

Metropolitan Nashville-Davidson County Multi-Hazard Mitigation Plan

January 2020
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Metropolitan
Nashville-Davidson County
Multi-Hazard Mitigation Plan

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Multi-Hazard Mitigation Plan
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LIST OF ACRONYMS

BCEGS	Building Code Effectiveness Grading Schedule
BFE	Base Flood Elevation
BMP	Best Management Practice
CAD	Computer Aided Design
CBD	Central Business District (in downtown Nashville)
CEMP	Comprehensive Emergency Management Plan (by OEM)
CFR	Code of Federal Regulations
COOP	Continuity of Operations Plan
CPC	Climate Protection Center
CPT	Community Planning Team
CRS	Community Rating System
DEC	Department of Emergency Communications
DMA	Disaster Mitigation Act of 2000
EMAP	Emergency Management Accreditation Program
EPCRA	Emergency Planning and Community Right-to-know Act
ETSZ	East Tennessee Seismic Zone
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FMA	Flood Mitigation Assistance
FPS	Feet Per Second
HIRA	Hazard Identification and Risk Assessment
HMGP	Hazard Mitigation Grant Program
GIS	Geographic Information System
GPM	Gallons Per Minute
LID	Low Impact Development
MGD	Million Gallons a Day
MOM	Multi-Objective Management
MSA	Metropolitan Statistical Area
MPW	Metropolitan Public Works
MWS	Metro Water Services
NIBS	National Institute of Building Sciences
NES	Nashville Electric Service
NFD	Nashville Fire Department
NFIP	National Flood Insurance Program
NFIRS	National Fire Incident Reporting System
NMSZ	New Madrid Seismic Zone
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NWS	National Weather Service
OEM	Nashville's Office of Emergency Management
PDM	Pre-Disaster Mitigation
PDSI	Palmer Drought Severity Index
PIAC	Public Input Advisory Committee
PIO	Public Information Officer

PNG	Piedmont Natural Gas
RSDE	Residential Substantial Damage Estimator
SASZ	Southern Appalachian Seismic Zone
SBA	Small Business Administration
SFHA	Special Flood Hazard Areas
SPI	Standardized Precipitation Index
SR2C	Stormwater Regulations Review Committee
TDEC	Tennessee Department of Environment and Conservation
TDOT	Tennessee Department of Transportation
TEMA	Tennessee Emergency Management Agency
TVA	Tennessee Valley Authority
TWRA	Tennessee Wildlife Resources Agency
UFPP	Unified Flood Preparedness Plan
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USGS	United States Geological Survey
WCT	Wind Chill Temperature

Multi-Hazard Mitigation Plan
1.0 Introduction

As part of the overall community planning effort for hazard mitigation, the Metropolitan Government of Nashville and Davidson County, Tennessee, (Metro) has prepared a Multi-Hazard Mitigation Plan pursuant to the requirements of the Disaster Mitigation Act of 2000 (Public Law 106-390).

Hazard Mitigation is defined as any sustained action taken to reduce or eliminate long-term risk to human life and property from hazards. Hazard Mitigation Planning is the process through which the natural hazards that threaten communities are identified, the likely impacts of those hazards are determined, mitigation goals are set, and appropriate strategies that would lessen the impacts are identified, prioritized, and implemented.

Hazard Mitigation Planning is a requirement for state and local governments in order to maintain eligibility for certain federal disaster assistance and hazard mitigation funding programs. Metro is both a community at risk and a community that has benefited from federal mitigation funding programs.

PURPOSE AND NEED

Each year, natural disasters in the United States take the lives of hundreds of people and injure thousands more. Nationwide, taxpayers pay billions of dollars annually to help communities, organizations, businesses, and individuals recover from disasters. These monies only partially reflect the true cost of disasters, because additional expenses upon insurance companies and non-government organizations are not reimbursed by tax dollars.

Many natural disasters are predictable and many more are repetitive, often with the same results. Many of the damages caused by these events can be alleviated or even eliminated through hazard mitigation activities.

FEMA, the Federal Emergency Management Agency, now a part of the Department of Homeland Security, has made reducing losses from natural disasters one of its primary goals. Hazard Mitigation Planning and the subsequent implementation of the projects, measures, and policies developed through those plans, is the primary mechanism in achieving this goal. Success in reducing disaster damages has been the result of mitigation projects that were implemented as a result of hazard mitigation planning.

This plan was revised pursuant to the Disaster Mitigation Act of 2000 (DMA) and the regulations published in the *Federal Register* Volume 67, Number 38, Tuesday, February 26,

2002 (44 CFR §201.6) and finalized on October 2, 2015. Section 104 of DMA revises the Robert T. Stafford Disaster Relief and Emergency Assistance Act by adding Section 322, which provides emphasis on hazard mitigation, including a requirement for local mitigation plans, and the required revision every 5 years.

Proactive hazard mitigation planning at the local level can help reduce the cost of disaster response and recovery to property owners and governments by protecting critical community facilities, reducing liability exposure, and minimizing overall community impacts and disruption.

SCOPE

This Multi-Hazard Mitigation Plan identifies goals and measures for hazard mitigation and risk reduction in order to make communities less vulnerable and more disaster resistant and sustainable. Information in this plan should be used to help guide and coordinate mitigation activities and local policy decisions for future land use decisions. This Plan covers the jurisdiction of the Metropolitan Government of Nashville and Davidson County which includes the satellite cities, and local Universities as listed in section 3.

This Plan follows DMA planning requirements and associated guidance for developing Local Hazard Mitigation Plans. This guidance sets forth a generalized nine-task process:

1) Determine the Planning Area and Resources;
2) Build the Planning Team;
3) Create an Outreach Strategy;
4) Review Community Capabilities;
5) Conduct a Risk Assessment;
6) Develop a Mitigation Strategy;
7) Keep the Plan Current;
8) Review and Adopt the Plan; and
9) Create a Safe and Resilient Community.

This Plan also uses the guidelines from FEMA's Local Mitigation Planning Handbook (2013) and Local Mitigation Plan Review Guide (2011).

Although not required under the Disaster Mitigation Act of 2000, the Metropolitan Government of Nashville and Davidson, along with the Community Planning Team recognizes the need to integrate human-caused hazards into the natural hazard mitigation planning process. Although not inclusive of all potential hazards, the most likely hazards in both categories are addressed here in order to necessitate a more effective mitigation planning process and strategy.

Multi-Hazard Mitigation Plan

2.0 Community Profile

GEOGRAPHY – LOCATION AND AREA

Metropolitan Nashville-Davidson County is located in middle Tennessee along the banks of the Cumberland River. The community encompasses 525 square miles. Three major interstate highways I-40, I-65, and I-24 converge in Nashville. Nashville is positioned within 600 miles and less than one day's drive from 50 percent of the United States population. It is also less than a 6 hour drive to 13 other states, Nashville enjoys a prime geographic location (See Figure 2-1).

The City of Nashville was settled in 1779 and became the state capital in 1843. The City of Nashville and Davidson County governments were consolidated into one entity, Metropolitan Nashville-Davidson County, in April 1963.

Figure 2-1: Metropolitan Nashville-Davidson County Location Map

CLIMATE

Nashville has a mild climate that is common throughout the southeastern part of the United States with four distinct seasons and light snowfall in the winter. Mean annual temperatures range from 38 to 79 degrees Fahrenheit with an average July high temperature of 89 degrees and an average winter January high of 47 degrees. The average annual precipitation is 47.3 inches and the average annual humidity is 70 percent. Table 2-1 presents normal climate statistics for the community.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Days with Precipitation	10	10	11	11	12	10	10	8	8	8	10	11
Wind Speed (mph)	8.4	8.5	8.8	8.2	7.1	6.4	6.3	5.9	6.2	6.5	7.6	8.1
Humidity (%)	70	69	65	63	70	70	73	73	74	69	70	71
Sunshine (%)	45	48	52	59	60	64	63	63	61	62	48	43
Days Clear of Clouds	6	7	8	8	8	8	8	10	11	13	9	7
Partly Cloudy Days	6	6	7	9	10	13	13	12	9	8	7	7
Cloudy Days	19	16	16	13	13	10	10	9	10	10	14	17
Snowfall (in)	2.1	2.3	0.7	0	0	0	0	0	0	0.1	0	1.0

Table 2-1: Normal Climate Statistics for Nashville-Davidson County, Tennessee

(Source: National Weather Service)

PHYSICAL FEATURES AND LAND USE

Nashville-Davidson County contains 525 square miles of land and is situated in a natural basin. The County has three eco-regions – the Inner Central Basis, the Outer Central Basin, and the Western Highland Rim – and is surrounded by wooded hills with five types of forest habitat, including cedar glades (unique to this part of the world). The County has over 34,000 acres of conserved open space, with around 70 percent of that as designated parks. Overall, Nashville-Davidson County is developed in a mixture of urban, suburban and rural land uses.

Topography ranges from 385 feet above sea level to 1,160 feet and includes flatter floodplain lands, rolling hills, picturesque valleys, and steep bluffs. Development patterns in Davidson County are closely related to its topography. Much of what remains as undeveloped, open space is located in the northwest and southwest portions of the County where the terrain is hilly and difficult to develop, with slopes at grades of 20 percent or more. Steeply sloping land is normally considered suitable for only very low intensity development, particularly in Davidson County, where such slopes are also covered by unstable soils and are often composed of fragile geological formations. In addition to providing wildlife habitat, steeply sloping areas with mature forests are important headwater areas, slowing down and absorbing water runoff and filtering water to improve water quality.

The Cumberland River and its numerous tributaries –350 miles of waterways – flow through a series of 14 watersheds in the County. Davidson County also has three large man-made lakes – J. Percy Priest, Old Hickory and Radnor Lakes. Throughout the County, 42,671 acres of land are in the floodplain. Undisturbed, vegetated floodplain areas along streams remove pollutants from the water, reduce soil erosion, and protect against flash flooding by slowing down stormwater runoff. Additionally, there are also numerous natural wetlands. In some portions of the County, mainly in the east and southeast, sinkholes, where over time water erodes the underlying bedrock, are also present.

In 1988, Nashville was divided into 14 communities for planning purposes (Figure 2-2). The 14 community plans were created and occasionally updated through 2012, when Metro Nashville began an update to the countywide General Plan, called *NashvilleNext*. All 14 community plans were updated into a consistent format when *NashvilleNext* was adopted in 2015.

Each of the 14 community plans creates a vision for the community's future preservation, growth, development, guiding land uses, urban design, streets, parks, and civic uses. These policies are then used to judge future preservation and development decisions. For each community, the physical features and land use are summarized on the following pages.

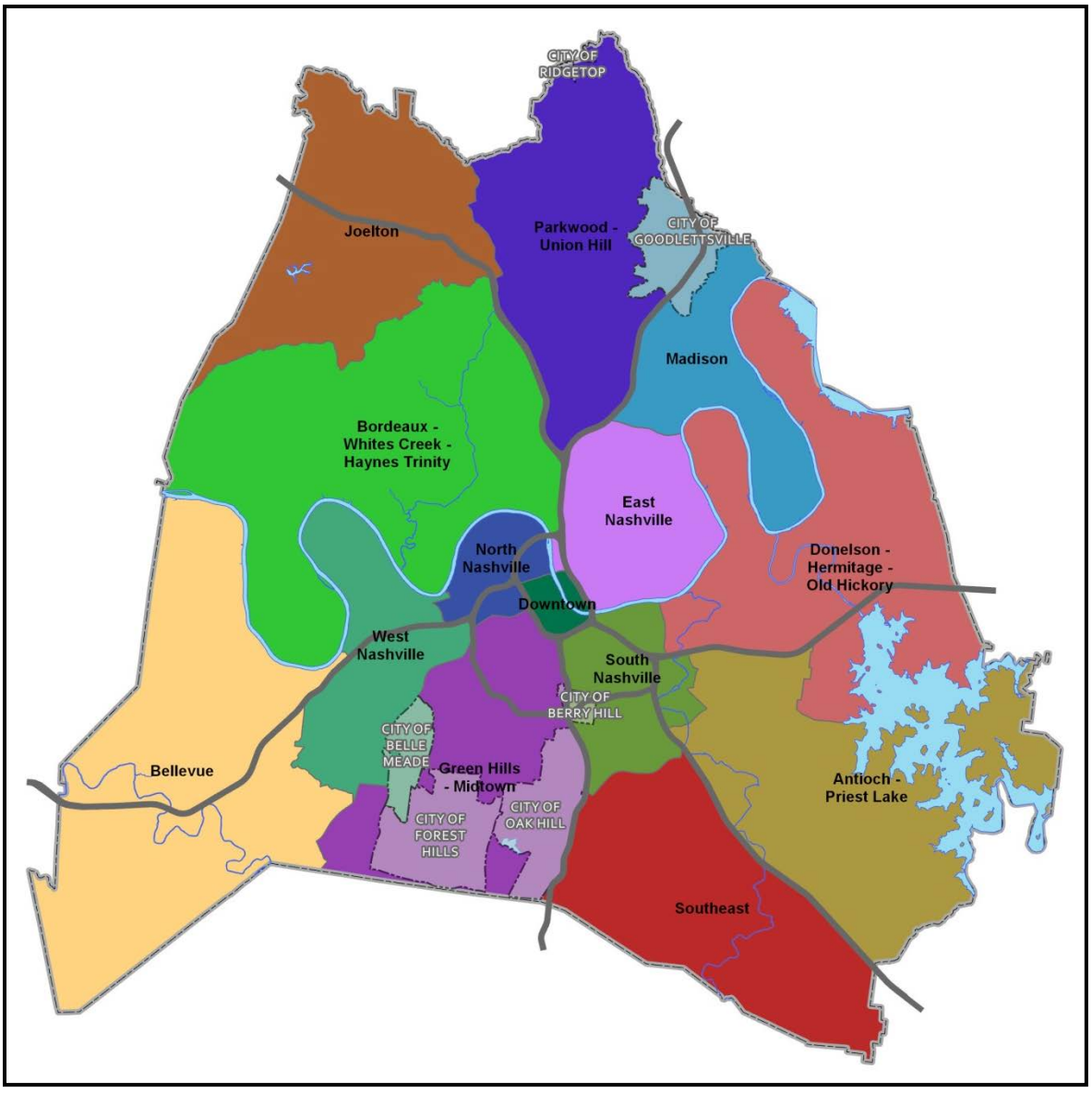


Figure 2-2: Community Location Map

SATELITE CITIES

City of Belle Meade

The City of Belle Meade is a satellite city located in the south central portion of Davidson County. It is bounded to the west by Harding Pike and a portion of Percy Warner Park, Lynwood Boulevard to the east, the convergence of Lynwood and Harding Pike to the north and Chickering Lane to the south. Corporate area of the City is 1,987 acres or 3.1 square miles. According to a 2015 U. S. Census estimate, Belle Meade had a population of 3,004.

Significant waterways include Richland Creek, Sugar Tree Creek and Belle Meade Branch. Approximately 9% (184 acres) of the community's land area is considered 100-year floodplain and 10% (197 acres) is in the 500-year floodplain. A total of 5% (99 acres) is considered in the floodway.

The developed community plan area is primarily residential single family homes. Three existing condominium units and one apartment building were grandfathered under Belle Meade's Zoning Code, which no longer permits the construction of multi-family structures. There are currently 1,220 parcels of privately owned land with approximately 95% being developed. There are three places of worship, St. George's Episcopal Church, The Temple and Immanuel Baptist Church. The two commercial parcels are the Belle Meade Country Club and the historic Belle Meade Plantation.

City of Berry Hill

Berry Hill, a satellite city, is located 1½ miles south of downtown Nashville. Properties fronting 8th Avenue South/Franklin Pike make up its western border and it is bounded on the south by Thompson Lane. I65 and I440 intersect near the southwest corner of the city.

Berry Hill is the smallest satellite city in both area (.91 square mile) and population (1,469 estimated as of 7/1/2018). The city's residential zone along Rosedale Avenue comprises less than 5% of the city's area, but the majority of the city's population now resides in multifamily and townhome developments in the Melrose area along 8th Avenue South.

The average annual value of construction projects in Berry Hill for the years 2010 – 2018 was $15,130,000. The annual value increased significantly during that period, from under $2 million in 2010 and 2011, to highs of $39 million and $34 million in 2014 and 2015, respectively. This increase was mainly due to large multifamily and mixed-use developments along 8th Avenue South. The result of those developments was an increase in population from 537 in 2010 to 1,469 (estimated) in 2018. While the residential growth trend is expected to slow from its peak, some additional multifamily residential developments are expected. Berry Hill currently has 442 residential properties (including individual condominium and townhome units) and 436 commercial properties.

The combined middle and west forks of Brown's Creek enter the City west of I65 near Gale Lane. The east fork enters the city east of I65 near Thompson Lane and West Iris Drive. The

branches converge east of I65, north of Berry Road, and continue to Craighead Street, where they exit Berry Hill, west of Bransford Avenue.

CSX Railroad has a line that parallels I65 immediately east of the interstate. A Nashville & Eastern Railroad line enters the city at Bransford Avenue near Craighead Street and connects to the CSX line north of Berry Road.

City of Forest Hills

The City of Forest Hills encompasses 9.3 square miles with about 1,850 homes. Its 5,040 residents are drawn to the exclusive single-family zoning and low-density housing on large, tree-filled lots. The City is almost exclusively residential, with no commercial or industrial enterprises. Forest Hills has the distinction of being part of the headwaters of five different streams that flow though the greater Nashville area, including Richland Creek. All of the waterways are part of the Cumberland River watershed. According to the Tennessee Department of Environment and Conservation, the streams are impaired and listed as unhealthy for the environment or recreation. A citizens cultural and natural resources committee is taking the lead of informing residents of actions that they can take to improve the water quality of Richland Creek. This citizen outreach initiative will continue in the future and the manager may find opportunities where the mission of the committee and city overlap and supportive activities can be undertaken.

City of Goodlettsville

The City of Goodlettsville is located in both Davidson and Sumner Counties. The city has experienced balanced growth in retail/service, office/professional, and residential uses in the last three (3) years. The city's access from both I-65 and SR 386-Vietnams Veterans Parkways and proximity to fast growing sections of Davidson County including Madison area planned renovations including designated investment districts will ensure continued balanced growth in the City for decades to come. The city's 2010 Census population was 15,921. Per the University of Tennessee, the City's estimated 2020 population is 19,651 and 2030 population is 20,762.

Retail/Service Uses (Completed or Under Construction)
- 375 Hotel Rooms
- 46,975 Sq. ft. retail/services multiple facilities

Office/Professional Uses (Completed or Under Construction)
- 105 Assisted Living/Memory Care Bed Facility
- 65,760 sq. ft. Office/professional multiple facilities

Residential (Approved developments and projects under construction- including multi-phase projects)
- 127 Apartments, 226 Townhouses, 478 Single Family Houses
- Since beginning of 2017- City has issued 171 new residential single family house and townhouse permits

City of Oak Hill

Oak Hill is located south of Metropolitan Nashville and is bordered by Woodmont on the north, Granny White Pike on the west, Old Hickory Boulevard on the south and Franklin Pike/I-65 on the east. Oak Hill is approximately 8 square miles.

There are two landmarks located within the corporate limits of Oak Hill; they are Radnor Lake and the State of Tennessee Governor's mansion.

Oak Hill has a population of approximately 4,800 and is governed by a three (3) member board elected by the citizens. It is a single family residential community with no commercial businesses.

COMMUNITIES

ANTIOCH – PRIEST LAKE
(including Una, the Crossings, Hickory Hollow, and Nashville International Airport)

The Antioch-Priest Lake community is located in southeastern Davidson County and encompasses an area spanning from Interstate 24 to the west, J. Percy Priest Lake to the east, the Airport to the north and the Rutherford County line to the south.

Antioch has small area of steep slopes (20 percent and greater) mainly in the northwestern and western portions of the planning area. Approximately 4 percent (1,600 acres) has steep topography.

Significant waterways in the community plan area include J. Percy Priest Reservoir, Mill Creek, Hurricane Creek, McCrory Creek, Hamilton Creek, Sorghum Branch, Whittemore Branch and Savage Branch. There are known sinkholes in the southeastern portion of the community, mainly around J. Percy Priest Reservoir and cedar glade areas. Wetlands are found throughout the community but are generally found within the floodplains of Mill Creek and J. Percy Priest Reservoir. Approximately, 25 percent (9,500 acres) of the area's land is within the floodway and 100-year floodplain areas.

This large community planning area has many residential communities. Residential subdivisions range in age and style from the 1950s to the present, and numerous multi-family complexes are located along Bell Road and around Hickory Hollow. Large industrial areas are found around the Nashville International Airport and in the southern portion of the community adjacent to La Vergne. The former Hickory Hollow Mall, now called Global Crossings, features major community facilities, including a regional park, library, ice rink, and community college. A new large mixed use development is under construction across the interstate from Global Crossings and will include regional employment and retail destinations. Out of approximately 38,150 acres, 26 percent of the community's land use is residential; 17 percent is vacant; 17 percent is water, most of which in J. Percy Priest Reservoir; 23 percent is civic and public benefit (including parks and right-of-way); 5 percent is industrial; 9 percent is commercial; and 3 percent is office.

BELLEVUE (including Centenary, Linton, Newsom Station, Pasquo, and Whites Bend)

The Bellevue community is located in the southwestern corner of Davidson County and encompasses an areas spanning to the Cumberland River to the north and northeast, I-40, Percy Warner Park and the CSX railroad to the east, the Williamson County line to the south, and the Cheatham County line to the west.

Half of the community plan area's terrain is steeply sloping (20 percent and greater) with mature forests. More level areas are located along the Harpeth, South Harpeth and Cumberland Rivers. Approximately 50 percent (22,700 acres) of the area has steep topography.

The area has numerous rivers and streams. Significant waterways in this area include the Cumberland River, Harpeth River, South Harpeth River, Cub Creek, Indian Creek, Overall Creek, Buffalo Creek, Beech Creek, Poplar Creek, Flat Creek, Trace Creek, East Fork, Newsoms Branch and Linton Branch. Approximately 10 percent (4,300 acres) of the area is within the defined floodway and floodplain area.

The community plan area's hills, rivers and farmland give an overall rural feel. The southwest and northern portions of the area are primarily rural, while the southeastern portion is predominantly suburban in character. Commercial and services uses are located primarily in nodes along the Old Hickory Boulevard, Charlotte Pike, Highway 70 and Highway 100 corridors. Out of approximately 45,000 acres, 51 percent of the subarea's land use is residential; 36 percent is vacant; 11 percent is civic and public benefit (including parks, water and right-of-way); and 2 percent is commercial, office and industrial.

