPLICATIONS FOR THE POSITION OF: ATHLETIC WORKER - SEASONAL - PARKS</p> <p>The City of Franklin, Parks Department has a vacancy for a ATHLETIC WORKER-SEASONAL. Please see the full job announcement and submit an online application at www.franklin-tn.gov/jobs.</p> <p>DEADLINE TO APPLY: 8/2/2017 SALARY: \$94.95 EOE/DFW-free Workplace</p>	<p>All American Remodeling Plus Paint</p> <p>From Painting to Complete Remodels</p> <p>931-619-7308 615-987-5123</p>	<p>LIVE FISH FOR STOCKING PONDS</p> <p>We provide hauling containers</p> <p>We will be at: Williamson Farmers COOP 290 Eddy Lane, Franklin October 7, 10-11AM Call 615-790-6100</p> <p>OR KEN JACOBS Bowling Green, KY 276-842-2555</p>	<p>FOR SALE</p> <p>TIMS FORD LAKE GETAWAY HOUSE</p> <p>In private woods, 2 party decks, 2 fireplaces, 3 beds, 3 baths, 2400 sq ft, all tile frontage, floating dock \$449k, off 41k near Bull Springs 931-607-7649 By owner.</p> <p>FOR SALE</p> <p>FOR SALE</p> <p>Old site bars in Hickman Co, good condition. Also, old house to be demolished. Make offer on either or both. 931-729-9353</p> <p>JOHN DEERE 755</p> <p>from 9523 HR. Diesel Hydraulic Transmission loader and Backhoe ONLY 775 Hrs. \$2270 Call 620-460-5490</p>
<p>Exp. Landscapers Needed</p> <p>Exp. Lead man; DL Required Full time; Know plants; \$14.00 & up contingent on exp. Nashville (615) 331-6289</p>	<p>LEGALS</p> <p>LEGALS</p>	<p>LEGALS</p> <p>LEGALS</p>	<p>LEGALS</p> <p>LEGALS</p>

NOTICE OF SUBSTITUTE TRUSTEE'S SALE

WHEREAS, default has occurred in the performance of the covenants, terms and conditions of a Deed of Trust dated May 31, 2006, executed by CHADWAIN L. MORRISSEY, JR. and BERRY L. MORRISSEY, conveying certain real property therein described to JENNIFER M. WEISS, as Trustee, as same appears of record in the Register's Office of Williamson County, Tennessee;

THE TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION gives notice that a Corrective Action Plan has been submitted for MAPCO #3212 site located at 8009 Moores Lane, Brentwood, TN, in compliance with the Code of Federal Regulations Title 40, Part 280.66(a) and Rule 1200-1-15-06(1)(a) of the State of Tennessee. Pursuant to Title 40, Part 280.67(b) and the Rule 1200-1-15-06(1)(a), the Corrective Action Plan is available for public inspection during normal business hours, with the exception of legal holidays, for a period of 30 days after the date of this publication at the State of Tennessee, Environmental Field Office located at 711 R.S. Gass Boulevard, Nashville, TN 37243