BORDEAUX – WHITES CREEK (including Bells Bend and Scottsboro)

The Bordeaux-Whites Creek community is located in northwest Davidson County, stretching from the Cumberland River in the south to Little Marrowbone Road/Old Hickory Boulevard in the north, I-24 to the east, and the Cheatham County line to the west.

The northern and western portions of the area consist of mainly steep slopes (20 percent and greater) along with unstable soils and fragile geological formation. The southeastern portion of the area is gently rolling or relatively level. Approximately 44 percent (20,200) acres of the community has steep topography.

Significant waterways in this area include the Cumberland River, Little Marrowbone Creek, Bull Run Creek, Whites Creek, Eatons Creek, Ewing Creek, Carney Creek, Tranham Creek, Back Creek, Little Creek, Dry Fork, Earthman Fork, Drakes Branch and Pages Branch. Approximately 14 percent (6,100 acres) of the area is within the floodway and 100-year floodplain areas.

The area is largely categorized by rural land and older suburban development with some commercial and industrial uses around Historic Talbot's Corner. A small area study for the Trinity Lane corridor was completed in 2018, which envisions the corridor transitioning to a more intense urban pattern. Out of approximately 45,700 acres, 47 percent of the community's land use is residential; 32 percent is vacant; 1 percent is civic and public benefit (including parks, water, and right-of-way); and 3 percent is commercial, office and industrial.

DONELSON – HERMITAGE – OLD HICKORY (including Opry Mills, Lakewood, and Pennington Bend)

The Donelson-Hermitage-Old Hickory community is located in eastern Davidson County, generally bounded by Spence Lane on the west, the Cumberland River to the north, the Wilson County line on the east, and Percy Priest Lake, Couchville Pike and I-40 to the south.

While land is mostly level to moderately sloping in the community plan area, there are areas with some steep terrain (20 percent and greater), unstable soils and sinkholes. Concentrations of steep slopes can be found in the Hermitage area, east of Old Hickory Boulevard to Wilson County, between Lebanon Pike and I-40; in the bend of the Stones River; and in the Pleasant Hill Road area north of Couchville Pike. Approximately 6 percent (2,200) acres of the community has steep topography.

Major waterways in this community include the Cumberland River, Old Hickory Reservoir, J. Percy Priest Reservoir, Stones River, Stoners Creek, Mill Creek, and McCrory Creek. Approximately 27 percent (10,600 acres) of the community's planning area is within the floodway and 100-year floodplain areas.

Three distinct communities exist in this part of Davidson County. Donelson is a stable, older postwar suburban area with established residential areas. Old Hickory was founded as a company town for DuPont and is more traditional in character. Hermitage is generally a newer suburban community, but is steeped in the history of President Andrew Jackson. Hermitage and points to the east continue to see new suburban residential communities. The area has a diverse range of land uses and development patterns, including older and newer suburban residential, large employment and retail centers. Out of approximately 39,700 acres, 37 percent of community's land use is residential; 15 percent is vacant; 13 percent is water, most of which is Old Hickory Reservoir, J. Percy Priest Reservoir and the Cumberland River, 22 percent is civic and public benefit (including parks and right-of-way); 4 percent is industrial; 7 percent is commercial; and 2 percent is office.

DOWNTOWN NASHVILLE

The Downtown Nashville community is located in the center of Davidson County. Downtown has long been the seat of state and local government, a destination for people joining or enjoying the entertainment industry, and the economic center of Middle Tennessee. The community is bounded to the north by Jefferson Street; to the east by I-65/I-24; and to the

south and west by I-40. The Cumberland River splits the community, with approximately 25 percent of the area on the east bank.

While Downtown is the most intense urban setting in Davidson County, it retains physical attributes including hills, bluffs, and the Cumberland River. Topography on the east bank is low and flat, while topography of the west bank is elevated with bluffs rising above the normal flow elevation of the river. Capitol Hill rises to an elevation of 555 feet and Rutledge Hill reaches 536 feet. Approximately 6 percent (107) acres of the community has steep topography.

The community plan area's only significant waterway is the Cumberland River, 500 feet in width as it moves through Downtown. Due to its lower elevation, the east bank is more severely impacted by the flooding of the Cumberland River than the west bank. 10 percent (175 acres) of the community's planning area is within the floodway and 100-year floodplain areas.

The community contains Nashville's Central Business District, the Tennessee State Capitol, Bicentennial Mall, older and newer skyscrapers, historic buildings, museums, and numerous entertainment venues, including the Second Avenue and Broadway corridors, Bridgestone Arena and Nissan Stadium (on the east bank of the Cumberland River). In recent years, Downtown continues to increase its proportion of residential uses, with additional development throughout downtown, but with notable additions in the Gulch and south of Broadway. A number of major employers have moved or are moving to Downtown in recent years. Out of approximately 1,800 acres, 8 percent of the subarea's land use is residential; 10 percent is vacant; 5 percent is water of which most is the Cumberland River; 40 percent is civic and public benefit (including parks and right-of-way); 7 percent is industrial; 10 percent is office; and 20 percent is commercial (including parking).

EAST NASHVILLE (including Inglewood and Northeast Nashville)

The East Nashville community is located in the central portion of the county, just across the Cumberland River from Downtown. It is bounded to the north by Briley Parkway; to the east and south by the Cumberland River; and to the west by I-65.

Most of the community plan area's terrain is relatively flat to gently rolling. The hilliest area is along the Ellington Parkway corridor in the northwestern quadrant of the subarea. Most other steep slopes are hillsides of valleys associated with tributaries to the Cumberland River in the southeastern section of the area. Approximately 4 percent (540 acres) of the community has steep topography.

Other than the Cumberland River, the most significant waterways are Ewing Creek, Cooper Creek, and Pages Branch. 13 percent (1,700 acres) of the community's planning area is within the floodway and 100-year floodplain areas.

This is a developed community, consisting primarily of historic urban residential areas. Commercial and service uses are concentrated along the Gallatin Pike, Dickerson Pike and Trinity Lane corridors. In recent years, redevelopment within existing neighborhoods has been significant and the community's commercial pikes are a focus for more residential and commercial density in the future. Out of 13,200 acres, 48 percent of the subarea's land use is residential; 8 percent is vacant; 2 percent is water, most of which is the Cumberland River; 24 percent is civic and public benefit (including parks and right-of-way); 10 percent is industrial; 2 percent is office; and 5 percent is commercial.

GREEN HILLS-MIDTOWN (including Hillsboro Village, Music Row, Forest Hills and Oak Hill)

The Green Hills-Midtown community is located in the south central portion of the County. It is bounded to the north by the inner loop of I-40; to the east by I-65; to the south by the Williamson County line; and to the west by the Belle Meade city limits, Charlotte Pike, and CSX Railroad.

Most of the northern half of the community is either gently rolling or relatively level. In contrast, a significant portion of the southern half of the community, mainly south of Harding Place/Battery Lane, has steeply sloping terrain (20 percent and greater). Approximately 20 percent (5,000 acres) of the community has steep topography.

Significant waterways include Radnor Lake, Richland Creek, Browns Creek, Otter Creek, Sugartree Creek and Bosley Spring. Approximately 3 percent (685 acres) of the community's land area is within the floodway and 100-year floodplain areas.

The community plan area ranges from a rapidly redeveloping Midtown and Vanderbilt University area, through older urban residential areas experiencing redevelopment, a strong regional commercial center and large-lot and estate suburban development. Out of approximately 25,000 acres, 53 percent of the subarea's land use is residential; 13 percent is vacant; 30 percent is civic and public benefit (including parks and right-of-way); less than 1 percent is industrial; 1 percent is office; and 3 percent is commercial.

JOELTON

The Joelton community is located in the northwestern part of Davidson County. It is bounded to the north by the Robertson County line; to the east by Ivy Point Road and Crocker Springs Road; to the south by Little Marrowbone Drive and Old Hickory Boulevard; and to the west by the Cheatham County line.

The community plan area is almost evenly divided into two distinct topographic areas. In a crescent that curves from the southwestern portion to the northeastern portion of the area, steep slopes (20 percent and greater), narrow ridges and valleys are the predominant features. In the northwestern and central portions of the community, level to rolling land is the

predominant feature along with occasional steep-sided ravines with streams at the bottom. Approximately 41 percent (10,400 acres) of the area's land has steep topography.

Significant waterways in this area include Marrowbone Lake, Marrowbone Creek, Little Marrowbone Creek, Long Creek, Claylick Creek, Sycamore Creek, Earthman Fork, and Sulphur Branch. Approximately 3 percent (660 acres) of the community's land area is within the floodway and 100-year floodplain areas.

The area's historically rural, large lot development pattern is evident in its land use. Out of 25,300 acres, approximately 54 percent of the subarea's land use is residential; 40 percent is vacant; 5 percent is civic and public benefit (including parks, water, and right-of-way); and 1 percent is used for office, commercial and industrial purposes.

MADISON (including Goodlettsville, Neelys Bend, and Rivergate)

The Madison community is located in the northeastern section of the county. It is bounded to the north by the Sumner County line; to the east and south by Briley Parkway and the Cumberland River; and to the west by the City of Goodlettsville.

The community's terrain is predominately level, with some areas of steep slopes (20 percent and greater) primarily in Goodlettsville and Neely's Bend. Approximately 6 percent (1,000 acres) of the subarea has steep topography.

Significant waterways in this area include the Cumberland River, Mansker Creek, Dry Creek, Gibson Creek, and Loves Branch. Approximately 13 percent (2,300 acres) of the community's land area is within the floodway and 100-year floodplain areas.

The community plan area is predominately developed with older suburban development and rural development in Neely's Bend. Commercial and service uses are located along Gallatin Pike and the Rivergate Mall area with industrial uses located along Myatt Drive. Out of approximately 17,000 acres, 50 percent of the subarea's land use is residential; 19 percent is vacant; 7 percent is civic and public benefit (including parks); 8 percent is commercial; 2 percent is industrial; and 1 percent is office.

NORTH NASHVILLE (including MetroCenter)

The North Nashville community is located to the north and northwest of Downtown. The area is bounded to the north, east and west by the Cumberland River; and to the south by Jefferson Street, the CSX Railroad, I-40, and Charlotte Avenue.

Terrain in this area is predominately flat to moderately sloping, with scattered areas of steep slopes (20 percent and greater) found in the southeastern and southwestern portions of the community. Approximately 4 percent (200 acres) of the area has steep topography.

The community's only significant waterway is the Cumberland River, which forms much of boundary of the subarea. Approximately 11 percent (1,344 acres) of the community's land area is within the floodway and 100-year floodplain area.

The community is developed and contains numerous historic urban neighborhoods, the historic Jefferson Street Corridor, industrial areas along the Cumberland River, several universities, and some suburban areas at its western edge near Tennessee State University. Out of approximately 4,900 acres, 22 percent of the subarea's land use is residential; 13 percent is vacant; 4 percent is water, most of which is the Cumberland River; 39 percent is civic and public benefit (including parks and right-of-way); 8 percent is industrial; 8 percent is commercial; and 5 percent is office.

PARKWOOD-UNION HILL (including Bellshire)

The Parkwood-Union Hill community is located in the north-central part of the county. It is bounded to the north by the Robertson and Sumner County lines; to the east by the Goodlettsville city limits and I-65; to the south by I-65 and I-24; and to the west by I-24 and Crocker Springs Road.

Most of the community plan area's terrain, consists of heavily forested steep slopes (20 percent and greater) and narrow ridges and valleys. Generally, land south of Old Hickory Boulevard is more level. Approximately 43 percent (11,600 acres) of the area has steep topography.

Significant waterways in this community include Whites Creek, Ewing Creek, Mansker Creek, Little Creek, Dry Creek, Lickton Creek, and Bakers Creek. Approximately 4 percent (1,100 acres) of the community's land area is within the floodway and 100-year floodplain area.

The community plan area is predominantly rural (in the north) with large farms and open land, and suburban residential (in the south) with scattered commercial development along Dickerson Pike and concentrated near Skyline Medical Center. Out of approximately 26,800 acres, 58 percent of the subarea's land use is residential; 30 percent is vacant; 9 percent is civic and public benefit (including parks, water, and right-of-way); and just over 2 percent is office, commercial and industrial purposes.

SOUTHEAST (including Crieve Hall, Cane Ridge, Lenox Village, and portions of Brentwood)

The Southeast community is located in southeastern Davidson County. It is bounded to the north by the CSX Railroad; to the east by I-24 and the Rutherford County line; to the south by the Williamson County line; and to the west by I-65.

While there are small areas with steep slopes scattered throughout the community plan area, most of the land is either gently rolling or relatively level. The only concentration of steep

slopes is an area west of Nolensville Pike and south of Old Hickory Boulevard. Approximately 43 percent (2,500 acres) of the area has steep topography.

Significant waterways in this community include Mill Creek and Sevenmile Creek. There are known sinkholes in the areas north and south of Harding Place and around Mill Creek. Wetlands are found throughout the area, but are generally found within the floodplains of Mill Creek and Sevenmile Creek. Approximately 9 percent (1,600 acres) of the community's land area is within the floodway and 100-year floodplain areas.

The area is largely a suburban community with a rural fringe, but has a range of land uses and development patterns, including older and newer suburban residential, significant retail centers, and a large rural area. Out of approximately 27,300 acres, 55 percent of the subarea's land use is residential; 25 percent is vacant; 16 percent is civic and public benefit (including parks and right-of-way); 3 percent is commercial; 1 percent is office; and less than 1 percent is industrial.

SOUTH NASHVILLE (including Berry Hill and the Fairgrounds)

The South Nashville community is centrally located, extending from the edge of Downtown southward about five miles to the Nashville Zoo at Grassmere. It is bounded to the north by the Cumberland River; to the east by I-24; to the south by the CSX Railroad; and to the west by I-65.

Although the area contains numerous hills, it does not have any large concentrations of land with slopes that are 20 percent or greater. Fort Negley Park in the northwest corner of the community contains some steeply sloping terrain. The remaining naturally steep terrain is found mainly along the banks of the major creeks and streams. Approximately 7 percent (690 acres) of the area has steep topography.

Significant waterways include the Cumberland River, Mill Creek, and Browns Creek. About 9 percent (920 acres) of the community's land area is within the floodway and 100-year floodplain areas.

The community plan area is a mix of land uses and ranges from large industrial areas along the Cumberland River and railroads to urban and suburban residential areas with significant commercial development lining Nolensville Pike. It also includes a regional attraction in the Fairgrounds, which is undergoing reconstruction with the addition of a Major League Soccer stadium. Out of approximately 9,900 acres, 26 percent of the subarea's land use is residential; 8 percent is vacant; 36 percent is civic and public benefit (including parks, water, and right-of-way); 13 percent is industrial; 14 percent is commercial; and 3 percent is office.

WEST NASHVILLE (including Cockrill Bend, West Meade and Belle Meade)

The West Nashville community is located to the west and southwest of downtown Nashville. It is bounded to the north by the Cumberland River; to the east by the CSX Railroad and the City of Belle Meade; to the south by Percy Warner Park and West Meade's ridgetops; and to the west by I-40.

Terrain in this area ranges from flat to moderately sloping, with some very steep slopes (20 percent and greater) found in the north, central and southwestern portions of the subarea. Approximately 9 percent (1,500 acres) of the community has steep topography.

In addition to the Cumberland River, significant waterways include Richland Creek, Sandy Creek, Jocelyn Hollow Branch, Ewin Branch, and Vaughns Gap Branch. Approximately 12 percent (1,100 acres) of the community's land area is within the floodway and 100-year floodplain areas.

The community plan area is developed with a mix of uses, ranging from urban neighborhoods along the Charlotte Pike corridor, to industrial in Cockrill Bend, to suburban neighborhoods along Highway 70 and Highway 100. Out of approximately 16,250 acres, 47 percent of the subarea's land use is residential; 8 percent is vacant; 33 percent is civic and public benefit (including parks, water, and right-of-way); 6 percent is industrial; 5 percent is commercial; and 1 percent is office.

POPULATION

Since its settlement in 1779, Nashville has grown to become Tennessee's largest city, and the 24th largest in the United States. Together, Nashville and Davidson County contain a population of 691,243, according to the US Census Bureau. (see Table 2-2).

Population Growth 1970 to 2017				
Year	**Total Population**	**Population Change**	**Percent Change**	**Annual Growth Rate**
1970	448,003	---	---	---
1980	477,811	29,808	6.7%	0.7%
1990	510,784	32,973	6.9%	0.7%
2000	569,891	59,107	11.6%	1.2%
2010	626,681	56,790	10.0%	1.0%
2017 estimate	691,243	64,562	10.3%	1.5%

Table 2-2: Population Growth (Source: Metro Planning Department and US Census Bureau)

DEMOGRAPHIC PROFILE AND VULNERABLE POPULATIONS

According to the 2017 American Community Survey (1-year estimates)

		Davidson County	
	Quick Facts	**#**	**%**
Population	Total	691,243	-
	Household Population	669,042	96.8%
	Group Quarters Population	22,201	3.2%
	Average Household Size	2.36	-
	Male	333,568	48.3%
	Female	357,675	51.7%
Families	Total	161,513	-
	Married Couple Families with Children	45,171	28.0%
	Single Parent Families with Children	25,261	15.6%
	Female Householder with Children	19,680	12.2%
Race	White alone	447,669	64.8%
	Black or African American alone	185,187	26.8%
	American Indian/ Alaska Native alone	1,507	0.2%
	Asian alone	24,546	3.6%
	Native Hawaiian or Pacific Islander alone	598	0.1%
	Other Race alone	10,086	1.5%
	Two or More Races	21,650	3.1%
Ethnicity	Hispanic or Latino	71,072	10.3%
Minorities	Not Non-Hispanic White alone	303,772	43.9%

Age	Less than 18	145,690	21.1%
	18-64	463,686	67.1%
	Greater than 64	81,867	11.8%
Housing Units	Total	314,038	-
	Owner Occupied	150,658	53.1%
	Renter Occupied	133,271	46.9%
	Occupied	283,929	90.4%
	Vacant	30,109	9.6%
Geographical Mobility	Same house 1 year ago	81.1%	-
Income	Median Household Income	$58,490	-
	Per Capita Income	$34,470	-
Poverty	Individuals with Income below Poverty level	97,184	14.5%
	Households with Income below Poverty level	38,541	13.6%
Education	Population 25 years and over	477,260	-
	Less than 9th grade	19,533	4.1%
	9th to 12th grade, No Diploma	26,359	5.5%
	High School Graduate (includes equivalency)	106,075	22.2%
	Some College, No Degree	94,749	19.9%
	Associate Degree	31,260	6.5%
	Bachelor's Degree	129,205	27.1%
	Graduate or Professional Degree	70,079	14.7%
		Davidson County	
	Quick Facts	**#**	**%**
Population	Total	691,243	-
Travel	Mean Travel Time to Work (min)	24.8	-
	Workers 16 years and over	375,836	-
	Drove Alone	295,085	78.5%
	Carpooled	35,386	9.4%
	Public Transportation	7,589	2.0%
	Walked	7,914	2.1%
	Bike	682	0.2%
	Taxicab, motorcycle or other means	3,148	0.8%
	Worked from Home	26,032	6.9%
Vehicles Available	No vehicle available	8,097	2.2%
Employment	Population 16 Years and Over	560,583	-
	In Labor Force	403,368	72.0%
	Civilian Labor Force	403,026	99.9%
	Employed	387,357	96.1%
	Unemployed (actively seeking employment)	15,669	3.9%
	Armed Forces	342	0.1%
	Not in Labor Force	157,215	28.0%
Industry	Civilian employed population 16 years & over	387,357	-
	Agriculture, forestry, fishing, hunting, & mining	766	0.2%
	Construction	24,363	6.3%
	Manufacturing	29,345	7.6%
	Wholesale Trade	11,291	2.9%
	Retail Trade	38,307	9.9%

	Transportation and warehousing, and utilities	21,578	5.6%
	Information	11,776	3.0%
	Finance and insurance, and real estate and rental and leasing	26,988	7.0%
	Professional, scientific, and management, and administration and waste management services	46,797	12.1%
	Educational services, and health care and social assistance	95,229	24.6%
	Arts, entertainment, and recreation, and accommodation and food services	49,763	12.8%
	Other services, except public administration	19,278	5.0%
	Public administration	11,876	3.1%

Table 2-3: Demographic Profile Information

Long Term Care Facilities/Nursing Homes etc.:

Assisted Living Facilities: 22
Nursing Homes: 22
Home for the Aged: 9
Hospice: 12

Hospitals: 12

Kindred Hospital
Monroe Carell Jr. Children's Hospital at Vanderbilt
Nashville General Hospital at Meharry
St. Thomas Midtown Hospital
St. Thomas West Hospital
TriStar Centennial Medical Center
TriStar Skyline Madison Campus
TriStar Skyline Medical Center
TriStar Southern Hills Medical Center
TriStar Summit Medical Center
Vanderbilt University Medical Center
Veterans Administration Nashville Campus
Approximate total licensed hospital bed capacity of 3,754

Higher Education (>1,000 students):

Vanderbilt University	13k - Private
Nashville State Community College	8k - Public
TN State University	8k - Public
Belmont University	8k - Private
Lipscomb University	4k - Private
Trevecca Nazarene University	2k - Private

Jail maximum occupancy: ~4,300

Prison maximum occupancy: 3,098

Charles Bass Correctional Complex	757
Riverbend Maximum Security	736
TN Prison for Women	805
Lois M. DeBerry Special Needs Facility	800

Police stations: 9 including headquarters
Fire Stations: 40 including headquarters
County Emergency Operations Center: 1
County Public Safety Answering Point: 1

Because a large portion of the population of the area surrounding Nashville is dependent on Nashville as a place to work or live, Nashville is the center of the Nashville Metropolitan Statistical Area (MSA). The Nashville MSA comprises 14 counties including Davidson, Cannon, Cheatham, Dickson, Hickman, Macon, Maury, Robertson, Rutherford, Smith, Sumner, Trousdale, Williamson and Wilson. The estimated 2017 MSA population is 1,930,961 people.

ECONOMIC DEVELOPMENT

Nashville is the capital of Tennessee and a vital transportation, business, and tourism center for North America. In addition to the thirteen counties included in the Nashville MSA, the Nashville Economic Market contains two additional counties (Maury and Montgomery). The Region's economy is diverse and mirrors the national economy. The area benefits from low unemployment, consistent job growth, substantial outside investment and expansion, and a growing labor force.

Nashville is known as “Music City USA” because of its vast musical heritage and ever-growing musical industry. It serves as the headquarters for more than a dozen major record labels and over 70 smaller labels, approximately 200 recording studios, 130 music publishing companies, 200 booking agents, 10 record manufacturers, and 33 record promotion companies. Although music is the City’s most popular industry, it’s not the largest. Nashville is a leader in the areas of publishing and printing, finance and insurance, healthcare, higher education, and tourism. All of these industries have helped to build a strong local economy.

Major companies with headquarters or plants in metropolitan Nashville include auto manufacturer Nissan North America; the nation’s largest small-box discount retailer Dollar General; national health care providers HCA Holdings Inc. and Community Health System; health care providers Vanderbilt University and Medical Center and Saint Thomas Health Services; skilled nursing and homecare provider National HealthCare Corporation; tire manufacturers Bridgestone Americas Inc. and Hankook Tire America; State of TN government; restaurants Cracker Barrel Old Country Store and Shoney's Inc.; religious affiliated publishers Thomas Nelson Inc., Baptist Sunday School Board and United Methodist Publishing. Increasingly, major national companies, such as Amazon, AllianceBernstein, and the Bank of New York Mellon are locating major employment centers in Nashville as well.

Higher education is also a large contributor to the local economy with several large universities such as Vanderbilt University, Belmont University and TN State University. Boasting a multitude of world-class companies, Nashville has become a destination for a young, progressive generation of families. Over the past decade, Nashville has seen tremendous increases in several areas including: population growth in the region to 24th in the United States. The median household income of the county is estimated at $58,490 from 2013-2017.

Year	Projection Population	Percent Change
2010	626,681	----
2015	657,627	4.9%
2020	688,587	4.7%
2025	720,056	4.6%
2030	751,314	4.3%
2035	782,194	4.1%
2040	813,297	4.0%

Table 2-4: Population Projections
(Source: Woods & Poole Economics, Inc. Data provided by the Nashville Area MPO)

EDUCATIONAL PROFILES

Davidson County has a large presence of private and public higher education institutes in the county. Since higher education institutes could be considered a city within a city, we will profile some of the larger locations to ensure they are highlighted within our community as important sectors of our community. We will also highlight the main county K-12th grade public school district, Metro Nashville Public School District, since it's the only public school district in the county. The high number of student pockets in the county is very important when it comes to preparedness, mitigation, response and recovery of any disaster or emergency situation.

METRO NASHVILLE PUBLIC SCHOOL DISTRICT

Quick Facts (2018-2019):

- ***Total Students: ~85,287***
  - MNPS: *71,710*
    - Pre-School/Pre-K: 2,957
    - Elementary (K - 4th): 30,108
    - Middle (5th - 8th): 18,558

        - High (9th - 12th): 19,115
        - Exceptional Ed. (Special Education): 972
    - Charter: *12,675*
        - Elementary: 3,426
        - Middle: 6,380
        - High: 2,869
    - Achievement School District (ASD): *902*
        - Elementary: 100
        - Middle: 802

- ***Total Staff: ~11,888***
    - Elementary: 4,346 (incl. Early Learning Centers & Pre-K)
    - Middle: 1,980
    - High: 2,132 (incl. Alternative Learning & Academies)
    - Exceptional Ed: 900
    - Other: 2,530 (nutrition services, maintenance, transportation, central office)
- Total Buildings:
    - Schools: 167
        - Early Learning Centers: 4
        - Elementary Schools: 73
        - Middle Schools: 33
        - High Schools: 26
        - Charter Schools: 29
        - Alternate Schools: 2
    - Other:
        - Schools buses: 630

VANDERBILT UNIVERSITY

Quick Facts:

- Students
    - ~960 part time students
    - ~11,864 full time students
    - ~12,824 students enrolled
- Staff and Faculty
    - ~4,427 full and part time staff
    - ~4,726 full and part time university faculty
- Property
    - 334 acres of land
    - 178 buildings
        - 10 Schools
        - 39 Residence halls and apartments
    - 6,241 student housing capacity
        - 94% undergraduates live on campus

    - 23 fraternity and sorority houses
- Vanderbilt University Research
- Vanderbilt University Medical Center
    - Independent, non-profit, but connected with Vanderbilt University
    - Only Level 1 trauma center in Middle TN
    - Only Level 4 neonatal intensive care unit in the region
    - Includes:
        - Vanderbilt University Hospital
        - Monroe Carell Jr. Children's Hospital
        - Vanderbilt Psychiatric Hospital
        - Vanderbilt Stallworth Rehabilitation Hospital
        - The Vanderbilt Clinic
        - Vanderbilt Health One Hundred Oaks.

BELMONT UNIVERSITY

Quick Facts:

- Students
    - ~6,700 undergraduate students
    - ~1,600 graduate students
    - ~8,300 students enrolled
- Staff and Faculty
    - 586 full and part time staff
    - 1,279 full and part time university faculty
- Property
    - 85 acres of land
    - 50+ buildings
        - 15 Residence halls and apartments
    - 3,858 student housing capacity
    - 57% undergraduates live on campus

TN STATE UNIVERSITY

Quick Facts:

- Students
    - ~6,121 undergraduates
    - ~1,653 graduate students
    - ~7,774 students enrolled
- Staff and Faculty
    - ~417 university full-time faculty
    - ~217 adjunct faculty
- Property
    - 500 acres of land near the Cumberland River (173 acres are in the floodplain)
    - 48 buildings
        - 1 additional academic building to be completed summer of 2020
        - 6 traditional residence halls

        - 2 student apartments
    - ~35% of the student population live on campus
- TN State University Research Building

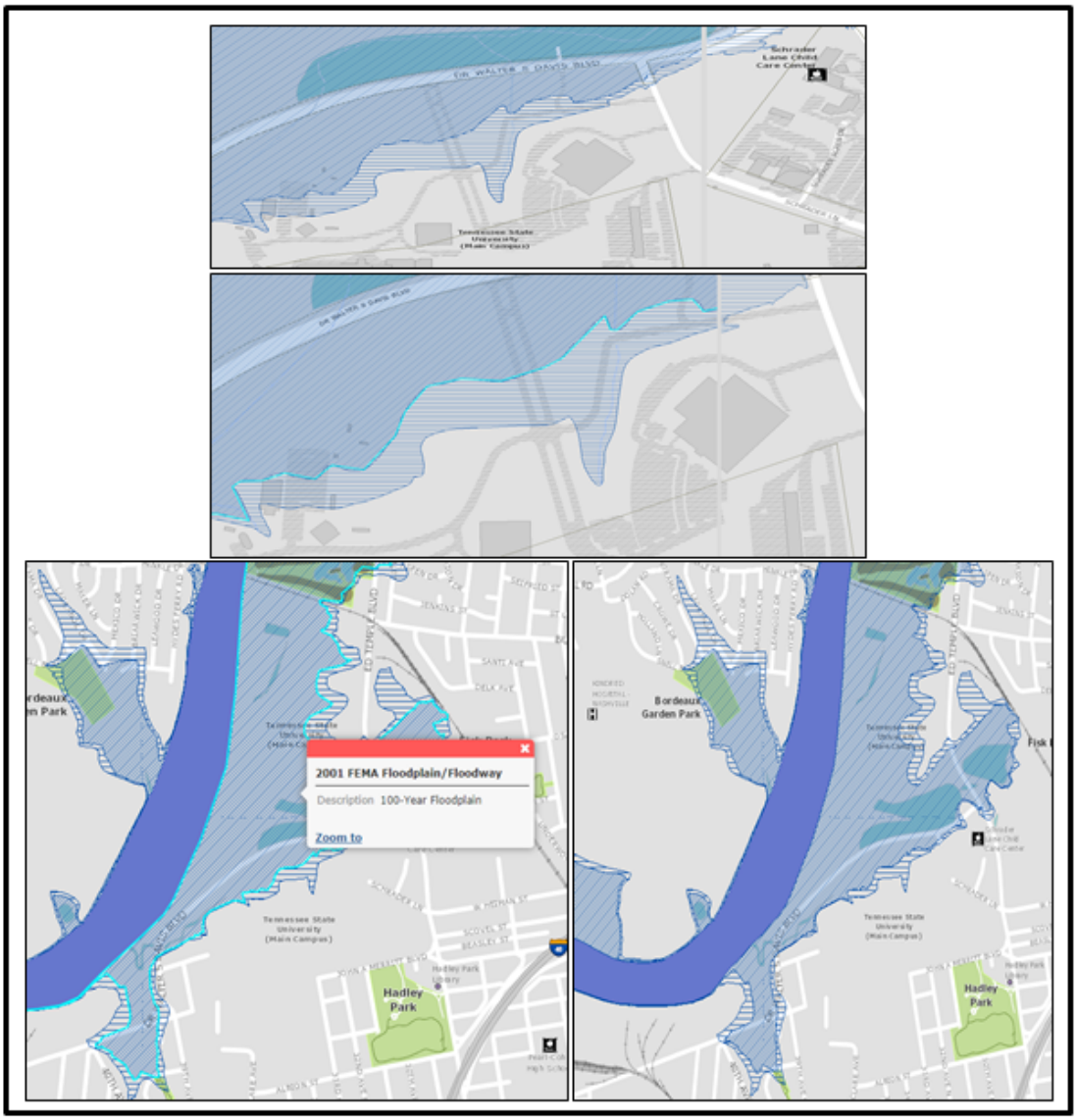


Figure 2-3: TSU Property in the Floodplain/Floodway

(*source: FEMA Viewer on Nashvill.gov)*

LIPSCOMB UNIVERSITY

Quick Facts:

- Students
  - 2,869 undergraduate students
  - 1,688 graduate students
  - 4,557 students enrolled
- Staff and Faculty
  - 2,288 full and part time staff
  - 696 full and part time university faculty
- Property
  - 75 acres of land
  - 29 buildings
    - 9 Schools
    - 6 Residence halls and apartments
  - 1,652 student housing capacity
    - 1,590 undergraduates live on campus

TREVECCA UNIVERSITY

Quick Facts:

- Students
  - 1,464 undergraduate students
  - 1,243 graduate students
  - 2,707 students enrolled
- Staff and Faculty
  - 221 full and part time staff
  - 130 full and part time university faculty
- Property
  - 113 acres of land
  - 32 buildings
    - 21 Schools
    - 11 Residence halls and apartments
  - 981 student housing capacity
    - 855 undergraduates live on campus

Metro Water Services (MWS)

Metro Water Services (MWS) serves approximately 700,000 customers within a service area of 388 square miles. The customer base is primarily located in Davidson County, with both direct and satellite customers also located in the surrounding counties including the cities of Goodlettsville, Hendersonville, Ridgetop, Millersville, Brentwood, Belle Meade, Mt. Juliet, La Vergne, and the White House Utility Districts.

The water infrastructure consists of over 3,000 miles of pipe, 56 pumping stations, over 21,100 fire hydrants, and over 64,000 valves. There are over 204,000 accounts that handle over 110 million gallons of water. The distribution system supplies an average of approximately 90 million gallons per day of water to approximately 204,000 customer accounts. In the summer months, the maximum daily demand of water is over 110 million gallons per day.

The wastewater system consists of approximately 3,100 miles of both gravity pipelines and force mains ranging in size from 3-inch diameter to 16.5-feet in diameter, 3 treatment plants located on the Cumberland River, and 112 sewer pumping stations. There are over 206,500 accounts and over 146 million gallons of wastewater treated per day. Approximately 224 miles, or 7%, of the wastewater collection system is combined, handling both sanitary and storm water flows from the downtown area. The remaining system is separated, which is not intended to handle storm water flows.

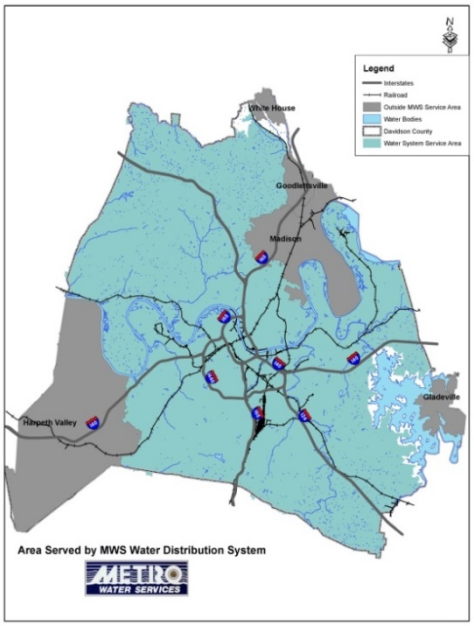


Figure 2-4: MWS Water Distribution Reach

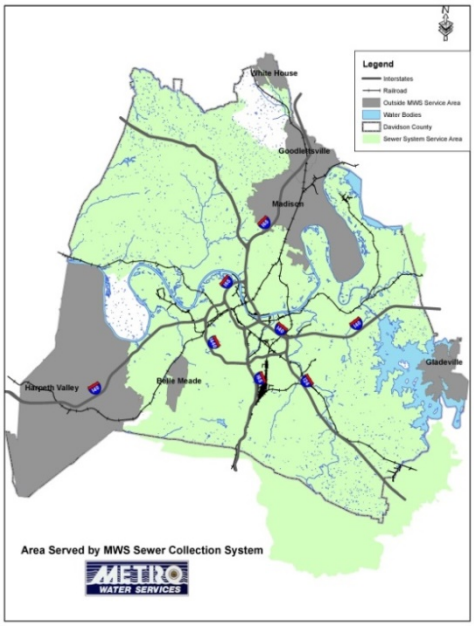


Figure 2-5: MWS Sewer Service Area Reach

Nashville Electric Service (NES)

Nashville Electric Service (NES) serves an area approximately 700 square miles. While most of the current customer extent is in Davidson County, part of the area is in the surrounding 6 counties of Cheatham, Robertson, Rutherford, Sumner, Williamson and Wilson, including all or parts of cities such as Hendersonville, Brentwood and Smyrna. Of the approximately 365,000 electric customers, 86% of them are inside Davidson County, while 14% are in the surrounding counties. NES has almost 6,000 miles of overhead and underground distribution and transmission lines with 83% of them in Davidson County.

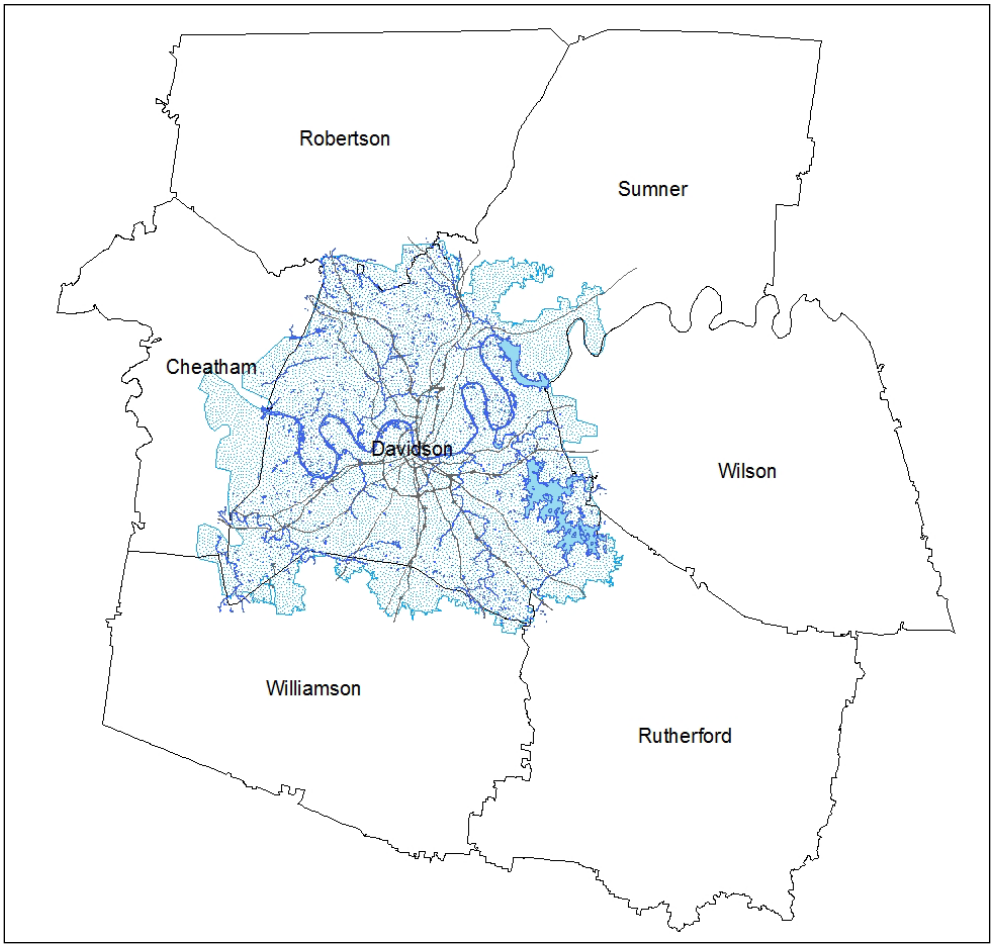


Figure 2-6: NES Reach

Piedmont Natural Gas (PNG)

Piedmont Natural Gas (PNG) is a publicly held company that provides natural gas service to more than 165,000 industrial, commercial and residential customers in the Middle Tennessee area.

In addition to serving Davidson County, PNG provides services to parts of eight (8) surrounding counties (Cheatham, Dickson, Robertson, Rutherford, Sumner, Trousdale, Williamson and Wilson) and has over 3,300 miles of underground transmission and distribution piping. PNG receives natural gas to supply its system from four (4) major interstate pipeline companies (EI Paso/Kinder Morgan, Columbia Gulf, Texas Eastern and East Tennessee).

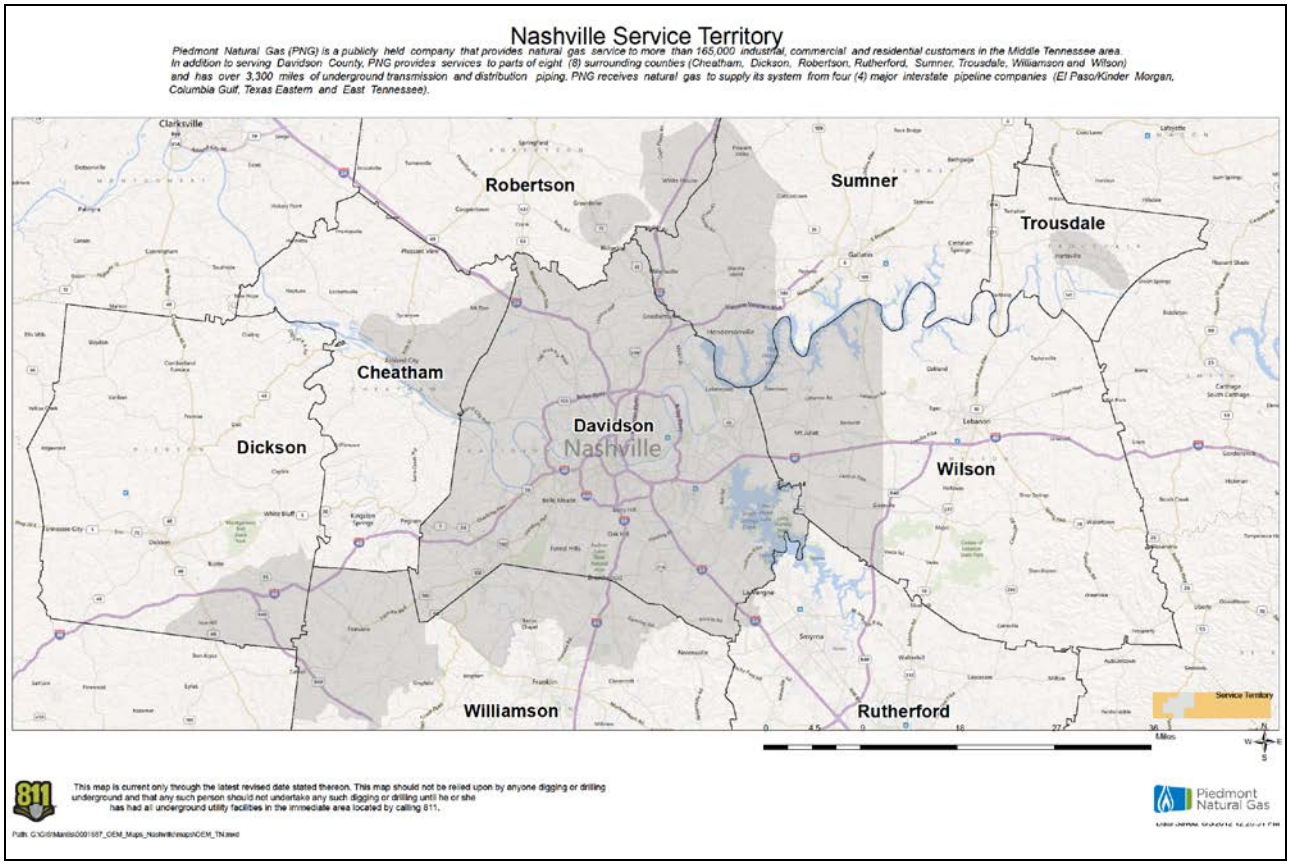


Figure 2-7: Piedmont Natural Gas Reach

Multi-Hazard Mitigation Plan
3.0 Planning Process

The Office of Emergency Management (OEM) in coordination with the community planning team facilitated updating this Multi-Hazard Mitigation Plan. The objectives were to:

- Establish a planning organization for Nashville and Davidson County and all of the participants;
- Meet all of the DMA requirements as established by federal regulations, following FEMA's planning guidance;
- Facilitate the entire planning process;
- Coordinate the DMA planning process with the Community Rating System planning process;
- Identify the data requirements that the participating counties, communities, and other FEMA "eligible applicants" could provide, and conduct the research and documentation necessary to augment that data;
- Develop and facilitate the Public Input process;
- Produce the Draft and Final Plan documents; and
- Formally adopt the plan following review and approval by FEMA Region IV.

For the 2020 revision, funding for the planning assistance personnel time was again provided "in-kind" by participants of the CPT. Many hours were spent on this effort by each of the planning team participants, as well as through the use of their facilities for meetings and actual materials provided for copying and public notices.

Metro OEM led the process for this planning effort utilizing the DMA planning requirements and FEMA's associated guidance, along with Emergency Management Accreditation Program standards. FEMA's guidance is structured around a 9-task process. Metro OEM also integrated the planning requirements for FEMA's Community Rating System (CRS) and Flood Mitigation Assistance (FMA) programs. Metro OEM formulated a single planning process that melds these planning requirements together and meets the requirements of six major programs: DMA, CRS, FMA, Hazard Mitigation Grant Program (HMGP), FEMA's Pre- Disaster Mitigation Program (PDM), and flood control projects authorized by the U.S. Army Corps of Engineers (USACE).

The following table also serves as a means of cross-referencing the planning requirements.

Disaster Mitigation Act Planning Regulations *(44 CFR 201.6)*	Local Mitigation Planning Handbook Tasks *(44 CFR Part 201)*	CRS Planning Steps
Planning process		
201.6(c)(1)	Task 1: Determine the Planning Area and Resources	1. Organize
	Task 2: Build the Planning Team	
201.6(b)(1)	Task 3: Create an Outreach Strategy	2. Involve the public
201.6(b)(2) & (3)	Task 4: Review Community Capabilities	3. Coordinate
Risk assessment		
201.6(c)(2)(i)	Task 5: Conduct a Risk Assessment	4. Assess the Hazard
201.6(c)(2)(ii) & (iii)		5. Assess the Problem
Mitigation strategy		
201.6(c)(3)(i)	Task 6: Develop a Mitigation Strategy	6. Set Planning Goals
201.6(c)(3)(ii)		7. Review Possible Activities
201.6(c)(3)(iii)		8. Draft an Action Plan
Plan maintenance		
201.6(c)(5)	Task 8: Review and Adopt the Plan	9. Adopt the Plan
201.6(c)(4)	Task 7: Keep the Plan Current	10. Implement, Evaluate, Revise
	Task 9: Create a Safe and Resilient Community	

Table 3-1: DMA and CRS Planning Cross Reference

LOCAL GOVERNMENT / COMMUNITY PARTICIPATION

FEMA planning regulations and guidance stress that each local government seeking the required FEMA approval of their mitigation plan must:

- Participate in the process;
- Detail areas within the Planning Area where the risk differs from that facing the entire area;
- Identify specific projects to be eligible for funding; and
- Have the Governing Board formally adopt the plan.

For Nashville and Davidson County, "participation" means the local government representatives will:

- Attend the Community Planning Team meetings;
- Provide available data that is requested by the Planning Team;
- Review and provide/coordinate comments on the Draft plans;
- Advertise, coordinate and participate in the Public Input process; and
- Coordinate the formal adoption of the plan.

Table 3-2 demonstrates the CPT member department's expertise in the six mitigation categories (Prevention, Property Protection, Natural Resource Protection, Emergency Services, Structural Flood Control Projects and Public Information). The Metro Planning/GIS department was an active participant on the CPT and provided important data and information throughout the plan, and was responsible for community land use and comprehensive planning.

Department	Prevention	Property Protection	Natural Resource Protection	Emergency Services	Structural Flood Control Projects	Public Information
Office of Emergency Management	✓	✓		✓		✓
Metro Water Services	✓	✓	✓		✓	✓
Metro Codes	✓	✓				✓
Metro Planning/GIS	✓					✓
Metro Public Works	✓					✓
NES		✓				✓
Universities						✓
Satellite Cities (In Davidson County)		✓				✓
Public Information Officers						✓

Table 3-2: Nashville CPT Capability with Six Mitigation Categories

THE PLANNING PROCESS

Step 1: Organize

With the commitment to lead the planning process by the Nashville Office of Emergency Management (OEM), the next steps involved an established framework and organization for the revision of the Multi-Hazard Mitigation Plan. This Plan was previously developed by a planning team led by OEM and comprised of key Metro and non-Metro stakeholders. This team is called the Community Planning Team, or CPT, and they met several times over several months. Representatives from several Metro and non-Metro departments attended these meetings including the Metro Water Services, Metro Public Works, Metro Planning Department; Metro Codes, Metro Fire, Metro Police, Nashville Electric Service, National Weather Service, Satellite Cities, local Universities and other stakeholders. On several occasions, someone from the public was in attendance at the planning meetings, and this is noted in the meeting minutes. The entire list of CPT members and meeting minutes are included in Appendix A. The CPT will stay in existence for the purpose of implementing and updating this plan, along with quarterly meetings to work towards annual reviews. The CPT meeting dates and topics for this revision were as follows:

1. March 14th, 2019 – Kick off meeting
2. April 9th, 2019 – HIRA & Consequence Analysis Meeting
3. April 17th, 2019 – Public Input Session
4. May 1st, 2019 – PIO Public Campaign Coordination Meeting
5. May 2nd, 2019 – Public Input Session
6. May 16th, 2019 – Plan Review Updates Meeting
7. June 20th, 2019 – Mid-Term Review Meeting
8. July 18th, 2019 – Public Campaign Coordination Meeting
9. July 30th, 2019 – Draft Plan Review Meeting
10. August 7th, 2019 – Public Input Session
11. August 15th, 2019 – Public Input Review Meeting
12. September 25th, 2019 – Final Plan Review Meeting

Step 2: Involve the Public

The CPT and stakeholder group contains about 28% non-local government members. In addition to the CPT, public input notices were sent to local media outlets, posted on the internet and in social media sites, and sent out by mass emails. As noted in step 3, coordination with other outside agencies was critical and implemented. During the planning process the public was afforded the opportunity to comment on the plan via an online survey. Hundreds of responses were received, and these responses were reviewed and considered by the planning committee during the planning process as noted in committee minutes. The results of the on-line survey were not inputted into this plan due to possible personal identifiable information; however, some graphic information is presented on the final results. The public was notified of three Public Input Sessions by OEM's press releases and social media posts. As recommended by the CRS, two public input sessions occurred at the beginning of the planning process, and then again near the end to obtain input on the draft final plan. More public involvement and outreach information is located in the new section Public Participation 3.1, and in Appendix A of this Plan.

Step 3: Coordinate with other Departments and Agencies

Early in the planning process, the CPT determined that data collection, mitigation and action strategy development, and plan approval would be greatly enhanced by inviting other state and federal agencies to participate in the planning process. Coordination letters were sent to numerous government and non-government agencies (listed in Appendix A) informing them of our plan revision, and inviting them to participate in the planning process, and requesting any information they may have that could be beneficial to our planning process. Based on their involvement in hazard mitigation planning, representatives from the following key agencies were included in the contact list requesting input into the planning process:

- U.S. Army Corps of Engineers, Nashville District;
- United States Geological Survey;
- United States Coast Guard;
- United States Department of Agricultural; and
- National Flood Insurance Program (NFIP) State Coordinator;

Other Federal/State representatives participated directly as members of the CPT and included: the National Weather Service, Tennessee Emergency Management Agency and the Tennessee Geological Survey. In addition, technical data, reports, and studies were obtained from these agencies either through web-based resources or directly from the agencies.

Neighboring communities (satellite cities) were also contacted for inclusion on the CPT along with ensuring open communication on the plan review. These communities included:

- Belle Meade;
- Berry Hill;
- Forest Hills;
- Goodlettsville;
- Oak Hill

As well as the following local Universities:

- TN State University
- Belmont University
- Vanderbilt University
- Trevecca University
- Fisk University

Relationship to Other Community Planning Efforts and Hazard Mitigation Activities

Coordination with other community planning efforts is also paramount to the success of this Plan. Hazard mitigation planning involves identifying existing community policies, tools and actions that will reduce a community's risk and vulnerability from natural hazards. Metro utilizes a variety of comprehensive planning mechanisms to guide and control community development, such as land use and master plans, emergency response and mitigation plans, and municipal ordinances and building codes. Integrating existing planning efforts and mitigation policies and action strategies into this Hazard Mitigation Plan establishes a credible and consistent plan that ties into and supports other community programs. This Plan, therefore, links the specific natural hazards that present a risk in the community with the existing mitigation elements found in the various community plans. The development of this Plan drew upon information included in the following plans, studies, reports, and initiatives:

- Metro's Office of Emergency Management: Metropolitan Nashville-Davidson County Multi- Hazard Mitigation Plan, September 2015
- Metro's Office of Emergency Management: Comprehensive Emergency Management Plan (CEMP), 2017
- Metro's Office of Emergency Management, Metro Nashville Wolf Creek Dam Failure Emergency Operations Plan 2008 (3 different water level scenario plans)
- Metro Water Services: Risk Management Plan
- Metro Water Services: COOP, 2014
- Metro Water Services: Stormwater Management Studies, various watersheds
- Metro Water Services: Stormwater Program and Organizational Study
- Metro Water Services: Community Rating System Action Plan
- Metro Water Services: Major Capital Improvement Program Planning and Prioritization
- Metro Water Services: Floodplain Management Plan for Repetitive Loss Areas
- Metro Water Services: Stormwater Business Plan, FY2009 – FY2013
- Metro Water Services: Comprehensive Stormwater User Fee Review, February 2016
- Metro Water Services: Drought Management Plan, June 2019
- Metro Water Services: Long-Term Control Plan , September 2011
- Metro Planning: NashvilleNext 2040 General Plan, which includes:
    - Metro Planning: 14 Community Plans
    - Metro Planning: Access Nashville 2040
    - Metro Planning: Major and Collector Street Plan
- Metro Planning: Various other plans
- NES: Emergency Load Curtailment Plan, (updated annually)
- NES: Emergency Response Plan (updated annually); and
- NES: Vegetation Management Plan

Additional references are included in Appendix D.

Step 4: Assess the Hazard

In 2005, the CPT conducted a Hazard Identification study to determine which hazards threaten the planning area. Research focused on previous occurrences, those that might occur in the future, and the likelihood of their occurrence or recurrence. In 2012 and 2014, the CPT conducted more Hazard Identification Risk Assessments (HIRA), and included both natural and manmade hazards. This HIRA was revisited and revised again in 2019. The completed HIRA is supplied in a report on the Nashville OEM website for the general public. The hazards identified for Metro Nashville Davidson County include:

- Dam and Levee Failures;
- Flooding
- Wildfires
- Hazardous Materials incidents
- Geological Hazards, which include
    - Earthquakes, and
    - Landslides and Sinkholes;
- Communicable Diseases/Public Health;

- Manmade Hazards (technological/terrorism); and
- Severe Weather, which includes:
  - Droughts
  - Extreme Temperatures (Hot & Cold);
  - Thunderstorms;
  - Tornadoes; and
  - Winter Storms.

The top 5 hazards that threaten this planning area are:

1. Flooding
2. Tornados
3. Winter Storms
4. Extreme Temperatures (Hot & Cold tied)
5. Thunderstorms

More detailed information regarding the HIRA is located in section 4 of this plan.

Step 5: Assess the Problem

Once the hazard identification step was complete, the CPT conducted both vulnerability and capability assessments to describe the impact that each identified hazard would have upon Metropolitan Nashville-Davidson County and to determine the current ability of Metropolitan Nashville and Davidson County to mitigate the hazards through existing policies, regulations, programs, and procedures. The analyses identified areas where improvements could or should be made.

Step 6: Set Planning Goals

Planning goals were established to incorporate improvement areas identified in Step 5 into the Mitigation Plan. The CPT set goals, formulated as public policy statements, that:

- Represent basic desires of the community;
- Encompass all aspects of the community, public and private;
- Are nonspecific, in that they refer to the quality (not the quantity) of the outcome;
- Are future-oriented, in that they are achievable in the future; and
- Are time-independent, in that they are not scheduled events.

Additionally, goals from other community programs and priorities were identified and discussed. This Multi-Objective Management (MOM) assisted the CPT in striving for efficiency by combining projects/needs from various community programs and plans that are similar in nature or location. Combining projects/needs through MOM effectively results in access to multiple sources of funding to solve problems that can be "packaged" and broadens the supporting constituency base by striving towards outcomes desired by multiple stakeholder groups.

Step 7: Review Possible Mitigation Activities

The CPT reviewed activities and goals presented in previous mitigation plans, and the last 2015 mitigation plan; this also included the review of any new activities and/or goals presented to the committee. This included review of the community survey, where it was asked of the public,

what they suggest for possible mitigation activities. The CPT continued to focus on the following categories of mitigation measures:

- Prevention;
- Floodplain Management Regulations
- Property Protection;
- Structural Projects;
- Natural Resource Protection;
- Emergency Services; and
- Public Information.

Step 8: Develop an Action Plan

The CPT continues to adhere to the above prioritized mitigation measures presented in 2005 that identifies the following for each measure:

- Source (developed by the CPT or originating from an existing plan);
- Mitigation category (prevention, property protection, etc.);
- Responsible office;
- Priority (high, medium, or low);
- Cost estimate;
- Benefit to the community;
- Potential funding sources; and
- Schedule for completion.

Step 9: Adopt the Plan

As was the case in 2015, the Metropolitan Mayor adopts the Multi-Hazard Mitigation Plan by letter of promulgation. All satellite cities are given the opportunity to adopt this plan as their city plan through letters of resolution at their respective public meetings.

Step 10: Implement, Evaluate, and Revise the Plan

Step 10 is critical to the overall success of Hazard Mitigation Planning. Upon adoption, the Mitigation Plan faces the truest test of its worth, implementation. Many worthwhile and high priority mitigation actions have been recommended. The CPT must decide which action to undertake based upon priority and available funding. The final plan (after FEMA approval) will be submitted to the governing body, released to the media, and made available to the public on the OEM website and the public library online catalog.

In addition, this Mitigation Plan requires on-going maintenance. There will be an ongoing effort by the Nashville Office of Emergency Management and the CPT, to monitor and evaluate the implementation of the plan, and to update the plan as progress, roadblocks, or changing circumstances are recognized. This review and evaluation process will include any lessons learned from either real world events, or exercise after action reviews. Quarterly reviews are conducted, and annual reports are created, submitted to the governing body, the media, and made available to the community. Every 5 years, a new full revision needs to be completed and submitted to the TN Emergency Management Agency and FEMA for approval.

Multi-Hazard Mitigation Plan
3.1 Public Participation

Public participation is paramount to a successful multi-jurisdictional Multi-Hazard Mitigation Plan. The CPT for this Plan decided there were several ways to reach the public, and gain feedback from them on the best ways to mitigate hazards in our area; public on-line surveys and community sessions.

The CPT also decided to create a new Public Campaign Coordination Group to better address the multi-hazard public outreach needs of this mitigation plan. This new group consists of public information officers from multiple agencies involved in the mitigation planning process. Initial agencies involved include:

- Nashville OEM
- Nashville Fire
- Metro Public Works
- Metro Water
- Metro Codes
- Metro Public Health
- Mayor's Office
- Nashville Electric Service
- City of Berry Hill
- City of Belle Meade
- City of Oak Hill
- Vanderbilt University
- Belmont University
- Trevecca University
- TN State University

Since this group is new and evolving, more agencies will be invited and encouraged to participate to enhance public messaging and engage more public participation. Nashville OEM is the lead agency with this group, to ensure consistency with the Multi-Hazard Mitigation Plan and the associated mitigating activities and hazards. This group will meet on a quarterly basis, along with an annual review of the program, to be coordinated with the CPT annual review, to create the annual report.

The Public Campaign Coordination Group's intent, through this plan, is to create and implement a program to reach the CPT's Goal #2: *promote awareness of hazards and vulnerability among citizens, business, industry and government*; Objective #2.1: *develop a seasonal multi-hazard public education campaign to be implemented annually*; and Recommended Action #2.1: *develop and conduct a multi-hazard, seasonal public awareness program that provides citizens and businesses with accurate information describing the risk and vulnerability to natural hazards, and is implemented on an annual basis.*

As suggested by the CPT, this educational program for the community should include information describing:

- historical events and losses,
- the likelihood of future occurrences,
- the range of possible impacts,
- appropriate actions citizens can take to save lives and minimize property damage, and

- resources for additional information.

Any information provided through this group needs to be accurate, specific, timely, and consistent with current and accepted local emergency management procedures as promoted by the Nashville Office of Emergency Management (OEM), TN Emergency Management Agency (TEMA), Federal Emergency Management Agency (FEMA), and the CRS Public Outreach – Activity 330.

Some of the topics that should be highlighted with this program should include:

- wind mitigation techniques (safe rooms, securing roofs/foundations etc.),
- information on geological hazards and risk areas,
- information on flood hazards, flood insurance, and safety tips,
- winter storm and heat wave tips,
- emergency preparedness plans and kits.

The group will utilize a variety of outlets to get the information to the community. This may include news media, websites/social media, bill inserts, information linked to online billing, brochures/flyers, government access television etc.

Public Outreach Results

As part of the public outreach for this mitigation plan, the CPT conducted several public input sessions (face to face), and created and distributed an on-line survey for public input. The public input session dates and locations, along with the link to the survey, were sent out via press releases, emails, social media sites (Facebook, Twitter, Nextdoor) and Metro Nashville websites. Through the press release, survey and website, the public was given the opportunity to email the OEM Planner for input.

The public input sessions offered a time for the community to come and talk with members of the CPT, and to view the current plan, bring any suggestions, concerns or possible mitigation solutions to the CPT. Unfortunately, these public input sessions did not garner much physical interest with the exception of the first session; one constituent attended and had some discussions with the entire group, and individually. The first public input session was scheduled at the beginning of the planning process so the CPT could hear what the public had to say about the plan and hazard mitigation in general. The first session was held in Midtown, which is near downtown, and is centralized in the county. The second public input session was also early in the planning process, but was in a different part of the county, South/Southeast part of the county, to appeal to others who didn't want to go to the first session near downtown. The South/Southeast area has some flood areas of concern, so a good portion of this area would have been affected previously by flooding. The third session was to afford the public the opportunity to review the draft plan prior to the CPT moving forward in finalizing the plan. Again, this third public input session was held in a different part of the county (east) to appeal to others, and this area has been affected by a tornado previously, and some flooding.

The on-line survey for public input included the option to rank the identified hazards they feel pose the biggest threat to them. They were also given a text box to suggest mitigation actions for

any of the hazards, and any additional comments. The actual questions on the survey were as follows:

1. Based on the above Planning Communities map, where do you live or work in Davidson County?
2. Have you ever experienced or been impacted by a disaster?
3. How concerned are you about the possibility of being impacted by a disaster?
4. Please rank the below hazards based on the hazards that you feel pose the biggest threat to you?
5. Is there a hazard not listed above that you feel is a threat we should include?
6. Do you have any specific suggestions for mitigating actions/activities for us to consider as a part of this plan? (mitigation is taking steps to reduce the likelihood of a disaster occurring or lessening its impact.)
7. Please feel free to share any other comments that you would like about the Multi-Hazard Mitigation Plan or the planning process.
8. Would you like to be contacted on future meetings/opportunities for this year's Multi-Hazard Mitigation Plan revision?
9. *Voluntary:* If you'd like to share with us. (name, company, address, email and phone number listed)

Most of the comments made on the on-line survey did not require action, and were simply statements or other comments not related to mitigation activities. Early in the life of the survey, the CPT was given a link to be able to instantly look at the live results and comments. CPT discussions happened throughout the planning process which was tied to the public survey and the public's comments. The results of the survey are not included within this plan due to any possible personal identifiable information.

Screen shots of the original on-line survey and all the different public outreach methods are following. This does not capture all the possible agencies sharing our social media posts, but at least the initial agencies that assisted in spreading the word.

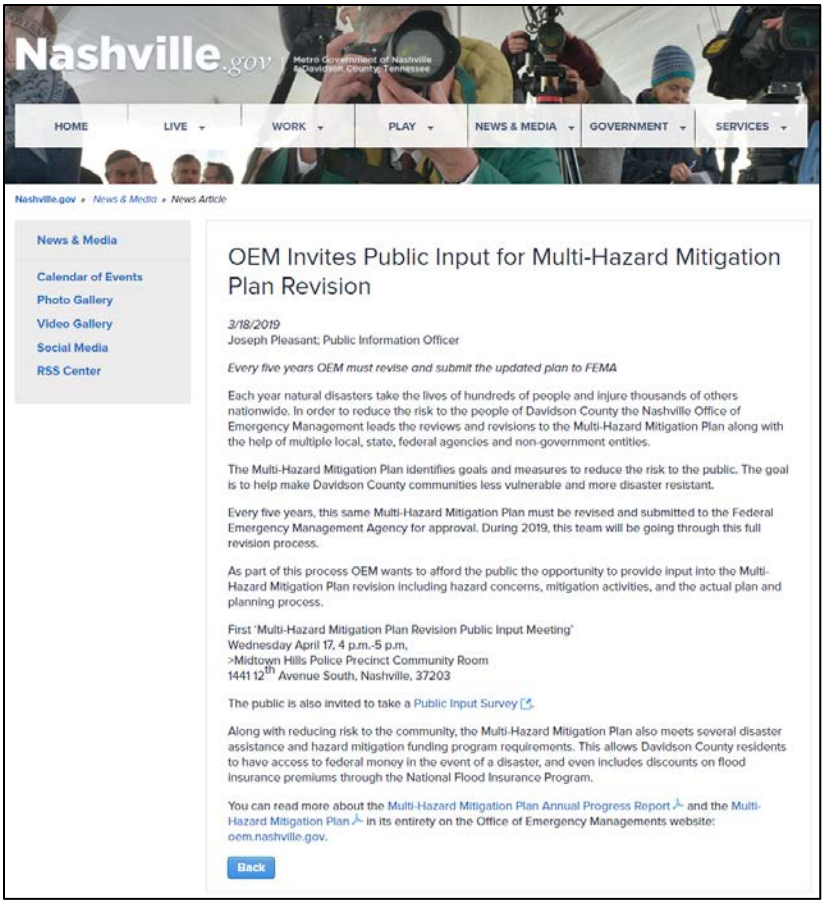


Figure 3-1: Initial Press Release about the revision

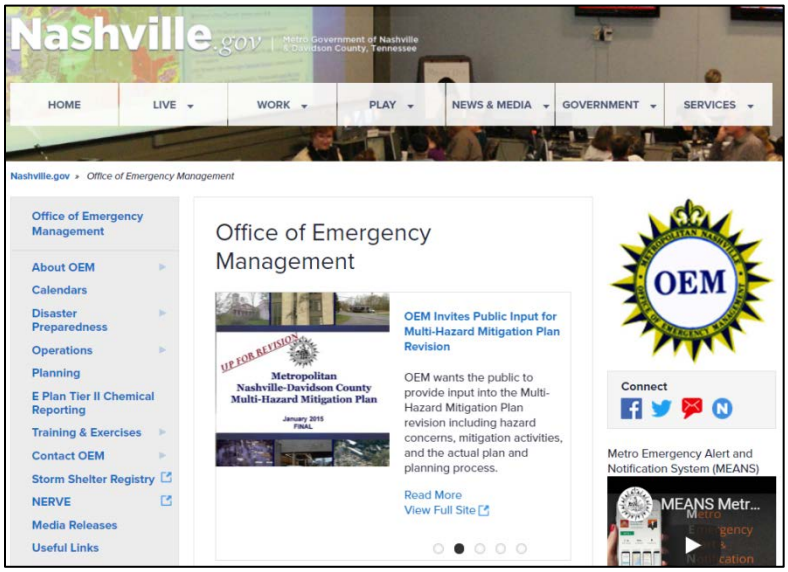
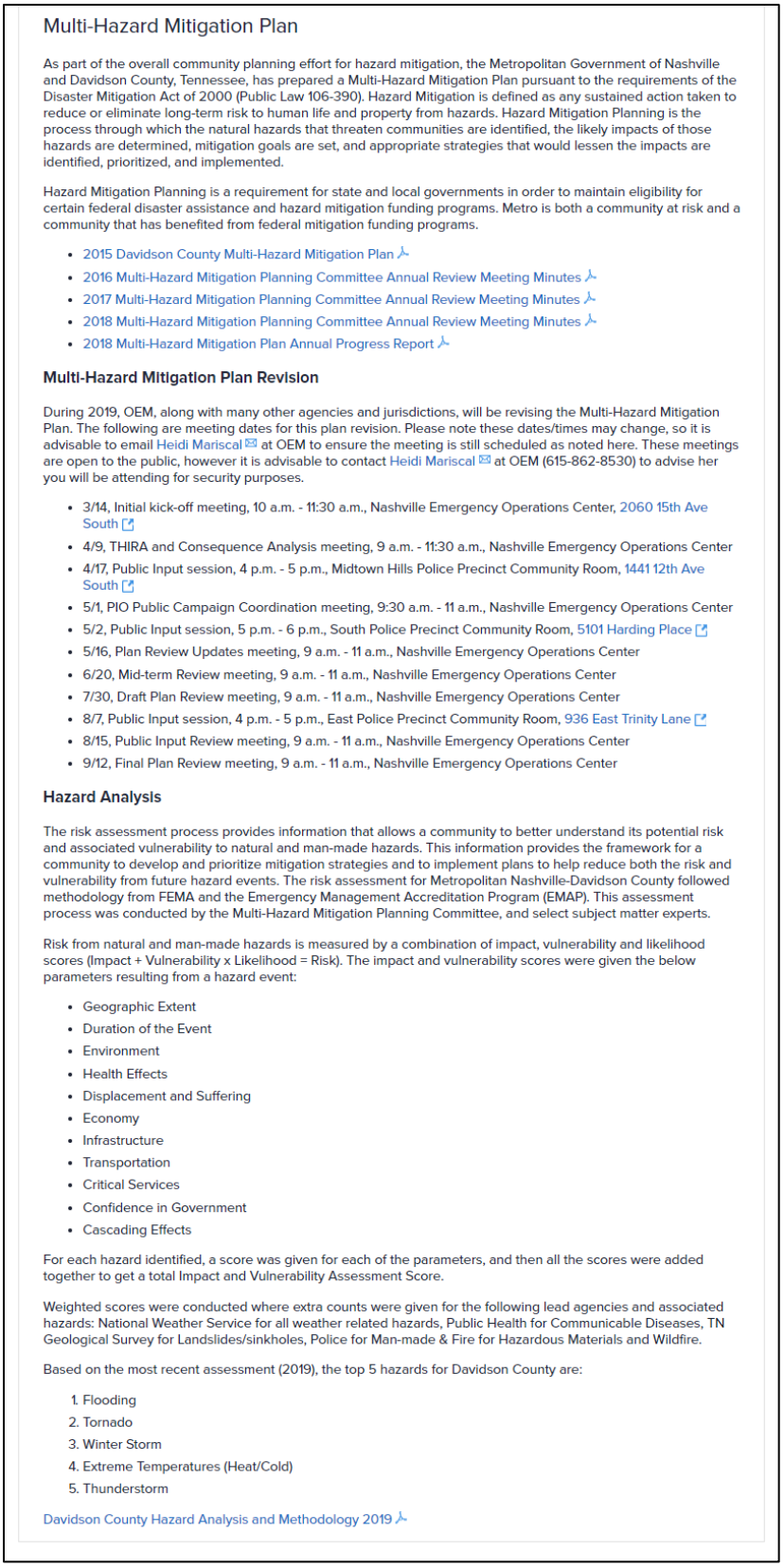


Figure 3-2: Mitigation Plan Revision on OEM's Featured Story on website



Multi-Hazard Mitigation Plan

As part of the overall community planning effort for hazard mitigation, the Metropolitan Government of Nashville and Davidson County, Tennessee, has prepared a Multi-Hazard Mitigation Plan pursuant to the requirements of the Disaster Mitigation Act of 2000 (Public Law 106-390). Hazard Mitigation is defined as any sustained action taken to reduce or eliminate long-term risk to human life and property from hazards. Hazard Mitigation Planning is the process through which the natural hazards that threaten communities are identified, the likely impacts of those hazards are determined, mitigation goals are set, and appropriate strategies that would lessen the impacts are identified, prioritized, and implemented.

Hazard Mitigation Planning is a requirement for state and local governments in order to maintain eligibility for certain federal disaster assistance and hazard mitigation funding programs. Metro is both a community at risk and a community that has benefited from federal mitigation funding programs.

- 2015 Davidson County Multi-Hazard Mitigation Plan
- 2016 Multi-Hazard Mitigation Planning Committee Annual Review Meeting Minutes
- 2017 Multi-Hazard Mitigation Planning Committee Annual Review Meeting Minutes
- 2018 Multi-Hazard Mitigation Planning Committee Annual Review Meeting Minutes
- 2018 Multi-Hazard Mitigation Plan Annual Progress Report

Multi-Hazard Mitigation Plan Revision

During 2019, OEM, along with many other agencies and jurisdictions, will be revising the Multi-Hazard Mitigation Plan. The following are meeting dates for this plan revision. Please note these dates/times may change, so it is advisable to email Heidi Mariscal at OEM to ensure the meeting is still scheduled as noted here. These meetings are open to the public, however it is advisable to contact Heidi Mariscal at OEM (615-862-8530) to advise her you will be attending for security purposes.

- 3/14, Initial kick-off meeting, 10 a.m. - 11:30 a.m., Nashville Emergency Operations Center, 2060 15th Ave South
- 4/9, THIRA and Consequence Analysis meeting, 9 a.m. - 11:30 a.m., Nashville Emergency Operations Center
- 4/17, Public Input session, 4 p.m. - 5 p.m., Midtown Hills Police Precinct Community Room, 1441 12th Ave South
- 5/1, PIO Public Campaign Coordination meeting, 9:30 a.m. - 11 a.m., Nashville Emergency Operations Center
- 5/2, Public Input session, 5 p.m. - 6 p.m., South Police Precinct Community Room, 5101 Harding Place
- 5/16, Plan Review Updates meeting, 9 a.m. - 11 a.m., Nashville Emergency Operations Center
- 6/20, Mid-term Review meeting, 9 a.m. - 11 a.m., Nashville Emergency Operations Center
- 7/30, Draft Plan Review meeting, 9 a.m. - 11 a.m., Nashville Emergency Operations Center
- 8/7, Public Input session, 4 p.m. - 5 p.m., East Police Precinct Community Room, 936 East Trinity Lane
- 8/15, Public Input Review meeting, 9 a.m. - 11 a.m., Nashville Emergency Operations Center
- 9/12, Final Plan Review meeting, 9 a.m. - 11 a.m., Nashville Emergency Operations Center

Hazard Analysis

The risk assessment process provides information that allows a community to better understand its potential risk and associated vulnerability to natural and man-made hazards. This information provides the framework for a community to develop and prioritize mitigation strategies and to implement plans to help reduce both the risk and vulnerability from future hazard events. The risk assessment for Metropolitan Nashville-Davidson County followed methodology from FEMA and the Emergency Management Accreditation Program (EMAP). This assessment process was conducted by the Multi-Hazard Mitigation Planning Committee, and select subject matter experts.

Risk from natural and man-made hazards is measured by a combination of impact, vulnerability and likelihood scores (Impact + Vulnerability x Likelihood = Risk). The impact and vulnerability scores were given the below parameters resulting from a hazard event:

- Geographic Extent
- Duration of the Event
- Environment
- Health Effects
- Displacement and Suffering
- Economy
- Infrastructure
- Transportation
- Critical Services
- Confidence in Government
- Cascading Effects

For each hazard identified, a score was given for each of the parameters, and then all the scores were added together to get a total Impact and Vulnerability Assessment Score.

Weighted scores were conducted where extra counts were given for the following lead agencies and associated hazards: National Weather Service for all weather related hazards, Public Health for Communicable Diseases, TN Geological Survey for Landslides/sinkholes, Police for Man-made & Fire for Hazardous Materials and Wildfire.

Based on the most recent assessment (2019), the top 5 hazards for Davidson County are:

1. Flooding
2. Tornado
3. Winter Storm
4. Extreme Temperatures (Heat/Cold)
5. Thunderstorm

Davidson County Hazard Analysis and Methodology 2019

Figure 3-3: OEM's website, Planning Section

Figure 3-4: OEM Facebook Posts for Public Meetings

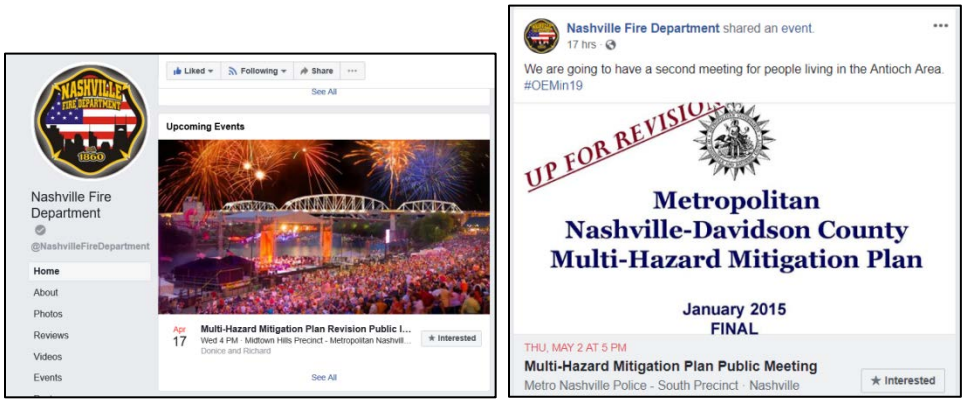


Figure 3-5: Nashville Fire Dept. Facebook Posts for April and May Public Mtg.

Figure 3-6: OEM Event Postings on Nextdoor for Public Mtgs.

Figure 3-7: OEM and Nashville Fire Twitter Posts

Figure 3-8: Metro Water Services Twitter Post for Survey

Figure 3-9: Nashville Police Facebook Post for April Mtg. and Survey

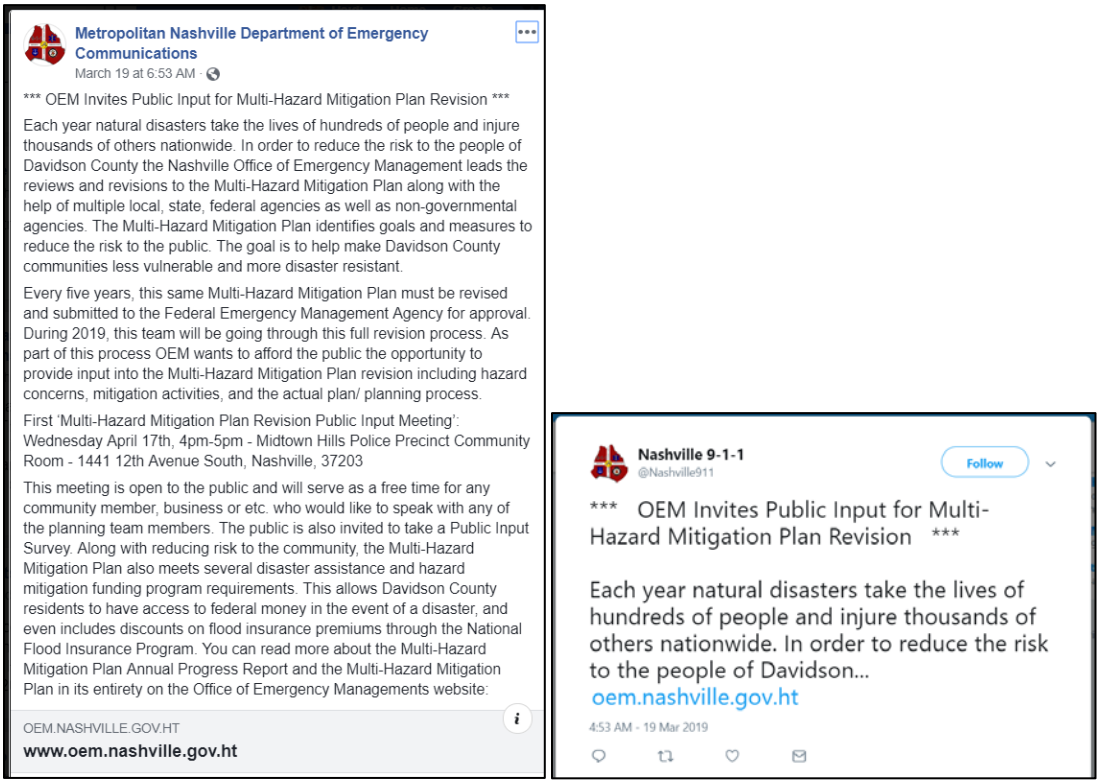


Figure 3-10: Nashville Dept. of Emergency Communications Facebook & Twitter post

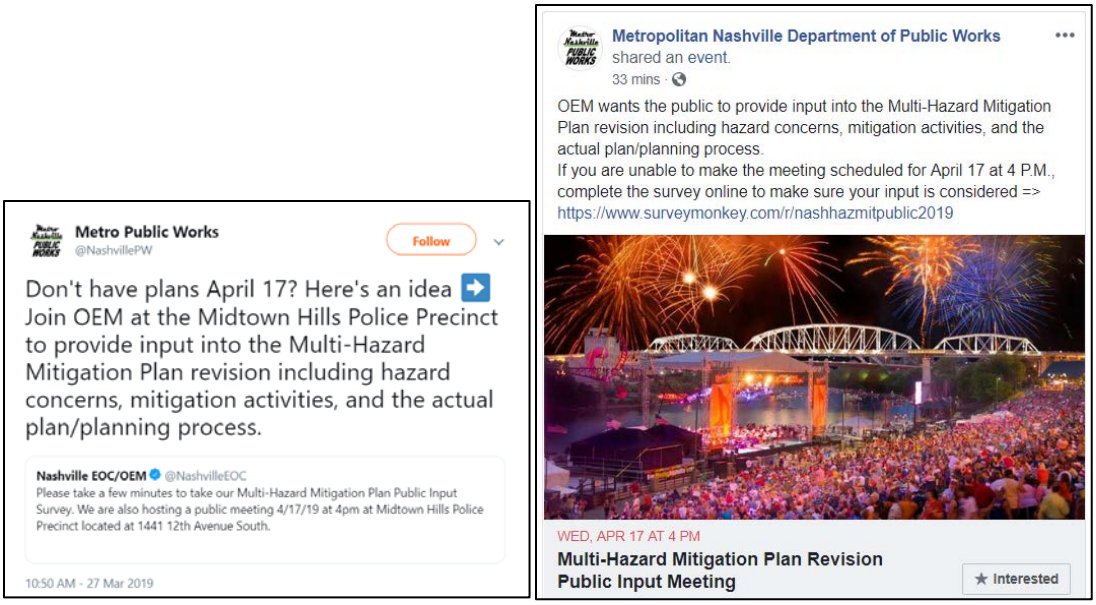
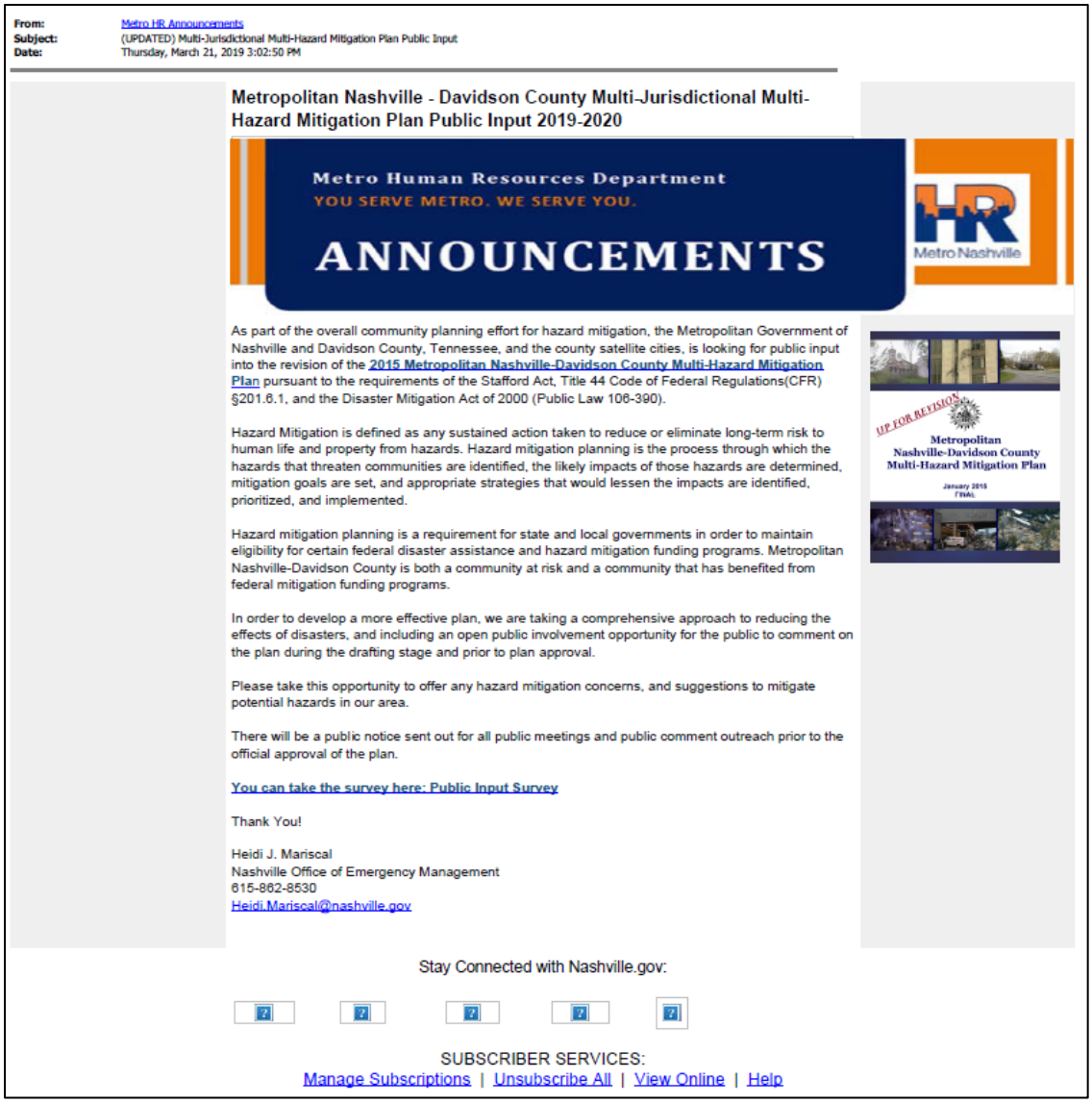


Figure 3-11: Metro Public Works Facebook & Twitter posts

Figure 3-12: Goodlettsville Fire sharing our 4/17/19 Public Mtg. on Facebook.



From: Metro HR Announcements
Subject: (UPDATED) Multi-Jurisdictional Multi-Hazard Mitigation Plan Public Input
Date: Thursday, March 21, 2019 3:02:50 PM

Metropolitan Nashville - Davidson County Multi-Jurisdictional Multi-Hazard Mitigation Plan Public Input 2019-2020

Metro Human Resources Department
YOU SERVE METRO. WE SERVE YOU.

ANNOUNCEMENTS

HR Metro Nashville

As part of the overall community planning effort for hazard mitigation, the Metropolitan Government of Nashville and Davidson County, Tennessee, and the county satellite cities, is looking for public input into the revision of the 2015 Metropolitan Nashville-Davidson County Multi-Hazard Mitigation Plan pursuant to the requirements of the Stafford Act, Title 44 Code of Federal Regulations(CFR) §201.6.1, and the Disaster Mitigation Act of 2000 (Public Law 106-390).

Hazard Mitigation is defined as any sustained action taken to reduce or eliminate long-term risk to human life and property from hazards. Hazard mitigation planning is the process through which the hazards that threaten communities are identified, the likely impacts of those hazards are determined, mitigation goals are set, and appropriate strategies that would lessen the impacts are identified, prioritized, and implemented.

Hazard mitigation planning is a requirement for state and local governments in order to maintain eligibility for certain federal disaster assistance and hazard mitigation funding programs. Metropolitan Nashville-Davidson County is both a community at risk and a community that has benefited from federal mitigation funding programs.

In order to develop a more effective plan, we are taking a comprehensive approach to reducing the effects of disasters, and including an open public involvement opportunity for the public to comment on the plan during the drafting stage and prior to plan approval.

Please take this opportunity to offer any hazard mitigation concerns, and suggestions to mitigate potential hazards in our area.

There will be a public notice sent out for all public meetings and public comment outreach prior to the official approval of the plan.

You can take the survey here: Public Input Survey

Thank You!

Heidi J. Mariscal
Nashville Office of Emergency Management
615-862-8530
Heidi.Mariscal@nashville.gov

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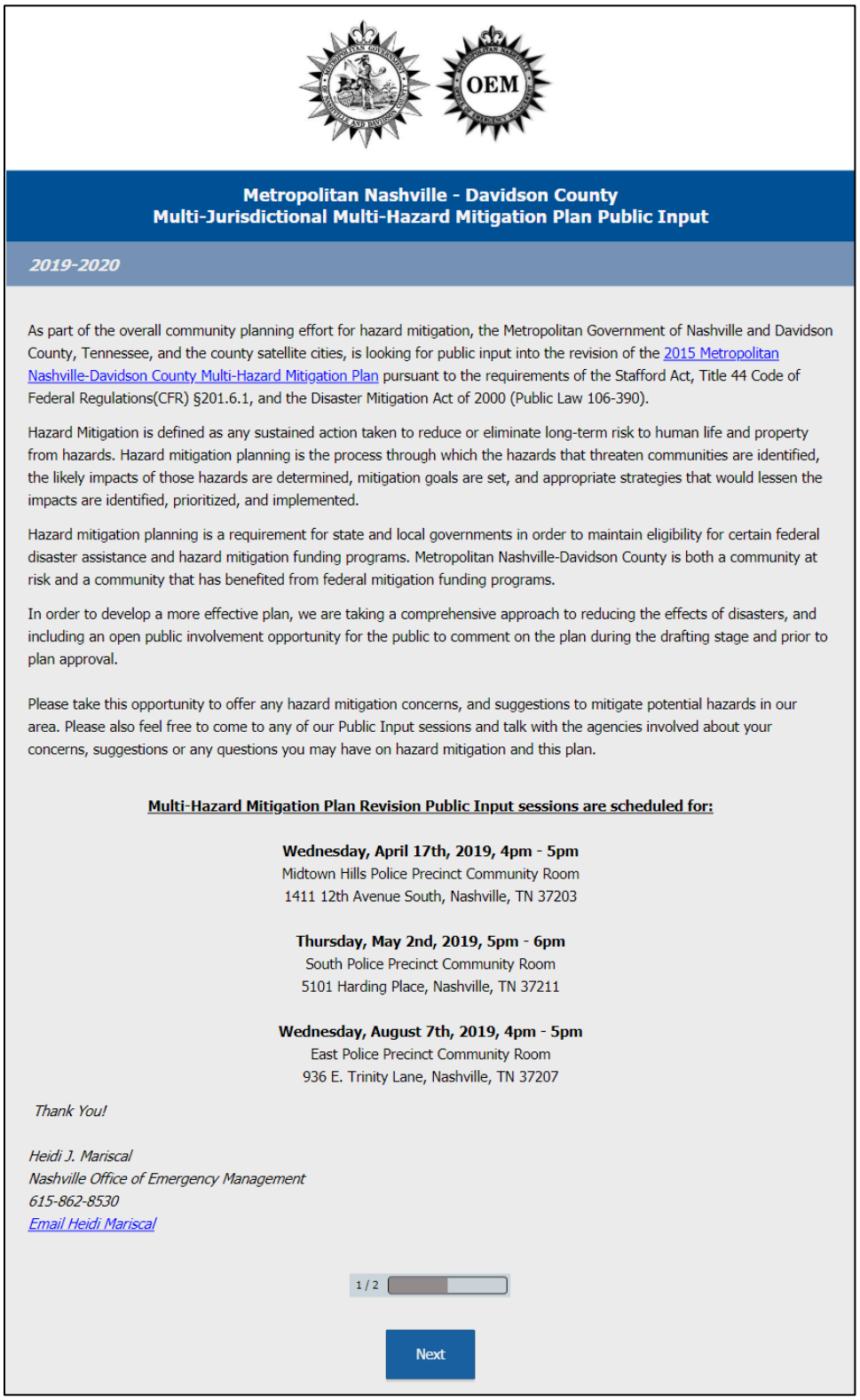
Figure 3-13: Metro Wide Email for Survey

Figures 3-14 and 3-15 show the actual blank survey used for public input. Note that all of the public input meetings are noted on the survey for anyone to see that clicks on the links.



Metropolitan Nashville - Davidson County
Multi-Jurisdictional Multi-Hazard Mitigation Plan Public Input

2019-2020

As part of the overall community planning effort for hazard mitigation, the Metropolitan Government of Nashville and Davidson County, Tennessee, and the county satellite cities, is looking for public input into the revision of the 2015 Metropolitan Nashville-Davidson County Multi-Hazard Mitigation Plan pursuant to the requirements of the Stafford Act, Title 44 Code of Federal Regulations(CFR) §201.6.1, and the Disaster Mitigation Act of 2000 (Public Law 106-390).

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In order to develop a more effective plan, we are taking a comprehensive approach to reducing the effects of disasters, and including an open public involvement opportunity for the public to comment on the plan during the drafting stage and prior to plan approval.

Please take this opportunity to offer any hazard mitigation concerns, and suggestions to mitigate potential hazards in our area. Please also feel free to come to any of our Public Input sessions and talk with the agencies involved about your concerns, suggestions or any questions you may have on hazard mitigation and this plan.

Multi-Hazard Mitigation Plan Revision Public Input sessions are scheduled for:

Wednesday, April 17th, 2019, 4pm - 5pm
Midtown Hills Police Precinct Community Room
1411 12th Avenue South, Nashville, TN 37203

Thursday, May 2nd, 2019, 5pm - 6pm
South Police Precinct Community Room
5101 Harding Place, Nashville, TN 37211

Wednesday, August 7th, 2019, 4pm - 5pm
East Police Precinct Community Room
936 E. Trinity Lane, Nashville, TN 37207

Thank You!

Heidi J. Mariscal
Nashville Office of Emergency Management
615-862-8530
Email Heidi Mariscal

1 / 2

Next

Figure 3-14: Public Input Survey

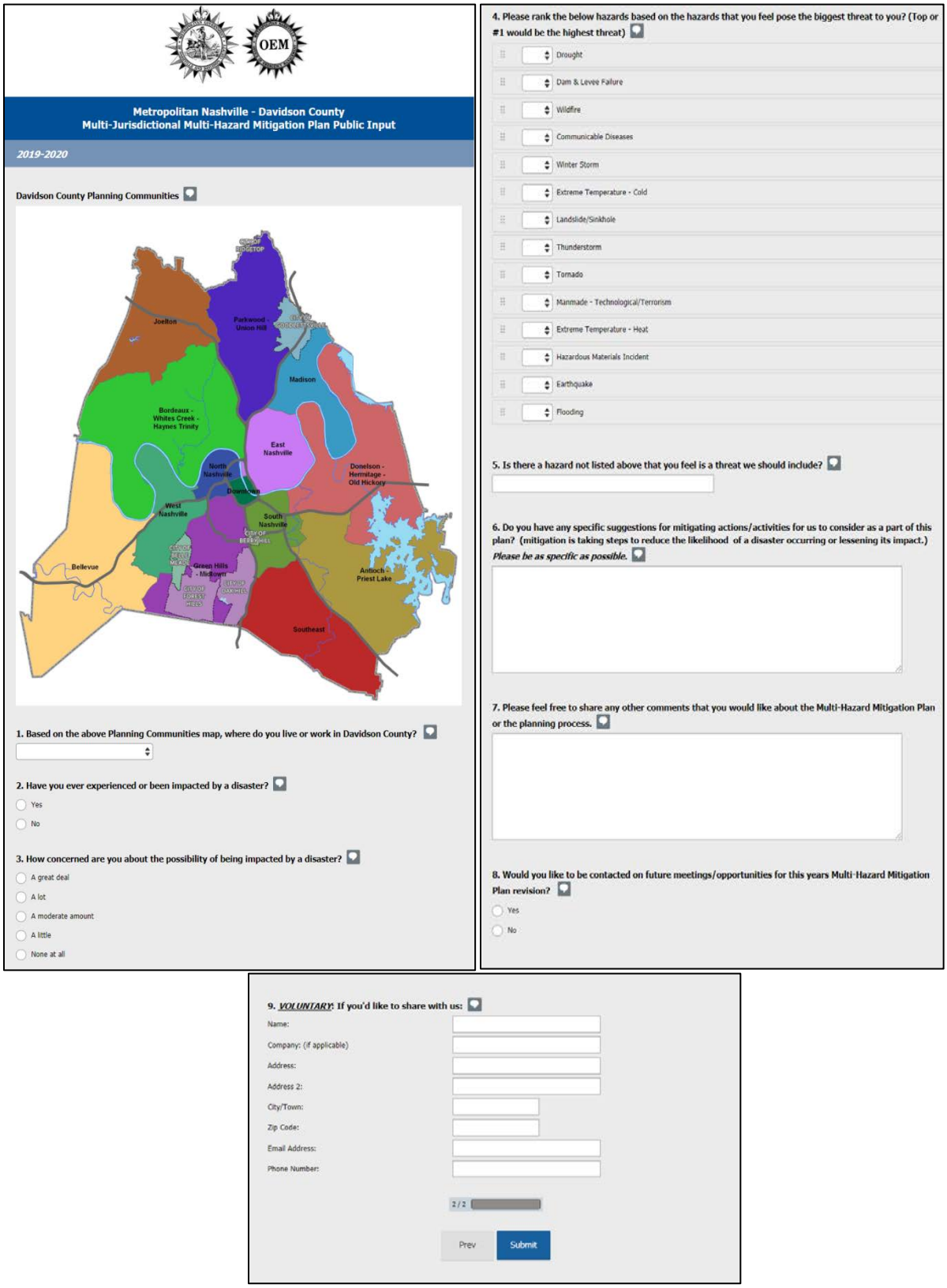

Figure 3-15: Public Input Survey

Figures 3-16 – 3.20 presents some of the findings from the on-line public survey conducted through the entire planning process of this revision. A total of 850 responses were received (minus hundreds of blank responses), with the majority, 88%, coming through social media posts, and the remaining 12% from web links (within emails, press releases etc.).

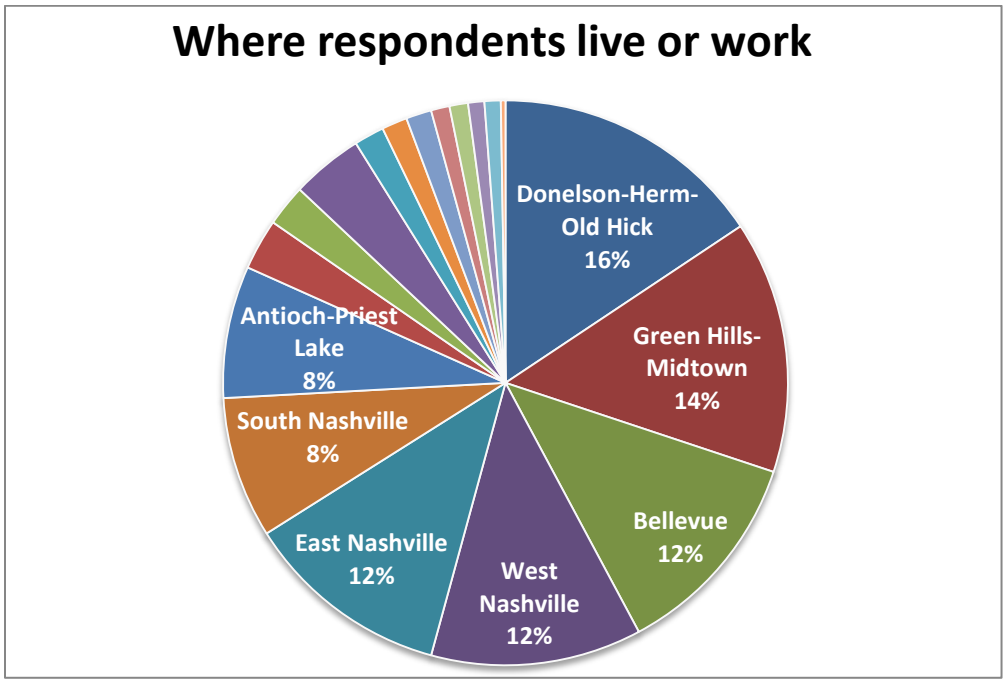

Figure 3-16: Where do the respondents live or work

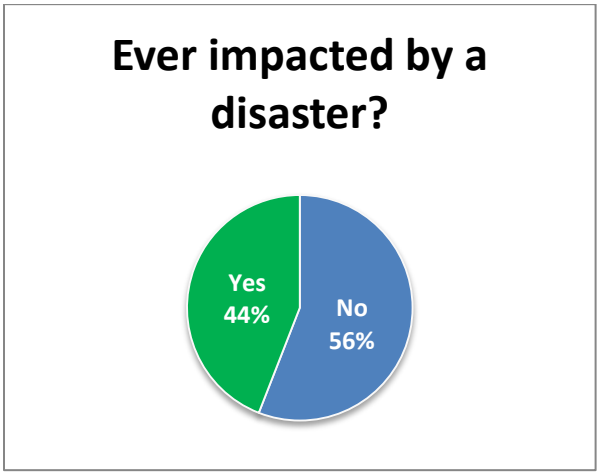

Figure 3-17: Respondents impacted?

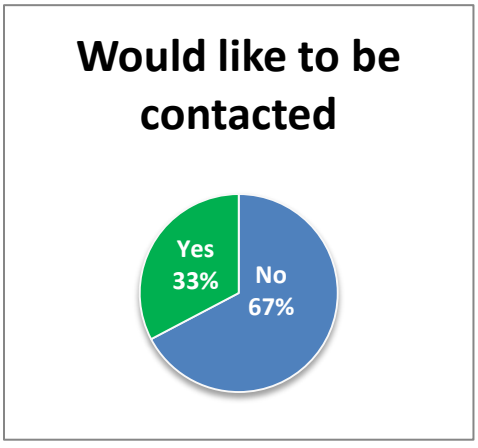

Figure 3-18: Like to be contacted?

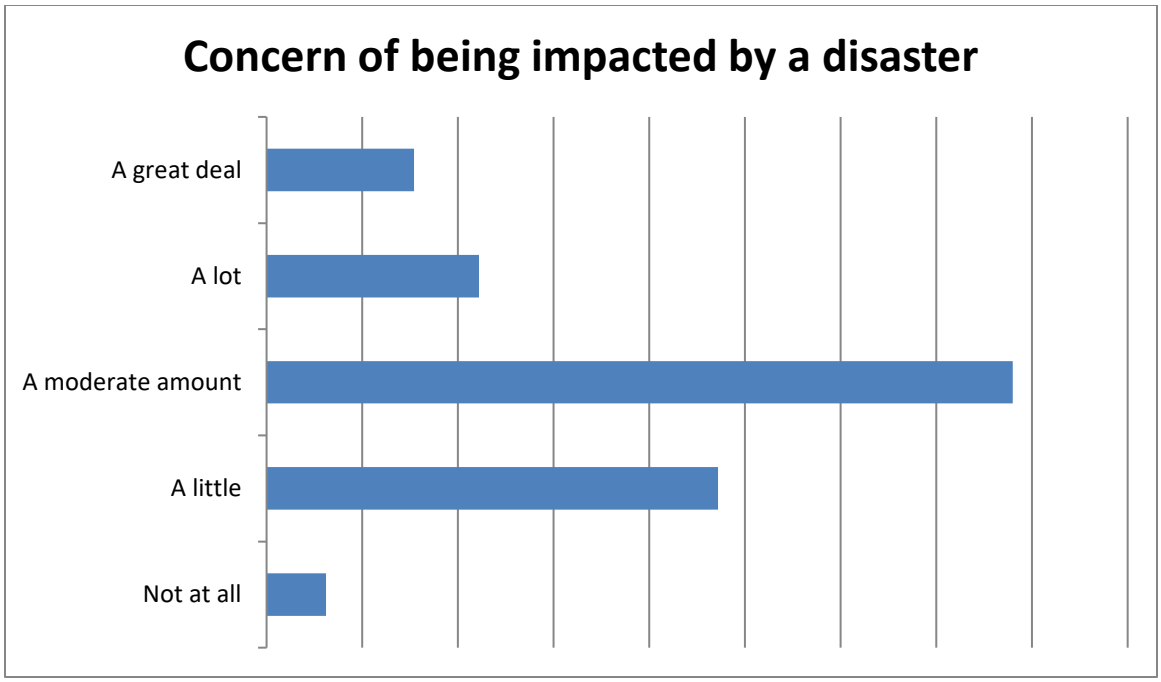

Figure 3-19: How concerned about the possibility of being impacted by a disaster

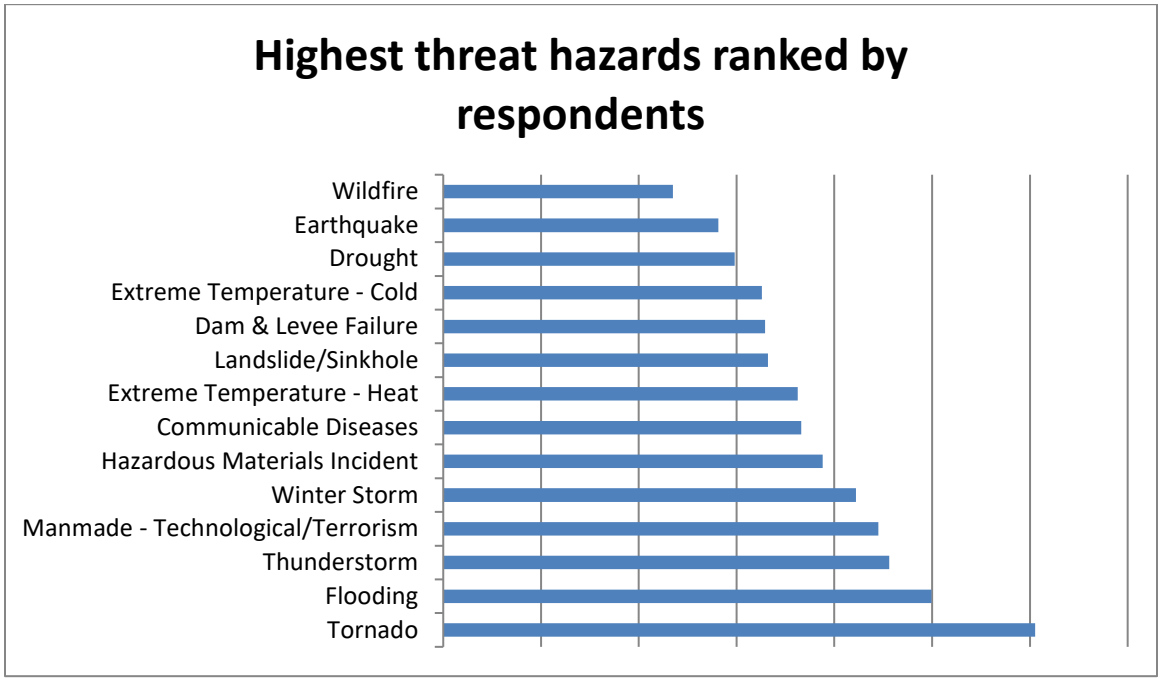

Figure 3-20: Hazards ranked by respondents on highest threat to them

Multi-Hazard Mitigation Plan

4.0 Risk Assessment

44 CFR 201.6(c)(2)(ii): "The risk assessment shall include…A description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

The risk assessment process provides information that allows a community to better understand its potential risk and associated vulnerability to natural and manmade hazards. This information provides the framework for a community to develop and prioritize mitigation strategies and to implement plans to help reduce both the risk and vulnerability from future hazard events. The risk assessment for Metropolitan Nashville-Davidson County followed methodology from FEMA and the Emergency Management Accreditation Program (EMAP). This assessment process was conducted by the CPT and select subject matter experts.

All the satellite cites, TN State University and other higher educational jurisdictions are all located within Metro Nashville Davidson County, and therefore are all exposed to the same hazards, level of impact and vulnerability, and have the potential to experience the same extent of risk.

Risk from natural and manmade hazards is measured by a combination of impact, vulnerability and likelihood scores (Impact + Vulnerability x Likelihood = Risk). The impact and vulnerability scores were given the below parameters resulting from a hazard event:

- Geographic Extent
- Duration of the Event
- Environment
- Health Effects
- Displacement and Suffering
- Economy
- Infrastructure
- Transportation
- Critical Services
- Confidence in Government
- Cascading Effects

For each hazard identified, each agency on the CPT gave a score for each of the parameters, and then all the scores were added together to get an overall total Impact and Vulnerability Assessment Score.

Weighted scores were conducted where extra counts were given for the following lead agencies and associated hazards: National Weather Service for all weather related hazards, Public Health for Communicable Diseases, TN Geological Survey for Earthquakes & Landslides/sinkholes, Nashville Electric Service for Earthquakes, Police for Manmade-Technological/Terrorism, and Fire for Hazardous Materials and Wildfire.

Table 4-1 defines each of the above parameters.

HIRA Impact & Vulnerability Parameters						
Parameter	***Definition***	***1***	***2***	***3***	***4***	***5***
Geographic Extent	Size of the affected area. Includes areas not damaged but strongly affected by the incidents. For example, areas backed up by a transportation accident.	Single site. One or two blocks.	Single site. Multiple blocks.	Community (downtown, Berry Hill)	City-wide	Regional. (Winter Storms.)
Duration	How long does the acute crisis part of the disaster last?	Less than 24 hours	1-3 days	4-7 days	7-30 days	30+ days
Environment	How damaging is the disaster for the natural environment?	No damage/ temporary minor damage	Degradation of ecosystem that will repair itself	Degradation of ecosystem that requires intervention	Functional loss of ecosystem, but restoration is possible	Permanent loss of ecosystem
Health Effects (Deaths and Injuries)	How dangerous is the disaster for the natural environment?	No deaths or injuries	1-10 deaths and/or 1-100 injuries	11-50 deaths and/or 101-500 injuries	51-500 deaths and/or 501-1500 injuries	Over 501 deaths and/or 1501 injuries
Displacement and Suffering	How likely is the hazard to negatively impact the exposed population in terms of displacement, personal property loss and increased indebtedness?	No displaced people	Vulnerable populations begin to have problems with food, water, access to shelter.	Vulnerable populations having serious difficulties. General population starting to have problems.	251-1000 people displaced. 5-30% of population facing acute shortages.	1000+ displaced people. More than 30% of population facing acute shortages of basic supplies and access to services.
Economy	How does the hazard affect the local economy?	No measurable impacts	No impacts to overall economy but isolated businesses experience hardship.	Entire sectors experience loss of revenue and capital.	Core sectors of economy are affected and unable to generate revenue. Capital losses between 1-10%	Physical losses equal to 10% to assess value. Loss of ability to generate revenue.
Built Environment (Property, Facilities, Infrastructure)	How does the hazard affect buildings and physical infrastructure? (Includes utilities)	No effects.	1-10 structures uninhabitable (red tagged). Up to 25% loss of one utility.	11-250 structures red tagged. Multiple utilities affected up to 25%.	251-1000 structures red tagged. Multiple utilities affected 25-50%.	1000+ structures red tagged. At least two major utilities degraded at least 50%.
Transportation	How does the hazard affect the ability of residents and workers to access the resources they need?	No effects on mobility	All critical services accessible, but delays reaching work or non essential services	One critical service inaccessible. Degradation of at least one mode. Major corridors open, but minor streets degraded or impassible.	Many critical services inaccessible. One major mode inoperable. One major corridor inoperable.	Most critical services inaccessible. Multiple modes inoperable. Most high volume corridors impassible.
Critical Services (Continuity of Operations and Responders)	How likely is the hazard to reduce the ability of government and business to provide critical services? (Medical, Public Safety, Social, Financial, etc)	No impairment on critical services	Temporary degradation of 1 critical service	Temporary degradation of multiple critical services. Long term degradation of 1 critical service	Temporary degradation of most critical services. Long term degradation of multiple services.	Unable to deliver most critical services.
Confidence in Government	Would public's confidence in government be shaken?	No	(Not used)	Somewhat	(Not used)	Yes
Cascading Effects	How severe and complex will the secondary effects be?	Hazard extremely unlikely to cause secondary hazards. If they occur, would have minor effect.	Secondary hazards may occur, but are likely to be minor compared to primary hazard	Secondary hazards occur that extend the impact of the disaster and hamper response, but are not disasters in their own right.	Secondary effects generated that significantly increase the magnitude of the disaster. Secondary impacts would likely be considered disasters if they occurred by themselves.	Secondary effects generated and rival or exceed primary hazard. Secondary impacts would definitely be disasters in their own right.

Table 4-1: HIRA Impact & Vulnerability Parameters

Following are the combined scores from all the participants for each of the hazards identified with each of the parameters.

OVERALL Impact & Vulnerability Assessment Scores 2019	Geographical Extent	Duration	Environment	Health Effects	Displacement	Economy	Built Environment	Transportation	Critical Services	Confidence in Govt	Cascading Effects	
Hazard	1	2	3	4	5	6	7	8	9	10	11	Total
Dam & Levee Failure	4	3	3	3	3	3	3	3	3	3	3	33
Flooding	3	3	3	3	3	2	3	3	3	3	3	31
Earthquake	4	3	3	3	3	3	4	4	3	3	3	36
Landslide/Sinkhole	2	2	2	2	2	1	2	2	1	2	1	19
Communicable Diseases	4	4	2	3	2	2	2	2	2	3	2	28
Drought	5	4	3	2	1	2	1	1	2	2	2	25
Wildfire	3	3	3	2	3	2	2	2	2	2	2	26
Extreme Temperature - Cold	5	3	2	2	2	2	1	2	2	2	2	25
Extreme Temperature - Heat	5	3	2	2	2	2	1	1	2	2	2	25
Thunderstorm	4	2	2	2	2	1	2	2	2	2	2	20
Tornado	3	2	3	3	3	2	3	2	2	2	3	29
Winter Storm	5	3	2	2	2	2	2	3	2	2	2	28
Manmade - Technological/Terrorism	3	3	2	3	2	3	2	2	2	3	2	29
Hazardous Materials Incident	2	2	3	2	2	2	2	2	2	2	2	25

Table 4-2: Impact & Vulnerability Assessment Scores

Next in this process was to calculate the Hazard Likelihood score. This score is based on its past frequency and the best estimate of when that particular hazard might reoccur. Table 4-3 outlines this ranking.

Hazard Likelihood Parameters		
Measure of likelihood	**Return period in years**	**Rank**
Frequent or very likely	Every 1-3 years	**6**
Moderate or likely	Every 3-10 years	**5**
Occasional, slight chance	Every 10-30 years	**4**
Unlikely, improbable	Every 30-100 years	**3**
Highly unlikely, rare event	Every 100-200 years	**2**
Very rare event	Every 200-300 years	**1**

Table 4-3: HIRA Hazard Likelihood Parameters

Hazard Likelihood Methodology Explanations:

Frequent or very likely
"Frequent or very likely to occur, events usually have a high number of recorded incidents or anecdotal evidence. (For example, an area that is subject to flooding every year or so)"

Moderate or likely
"Moderate or likely to occur, hazards also have a historical record but occur with a frequency of 3-10 years. (For example, an area that faces an infectious disease outbreak every few years)"

Occasional, slight chance
"Occasional or slight chance means events are those that occur infrequently. There may be little recorded historical evidence and a return interval of 10-30 years. (For example, a rail accident where dangerous chemicals are released)"

Unlikely, improbable
"Unlikely or improbable refers to hazards that are not expected to occur more frequently than once every 30-100 years. There may be no historical incidents in the community. (For example, a plane crash with total loss of life)"

Highly unlikely, rare
"Highly unlikely or rare events are extremely unlikely and have a return period of 100-200 years. (For example, a one hundred year flood)"

Very rare event
"Very rare events may happen every 200+ years. (For example, a large earthquake)"

Impact and Vulnerability Assessment x Hazard Likelihood = Risk

Table 4-4 shows the completed chart with the previous Impact and Vulnerability Assessment scores multiplied by the combined Hazard Likelihood scores to come up with the Risk Factor scores for each hazard.

OVERALL Total Risk Scores for Davidson County 2019			
Hazard	Impact & Vulnerability	x Likelihood	= Risk Factor
Flooding	31.26	5.24	**164**
Tornado	29.38	4.92	**144**
Winter Storm	27.91	4.94	**138**
Extreme Temperature - Heat	24.65	4.94	**122**
Extreme Temperature - Cold	24.71	4.88	**121**
Thunderstorm	20.47	5.76	**118**
Hazardous Materials Incident	24.65	4.65	**115**
Communicable Diseases	27.76	3.76	**105**
Drought	24.91	4.09	**102**
Manmade - Technological/Terrorism	28.82	3.53	**102**
Dam & Levee Failure	33.21	2.59	**86**
Wildfire	26.06	3.24	**84**
Landslide/Sinkhole	18.83	4.11	**77**
Earthquake	35.71	1.81	**64**

Table 4-4: HIRA Total Risk Scores

Based on this most recent assessment (2019), the top 5 hazards for Davidson County are:

1. Flooding
2. Tornado
3. Winter Storm
4. Extreme Temperatures (Heat/Cold)
5. Thunderstorm

This risk assessment covers DMA Planning Step 4: Assess the Hazard and DMA Planning and Step 5: Assess the Problem. It also includes a third component, Existing Mitigation Capabilities, where the risk and vulnerability are analyzed in light of existing mitigation measures, for example, the adoption and enforcement of building codes, warning systems, and floodplain development regulations.

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Multi-Hazard Mitigation Plan

4.1 Hazard Identification

INTRODUCTION

The Metropolitan Nashville-Davidson Community Planning Team (CPT) conducted a Hazard Identification study to determine what hazards threaten the planning area. This section of the plan documents the previous occurrence of hazards, those that might occur in the future, and the likelihood of their occurrence or recurrence.

The hazards identified and investigated in the Metropolitan Nashville-Davidson County area include:

- Dam and Levee Failure;
- Flooding;
- Geological Hazards, which includes:
  - Earthquakes; and
  - Landslides and Sinkholes;
- Communicable Diseases;
- Wildfires;
- Hazardous Materials incidents;
- Manmade Hazards (technological/terrorism); and
- Severe Weather, which includes:
  - Droughts;
  - Extreme Temperatures;
  - Thunderstorms;
  - Tornadoes; and
  - Winter Storms

Disaster Declaration History

One method of identifying hazards based upon past occurrence is to determine what events triggered federal and/or state disaster declarations within the planning area. Disaster declarations are granted when the severity and magnitude of the event's impact surpass the ability of the local government to respond and recover. Disaster assistance is supplemental and sequential. When the local government's capacity has been surpassed, a state disaster declaration may be issued, allowing for the provision of state assistance. If the disaster is so severe that both the local and state government capacities are exceeded, a federal disaster declaration may be issued, allowing for the provision of federal disaster assistance.

Within Nashville and Davidson County there have been ten federal disaster declarations since 1994 related to flooding, severe storms/tornadoes, and ice storms. All ten disasters are included in Table 4-5.

Date	Cause	FEMA Disaster Number	Total Federal/State Expenditures for Davidson County[1]	Total Local Expenditures for Davidson County[2]	NES Expenditures for Davidson County[3]
15-Feb-15	Severe Winter Storm and Flooding	4211-DR	$524,013.56	$74,4993.18	$1,098,024.89
06-April-11	Severe storms, flooding, tornadoes, and straight-line winds	1978-DR*	N/A	N/A	$1,123,965
04-May-10	Severe Storms, Flooding, Straight-Line Winds, Tornadoes	1909-DR*	$ 52, 673, 689	$ 13,168,422	$ 6,098,027
06-April-06	Severe Storms, Tornadoes	1634-DR*	$ 42,457	$ 10,614	$ 1,359,604
08-May-03	Flooding, Severe Storm, Tornado	1464-DR*	N/A	N/A	$ 1,351,720
12-Jun-00	Flooding, Severe Storm, Tornado	1331-DR*	$ 1,271,947	$ 317,987	$ 1,435,929
12-May-99	Severe Storm, Tornado, Flooding	1275-DR*	$ 3,095,850	$ 773,963	$ 1,959,361
20-Apr-98	Flooding, Severe Storm, Tornado	1215-DR*	$ 20,454,316	$ 5,113,579	$ 7,751,925
07-Mar-97	Tornadoes, Hail, Floods	1167-DR*	$ 44,388	$ 11,097	Information not available
28-Feb-94	Ice Storm	1010-DR	$ 373,530	$ 93,383	$ 7,540,181

Table 4-5: Federal Disaster Declarations for Davidson County

[1]Source: Tennessee Emergency Management Agency (TEMA)
[2]Local expenditures calculated to be 25 percent of Federal expenditures.
[3]NES is the Nashville Electric Service.
*SBA Declaration associated with FEMA Declaration, not included in amounts listed.

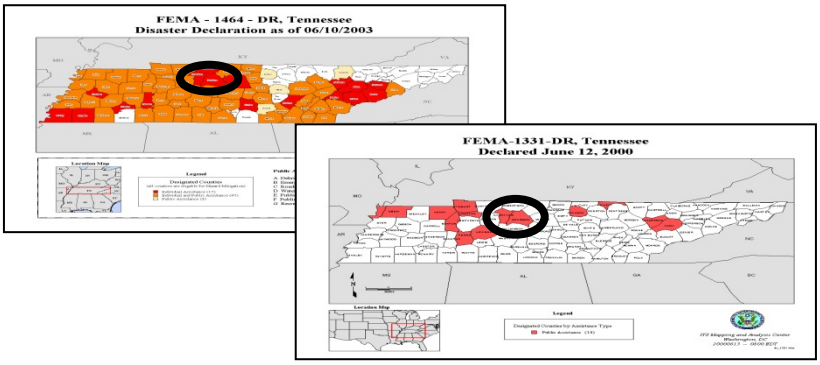


Figure 4-1: Federal Disaster Declaration Maps

It is also important to note that the federal government may issue a disaster declaration through the U.S. Department of Agriculture and/or the Small Business Administration, as well as through FEMA. The quantity and types of damage are the factors that determine whether such declarations are issued.

The U.S. Department of Agriculture (USDA) provides assistance to farmers and other rural residents, as the result of natural disasters. Agricultural-related disasters are quite common. One-half to two-thirds of the counties in the United States have been designated as disaster areas in each of the past several years. Agricultural producers may apply for low-interest emergency loans in counties named as primary or contiguous in a disaster designation.

USDA Secretarial disaster designations must be requested of the Secretary of Agriculture by a governor or the governor's authorized representative, or by an Indian Tribal Council leader. Davidson County is currently not a primary county with a USDA designation.

The Small Business Administration (SBA) provides disaster assistance to families and businesses through its Disaster Assistance Program. The mission of this program is to offer financial assistance to those who are trying to rebuild their homes and businesses in the aftermath of a disaster. By offering low-interest loans, the SBA is committed to long-term recovery efforts. SBA is also committed to mitigation, and has additional loan programs to help reduce future losses. Table 4-6 outlines SBA and USDA Declarations for Davidson County.

A state governor may request an SBA declaration. When the governor's request for assistance is received, a survey of the damaged area(s) is conducted with state and local officials, and the results are submitted to the Administrator for a decision. When the Administrator of SBA declares an area, both primary and adjacent counties are eligible for the same assistance.

Declaration Date	Cause	SBA/USDA Declaration Number	FEMA Disaster Number	Total SBA Loan Amount
19-Feb-19	Severe Storms, Flooding (Sec-AG)	S4427	-	-
1-May-18	Prolonged Excessive Rain & Flooding (Sec-AG)	S4485	-	-
15-Nov-16	Drought (Sec-AG)	S4154	-	-
4-Oct-16	Drought (Sec-AG)	S4128	-	-
12-Nov-14	Freezing Temps (Sec-AG)	TN-00086 / 14187	-	-
12-Aug-12	Drought & Excessive Heat (Sec-AG)	TN-00072/13304	-	-
18-Jan-12	Drought & Excessive Heat (Sec-AG)	TN-00062/12995	-	-
29-Dec-11	Drought & Excessive Heat (Sec-AG)	TN-00060/12980	-	-
15-Feb-11	Drought & Excessive Heat (Sec-AG)	TN-00047/12470	-	-
06-Dec-10	Drought & Excessive Heat (Sec-AG)	TN-00046/12413	-	-
29-Aug-10	Drought & Excessive Heat (Sec-AG)	TN-00044/12344	-	-
07-July – 10	Excessive Rainfall, Flooding, and Flash Flooding (Sec-AG)	TN-00041/12230	-	$ 22,500
04-May-10	Severe Storms, Flooding, Straight-Line Winds, Tornadoes	TN-00039/12159 Presidential IA	1909-DR	$ 187,552,300
04-May-10	Severe Storms, Flooding, Straight-Line Winds, Tornadoes	TN-00038/12161 Presidential PA	1909-DR	$ 2,097,700
05-April-06	Severe Storms, Tornadoes	TN-00008/10440 Presidential IA	1634-DR	$ 16,786,600
15-April-04	Five Alarm Fire in Old Hickory	3571	-	$ 424,500
08-May-03	Storms, Tornadoes, Flooding	3498	1464-DR	$ 354,400
22-Oct-01	Expanded EIDL Program	9TTN	-	$ 944,000
12-Jun-00	Severe Storms & Tornadoes	3263	1331-DR	$ 5,300
12-May-99	Storms, Tornadoes, Flooding	3183	1275-DR	$ 65,600
20-Apr-98	Storms, Tornadoes, Flooding	3078	1215-DR	$ 4,732,400
07-Mar-97	Heavy Rain & Tornadoes	2937	1167-DR	$ 229,300
03-Feb-97	Tornadoes	2929	-	$ 10,000

Table 4-6: SBA & USDA Declarations for Davidson County

DAM AND LEVEE FAILURE

Dams are man-made structures built for the purpose of navigation, power production, agriculture, water quality, water supply, recreation, and flood protection. A levee is a natural or artificial barrier that diverts or restrains the flow of a stream or other body of water for the purpose of protecting an area from inundation.

Dams and levees are usually designed to withstand a flood with a computed risk of occurrence. For example, a dam or levee may be designed to contain a flood at a location on a stream that has a certain probability of occurring in any one year. If a larger flood occurs, then that structure will be overtopped. Overtopping is the primary cause of earthen dam failure. Failed dams or levees can create floods that are catastrophic to life and property because of the tremendous energy of the released water and the amount of development located within the area protected by the dam or levee.

Dams and levees typically are constructed of earth, rock, concrete, or mine tailings. Two factors that influence the potential severity of a full or partial dam failure are:

- The amount of water impounded; and
- The density, type, and value of development and infrastructure located downstream.

Dam failures can result from any one or a combination of the following causes:

- Deliberate intention (terrorism);
- Prolonged periods of rainfall and flooding;
- Earthquake (liquefaction / landslides);
- Inadequate spillway capacity, resulting in excess overtopping flows;
- Internal erosion caused by embankment or foundation leakage or piping;
- Improper design;
- Improper maintenance;
- Negligent operation; and/or
- Failure of upstream dams on the same waterway.

There are twenty-four dams located in Nashville-Davidson County (Figure 4-2). Eighteen of the dams are private dams, and two are Metro dams. The dams at J. Percy Priest Lake and Old Hickory Lake are managed by the U.S. Army Corps of Engineers. Old Hickory Dam is authorized and operated primarily for commercial navigation and hydroelectric power generation, with recreation and water supply as two important incidental benefits. J. Percy Priest Dam is authorized and operated primarily for flood control, recreation, hydroelectric power generation, and water supply. The Marrowbone Lake Dam is managed by the Tennessee Wildlife Resources Agency and is used for recreational purposes.

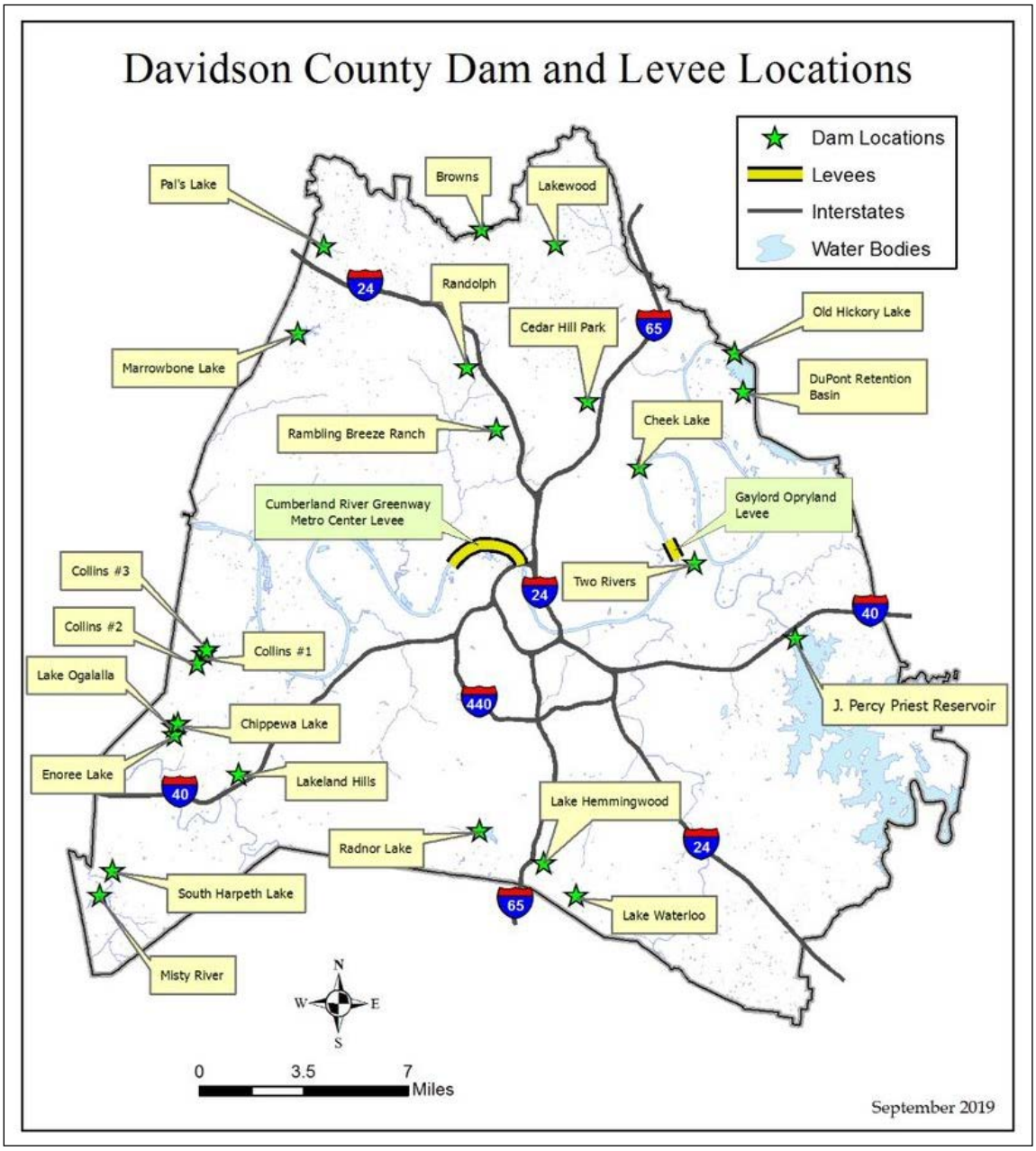


Figure 4-2: Dams and Levees within Davidson County

Each dam is categorized by its hazard potential. The "Federal Guidelines for Dam Safety", Published by FEMA, determines hazard potential by the downstream damage that could result if a dam failed. Table 4-7 lists the hazard classification for each dam, and section 4.2 explains this process more and the Dam Safety Act.

- High hazard – dams would probably cause loss of life in the event of failure.
- Significant hazard – dams would cause property damage or temporary loss of roads or utilities with a remote chance of loss of life.
- Low hazard – dams would have little or no effect to life and property downstream in the event of failure.

Dam Name	Owner / Regulator	Hazard Classification	EAP Req'd	Max Storage (acre-feet)
J. Percy Priest Lake	USACE	High	Y	652,000
Old Hickory Lake	USACE	High	Y	545,000
Radnor Lake	TDEC	High	Y	2,150
Marrowbone Lake	TWRA	High	Y	1,670
Collins #1	Private	High	N	410
South Harpeth	Private	Low	N	331
DuPont Retention Basin	Private	Low	N	290
Cheek Lake	Private	Low	N	210
Two Rivers	Metro Parks	High	Y	163
Misty River	Private	Low	N	145
Pal's Lake	Private	Significant	N	143
Lakewood	Private	High	Y	132
Collins #3	Private	High	N	90
Lake Ogallala	Private	Significant	N	80
Collins #2	Private	High	N	60
Lake Waterloo	Private	High	N	60
Browns	Private	High	N	50
Cedar Hill Park	Metro Parks	High	Y	50
Lake Hemmingwood	Private	High	Y	40
Rambling Breeze Ranch	Private	High	N	40
Randolph	Private	High	N	39
Chippewa Lake	Private	Significant	N	28
Lakeland Hills	Private	High	N	24
Enoree Lake	Private	Significant	N	23
Large Dams located outside of Davidson County				
Wolf Creek	USACE	High	Y	6,089,000
Center Hill	USACE	High	Y	2,092,000
Dale Hollow	USACE	High	Y	1,706,000
Great Falls	TVA	High	Y	64,800

Table 4-7: Dams affecting Davidson County

(source: USACE National Inventory of Dams)

J. Percy Priest Dam and Reservoir

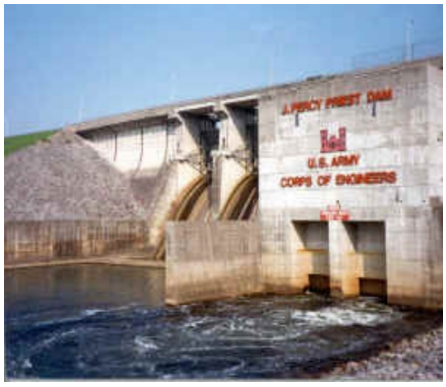


Figure 4-3: J. Percy Priest

J. Percy Priest Dam (Figure 4-3) is located at river mile 6.8 of the Stones River. The reservoir covers portions of Davidson, Rutherford, and Wilson counties and consists of 14,200 surface acres of water at summer pool elevation (490 feet above mean sea level). The water is surrounded by 18,854 acres of public lands; 10,000 acres are devoted to wildlife management. Total storage capacity at maximum pool (elevation 504.5) is 652,000 acre-feet.

Rising 130 feet above the streambed, the combination earth and concrete-gravity dam is 2,716 feet long including a hydroelectric power generating plant. Average annual energy output is 70 million kilowatt hours. The dam has contributed significantly to reducing the frequency and severity of flooding in the Cumberland Valley. In addition to the far-reaching effects of flood control, the project contributes to the available electric power supply of this area. Construction began June 2, 1963 and the dam was completed in 1968.

Old Hickory Dam and Reservoir

The Old Hickory Lock and Dam (Figure 4-4a) is located on the Cumberland River at Mile 216.2 in Sumner and Davidson Counties. The reservoir extends 97.3 miles upstream to Cordell Hull Lock and Dam near Carthage, Tennessee.

Old Hickory Lock and Dam were authorized for construction by the Rivers and Harbors Act of 1946 as a unit of a comprehensive development plan for the Cumberland River Basin. The project was designed by the U.S. Army Corps of Engineers and built by private contractors under the Corps' supervision. Construction started in January 1952, and dam closure was completed in June of 1954. The project was completed for full beneficial use in December of 1957 with the placement of the final hydroelectric power unit in operation.

Figure 4-4a: Old Hickory Dam

The reservoir contains 22,500 surface acres at an elevation of 445 feet above sea level. Water level fluctuations are minimal with minimum pool elevation at 442 feet. Public facilities include nine marinas, three Corps-operated campgrounds, and 41 boat access sites.

Wolf Creek Dam and
Lake Cumberland Reservoir

Figure 4-4b: Wolf Creek Dam

The Wolf Creek Dam (Figure 4-4b) impounds Lake Cumberland at river mile 460.9 on the Cumberland River ten miles southwest of Jamestown, Kentucky. The reservoir is located in Wayne, Russell, Pulaski, Clinton, McCreary, Laurel and Whitley counties in Kentucky. Lake Cumberland is the largest man made reservoir east of the Mississippi River. The reservoir is 101 miles long and has 1,255 miles of shoreline. During flood conditions Wolf Creek Dam has the capability of storing 6,089,000 acre-feet of water. The reservoir contains 50,250 acres of surface area at a normal summer pool elevation of 723 feet, and 63,530 acres of surface area at a flood control storage elevation of 760 feet.

Through the Corps of Engineers dam safety inspection program, seepage concerns associated with a karst foundation were identified at the project. In 2005, a Major Rehabilitation Report was completed and approved at US Army Corps of Engineers headquarters which called for a long-term rehabilitation of the project to include a grout curtain and concrete diaphragm wall to run the entire length of the earthen embankment and upstream of the right most concrete monoliths. The first phase of the construction project began in March 2006 and was estimated to be completed in October 2012 at an estimate cost of $594 million dollars. To decrease the risk of failure of the dam, and to those living in the downstream communities, an interim pool restriction at the project was put into place in January 2007 that targets a pool elevation of 680 feet for operation of the reservoir. This pool restriction was lifted in 2013 and is now back to normal levels as the project was completed in 2013.

Center Hill Dam

Figure 4-4c: Center Hill Dam

Center Hill Dam (Figure 4-4c) is located at river mile 26.6 of the Caney Fork River above its confluence with the Cumberland River at river mile 309.2. The reservoir is located in Dekalb, Putnam, and White Counties in Tennessee. The dam impounds a reservoir that is 64 miles long and has 415 miles of shoreline. During flood conditions Center Hill Dam has the capability of storing 2,092,000 acre-feet of water. The reservoir contains 18,220 acres of surface area at a normal summer pool elevation of 648 feet and 23,060 acres of surface area at a flood control storage elevation of 685 feet.

Through the Corps of Engineers dam safety inspection program, concerns associated with a karst limestone foundation were identified at the dam. In 2006, a Major Rehabilitation Report

was completed and approved at US Army Corps of Engineers headquarters which called for a long-term rehabilitation of the project to include modern concrete cutoff walls through the embankment and into the foundations and grouting beneath the entire dam and along both sides of the dam. The construction project began in 2008, and will be completed in the spring of 2020, at a cost of $364 million.

To decrease the risk of failure of the dam and to those living in the downstream communities an interim pool restriction at the project was put into place in 2007 that targets a pool elevation range of 618 ft. to 630 ft. for operation of the reservoir.

Dam Failure Flooding

Dam failure flooding can occur as the result of partial or complete collapse of an impoundment. Dam failures are often the result of prolonged rainfall and flooding or, during very dry conditions, erosion. The primary danger associated with a dam failure is the swift flooding of those properties immediately downstream of the dam.

In Tennessee, there are more than 1,200 dams and significant dam failures occur on an average of less than once every 40 years. There are large dams within the state, including those operated by the Tennessee Valley Authority and the U. S. Army Corps of Engineers. These dams serve to produce electrical power for the state, control flooding, water supply & quality, navigation, and to provide recreational opportunities to the state's citizens and its visitors. Dam failures are an infrequent occurrence. There has never been a major dam failure in Tennessee. All of the failures that have occurred have involved the small agricultural dams that are prevalent throughout the state.

In Tennessee, the Safe Dams Division of the Tennessee Department of Environment and Conservation regulates non-federal dams. This agency is responsible for enforcement of state and federal dam safety regulations (Safe Dams Act).

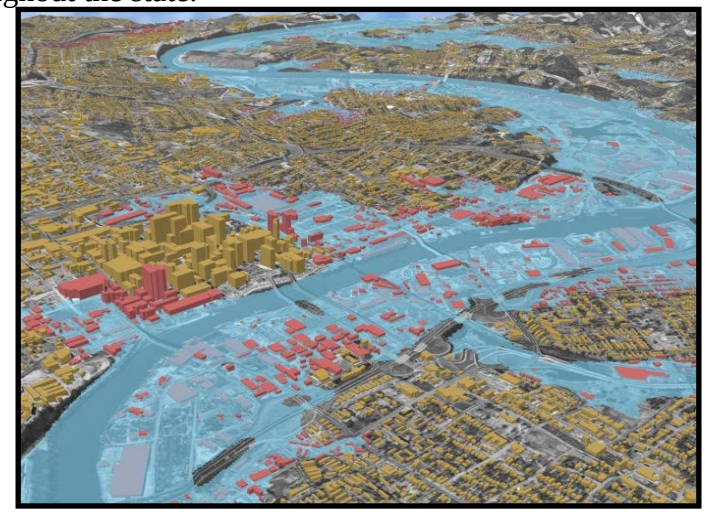


Figure 4-5: Center Hill Dam Break Scenario

Center Hill and Wolf Creek Dam Break Analyses and Risk Communication

Following the approval of Major Rehabilitation Reports for both Wolf Creek and Center Hill, the Nashville District of the United States Army Corps of Engineers (USACE) conducted detailed analyses of the impacts of potential dam failure at both reservoirs (scenario shown in Figure 4-5).

These analyses included dam failure routines within the unsteady-flow hydraulic model HEC-RAS, and mapping of the resulting flooding downstream of each dam. Detailed maps for several potential failure scenarios at each dam were created.

Hardcopy maps, digital map-books, and Geographic Information System (GIS) layers were distributed to emergency management agencies within affected counties downstream of each dam to aid in preparation of flood evacuation and emergency management plans. In addition, multiple public meetings were held within affected communities to share information on the potential risks at each dam, the proposed construction projects, and to allow members of the public to view the dam failure flood mapping.

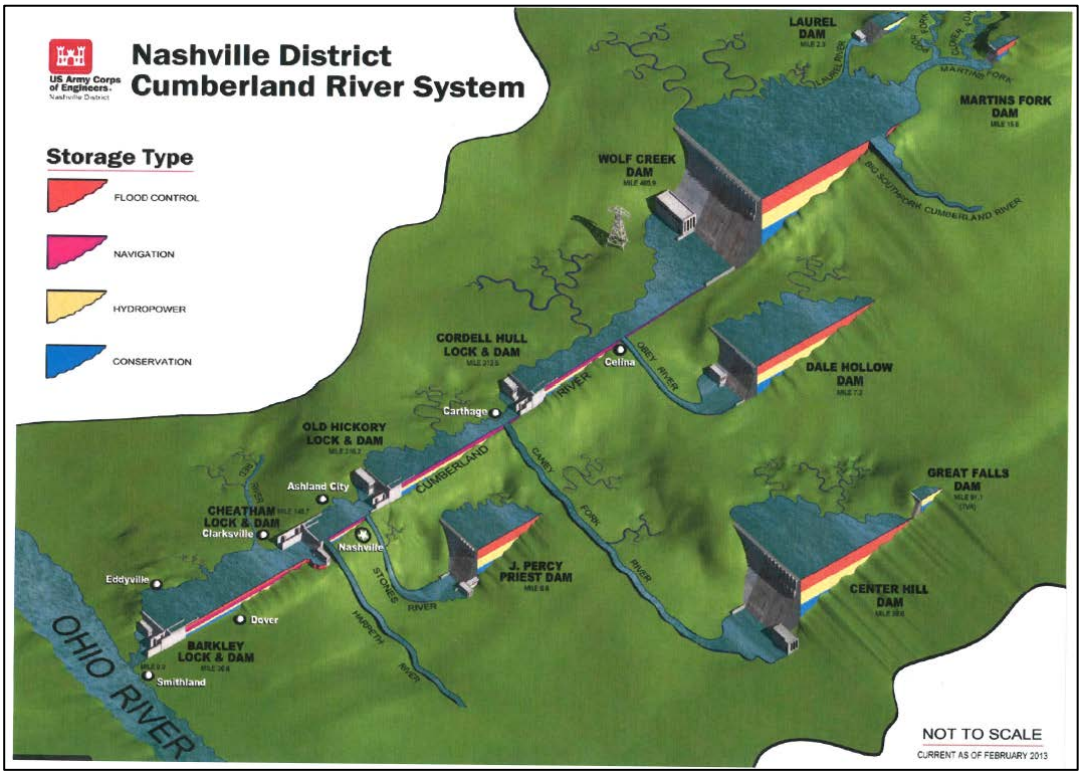


Figure 4-6: Nashville District Cumberland River System

LEVEES

Table 4-8: Davidson County Levees

Levee Name	Owner/Regulator	Hazard Classification	People at Risk	Structures at Risk	Property Value
Cumberland River Greenway Metro Center Levee	Metro Govt. of Nashville & Davidson County	High	14,667	341	$1.95B
Gaylord Opryland Levee	Private	High	1,545	38	$81.5M
Cumberland River Levee	Private	High	697	18	$33.4M

Metro Center Levee

Metro Center is a 1,000-acre commercial and industrial development located along the Cumberland River near downtown Nashville, Tennessee. The complex was developed in the early 1970's and encompasses a wide range of businesses. It contains approximately ninety property holdings and over 420 companies employing approximately 8,000 people. A 3-mile long levee, also built in the early 1970's, protects the Metro Center area from flooding.

Figure 4-7: Metro Center Levee Rehabilitation

When the levee was built, it was considered sufficient to protect the development from major floods. However, revised flood projections and deterioration of the levee over time have increased the risk of flooding. Stream bank erosion was threatening to undermine the levee's foundation and reducing its reliability. Trees and their root systems had also potentially compromised the integrity of the structure.

In 1999, the U.S. Army Corps of Engineers determined that the levee would have to be raised to meet new flood-control standards. The levee was raised and reconstructed by adding fill dirt and approximately 600 feet of floodwall in two sections (Figure 4-7). The project also improved the reliability of the interior drainage system for Metro Center. Subsequent inspection of the project in 2007 revealed additional deficiencies such as an encroachment at one facility, excessive vegetation, and a low area in the levee that would prevent it from providing the protection up to the 500 year flood. The 2010 Flood highlighted the need to construct a levee closure in front of the I-65 bridge opening. The opening was constructed to the 100 year flood elevation and required sand bagging to protect Metro Center properties during the actual flood. The recently constructed levee provides 500 year protection for the entire development. The completed project will bring the levee to post Katrina levee standards for certification. Metro Nashville and the US Army Corps of Engineers, Nashville District has

agreed to continue with the project to address all deficiencies. Completion of this work will allow the levee to be placed into the Federal Rehabilitation and Inspection Program under Public Law 84-99. This will allow for federal funds to be used to fix any damage to the levee as the result of a natural disaster. Fixing the deficiencies will also allow the levee to be certified under the Federal Emergency Management Agency National Flood Insurance Program.

The Metro Parks Department worked with the Corps of Engineers on improvements to the levee trail, which became part of a large greenway system. A paved greenway path was added atop the levee, providing a recreational amenity for employees in Metro Center. Trailheads with parking were added for others who wish to use the site.

The Metro Center Levee performed as designed during the May 2010 flood and protected the 1,000 acre Metro Center commercial and industrial development from flood damage. However, there were a few vulnerabilities in the levee system that were identified and some damages that occurred during the flood that were addressed by the COE in the summer of 2011. Figure 4-8 shows locations where improvements were made to the levee system to increase its reliability for future flood events. The work included:

- Removal of woody vegetation from the levee
- Repair of railroad closure structure (See Figure 4-9)
- Installation of an inland levee under I-65 (See Figures 4-10 & 4-11).
- Repair of topsoil slide
- Levee center line shift
- Repaving of the damaged greenway trail.

Figure 4-8: Metro Center Levee
Post-May 2010 Construction Areas

Figure 4-9: Repaired Railroad Closure

Figure 4-10: Sandbags placed by volunteers in May 2010 under I-65

Figure 4-11: I-65 Inland Levee Installed Under I-65

Figure 4-12: Metro Center Levee (2019)

Figure 4-13: Metro Center Levee (2019)

Figure 1-14: Nashville "Chew Crew"
(photo from NY Times article 4/22/19)

Metro Center Stormwater Pump Station

During the May 2010 flood, the pump station effectively protected the buildings within Metro Center from flooding. However, the existing pumps could not meet the demand to keep the roadways free from flooding. Supplemental portable pumps were required to evacuate the stormwater from the protected area. Following the May 2010, Metro conducted a study on the stormwater pumping station and decided to increase the protection level to a 500-year event. The study recommended increasing the capacity of the existing station and building a new, parallel station to increase the overall capacity and reliability of the system. Construction began in August 2012 and was completed February 2014 with a cost of $4.1 million. The project included upgrading the existing 72-MGD low-lift pump station and constructing a parallel 72-MGD pump station and lake intake, as well as backup power generation and increasing the total capacity to 144 MGD.

Figure 4-15: Metro Center Pump Station

Figure 4-16: Discharge from new station

The new pump station includes:

- Belowground concrete pump station structure
- Electrical/pump building adjacent to new pump structure
- Emergency generator with integral diesel fuel tank
- Concrete splash pad with dissipater blocks at the force main discharge
- Site work, including new asphalt drive and parking area, demolition, new retaining wall, riprap, fencing, and grading
- Main switch gear, circuit breakers, and motor control center in new electrical/pump building
- Demolition and replacement of existing greenway and levee wall
- Two 25,000-GPM submersible mixed-flow pumps and two 36-inch discharge pipes over existing levee

The work at the existing pump station included:

- Removal of majority of the existing equipment, including diesel-driven pumps, emergency generator, diesel fuel tank, instrumentation, and controls
- Installation of two new 25,000-GPM submersible mixed-flow pumps with electric motors
- Structural and architectural modifications to existing pump station
- Upgrade of heating and ventilating system
- Upgrade of electrical and instrumentation system
- Modification of lake sluice gate actuator for 480-volt service
- Upgrade of instrumentation and controls to monitor river and lake water levels and operate equipment
- Modification of recharge pump piping and removal of valves beneath floor slab

Opryland Levee

The Opryland levee on the Cumberland River is located approximately 2.1 miles downstream of Briley Parkway. It was originally constructed in 1972 and it currently meets the FEMA requirements of having a minimum of three feet of vertical distance above the 100-year flood. During the May 2010 flood, this levee failed due to overtopping. The historic two-day May 2010 rain event caused the Cumberland River to reach just below the 500-year flood level. Floodwaters soon inundated the Gaylord Opryland Resort and Convention Center, the Grand Ole Opry House, and the Opry Mills Mall. After the May 2010 flood, Gaylord Entertainment made the decision to add additional flood protection for the hotel and Opry House. The new and improved levee will provide protection to the 500-year flood level.

Figure 4-17: Opryland Complex May 2010 Flood

While aesthetics and blending in with the existing landscape architecture was a major factor, public safety was the top priority. Design tasks included raising sections of the existing mile-long levee, installation of new concrete levee structures, and closures for 12 pedestrian and traffic openings. The combination of solid walls with removable barrier openings met the public accessibility and aesthetic issues. Because the complex was a "high visibility and tourist travel" attraction, the design had to accommodate the normal schedule of events which put emphasis on fast installation should a flood warning be issued. Simplicity was also a key consideration as the goal was to make as many of the closure beams of a common dimension as economically possible to minimize training and on-site storage issues. The final design met all these requirements and setup/take down time can be accomplished in half the time as was originally forecasted.

Figure 4-18: Opryland Flood Wall Typical Road Closure

The original stormwater pumping station at the Opryland complex was replaced with a larger facility, having three auto-controlled electric 10,000 GPM pumps in a detention or storage pond at the southwest corner of the protected area. The storm drainage within the old park area was revised to direct all storm water to the detention pond. In addition, a two-acre section of the parking lot adjacent to the Opry Mills Shopping Center was lowered to provide additional storage in the event of an extreme rain during a river flood period.

Figure 4-19: Opryland Levee Pump Station

Past Occurrences

There have been 55 known dam failures that caused the release of water in the State of Tennessee. An additional 12 dams have had partial failures, which could have resulted in the release of floodwaters if remedial action had not been taken. Dam failures that have occurred in Davidson County are presented in Appendix B.

Likelihood of Future Occurrences

The Tennessee Safe Dams Program, operated by the TDEC, was created to protect the public from dam failures. TDEC inspects dams for safety and requires that dams meet stability and spillway standards in order to obtain and maintain an operating permit. Dams are inspected every 1, 2, or 3 years depending on the hazard potential category of the dam. Although the possibility of a dam failure is present, the probability of dam failure is low and not predictable.

FLOODING

Floods are among the most frequent and costly natural disasters in terms of human hardship and economic loss. This is why the Nashville CPT found flooding to be the highest rated hazard risk in the Nashville-Davidson County community. This assessment is based on impact, vulnerability and likelihood of an event. See section 4.0, Risk Assessment, for more risk factors and methodology. There are several different types of likely flood events in Tennessee including flash, riverine, and urban stormwater. Regardless of the type of flood, the cause can almost always be attributed to excessive rainfall, either in the flood area or upstream reach.

A flood defined by FEMA is “a general and temporary condition of partial or complete inundation of 2 or more acres of normally dry land area or of 2 or more properties from overflow of inland waters; or unusual and rapid accumulation or runoff of surface waters from any source; or mudflow; or subsidence of land along a lake or water conveyance as a result of erosion or undermining caused by water current.”

The term "flash flood" describes localized floods of great volume and short duration. In contrast to riverine flooding, this type of flood usually results from a heavy rainfall on a relatively small drainage area. Flash floods, as described by NOAA, “the most dangerous kind of floods, because they combine the destructive power of a flood with incredible speed and unpredictability. Flash floods occur when excessive water fills normally dry creeks or river beds along with currently flowing creeks and rivers, causing rapid rises of water in a short amount of time. They can happen with little or no warning.” Densely populated areas are at a high risk for flash floods. Buildings, highways, driveways, parking lots, and other impervious areas increase runoff and reduce the amount of rain absorbed by the earth. The increased runoff caused by these impervious areas intensifies the flash flood potential. Precipitation of this sort usually occurs in the spring and summer. As previously discussed, there are several dams and levees in the community and a failure in any of them can result in flash flooding.

Riverine floods result from persistent rain events for extended periods of time. This type of flood occurs in river systems whose tributaries may drain large geographic areas and include many independent river basins. The duration of riverine floods may vary from a few hours to many days. Factors that directly affect the amount of flood runoff include precipitation, intensity and distribution, the amount of soil moisture, seasonal variation in vegetation, snow depth, and water-resistance of the surface areas due to urbanization.

Urban flood events result as land loses its ability to absorb rainfall as it is converted from fields or woodlands to roads, buildings, and parking lots. Urbanization increases runoff two to six times over what would occur on undeveloped terrain. During periods of urban flooding, streets can become swift moving rivers.

The public stormwater drainage system for Nashville-Davidson County is designed to handle the most frequent rain events. During a heavy rain, the storm drainage system can become

overwhelmed resulting in flooded roads and buildings. Low spots, such as underpasses, underground parking garages, and basements are susceptible to flooding.

All flood events may result in upstream flooding due to downstream conditions such as channel restriction and/or high flow in a downstream confluence stream. This type of flooding is known as backwater flooding.

Major Sources of Flooding

The Cumberland River is the largest stream in Davidson County and serves as the eventual receiving stream for all surface runoff in the County. Local, state, and federal agencies have defined watersheds in the county in a number of ways in prior reports. There are 26 watersheds in Davidson County as defined by the National Pollutant Discharge Elimination System (NPDES) permit (see Figure 4-20). Twenty-five watersheds represent tributaries to the Cumberland River and the 26th watershed represents the local inflow directly into the Cumberland River. Table 4-9 displays the known flood hazard in each watershed with specific information on drainage area, flooding source, length, velocity, and depth of flooding.

As part of the National Flood Insurance Program (NFIP), floodplains and floodways on many local streams have been established and are regulated by the local floodplain management ordinance (see Figure 4-21). The current effective Flood Insurance Study (FIS) for Metro Nashville was published by FEMA in 2001. This countywide FIS was revised in 2017. For this 2017 revision, a total of 7.2 stream miles were studied by AECOM using detailed methods. Floodplain boundaries of 52.68 miles of streams that had been previously studied by detailed methods were re-delineated based on more detailed and up-to-date topographic mapping for this FIS report. Additionally, 187.38 miles of detailed study streams were studied by USACE Nashville District in 2012 and incorporated in the FIS report (see Table 4-9). The area of the special flood hazard area and floodway within each jurisdiction are presented below:

- **Berry Hill** – Total Area = 562.7 acres; Total SFHA = 49.2 acres, **8.7%**
- **Belle Meade** – Total Area = 1,984.3; Total SFHA = 183.8 acres, **9.3%**
- **Forest Hills** – Total Area = 5,835.5; Total SFHA = 215.3 acres, **3.7%**
- **Goodlettsville** – Total Area = 4,253.9; Total SFHA = 226.4 acres, **5.3%**
- **Oak Hill** – Total Area = 4,916.8; Total SFHA = 95.5 acres, **1.9%**
- **Ridgetop** – Total Area = 146.9; Total SFHA = 0.0 acres, **0.0%**
- **Metro Nashville** – Total Area = 318,668.0; Total SFHA = 41,901.4 acres, **13.1%**

The potential for damage to areas within Davidson County are greater from the Cumberland River than any other flooding source. Also, the type of flooding experienced from the Cumberland River is more general in nature than flash flooding caused by excessive rainfall over short periods. All of the streams within Davidson County are subject to flooding and

backwater flooding is significant. The primary effect of flooding on these streams appears to be inundation, although velocities will become significant to persons and structures under more extreme flooding situations. Calculated floodplain velocities range from one to five feet per second, and these are generally considered to be of dangerous magnitudes.

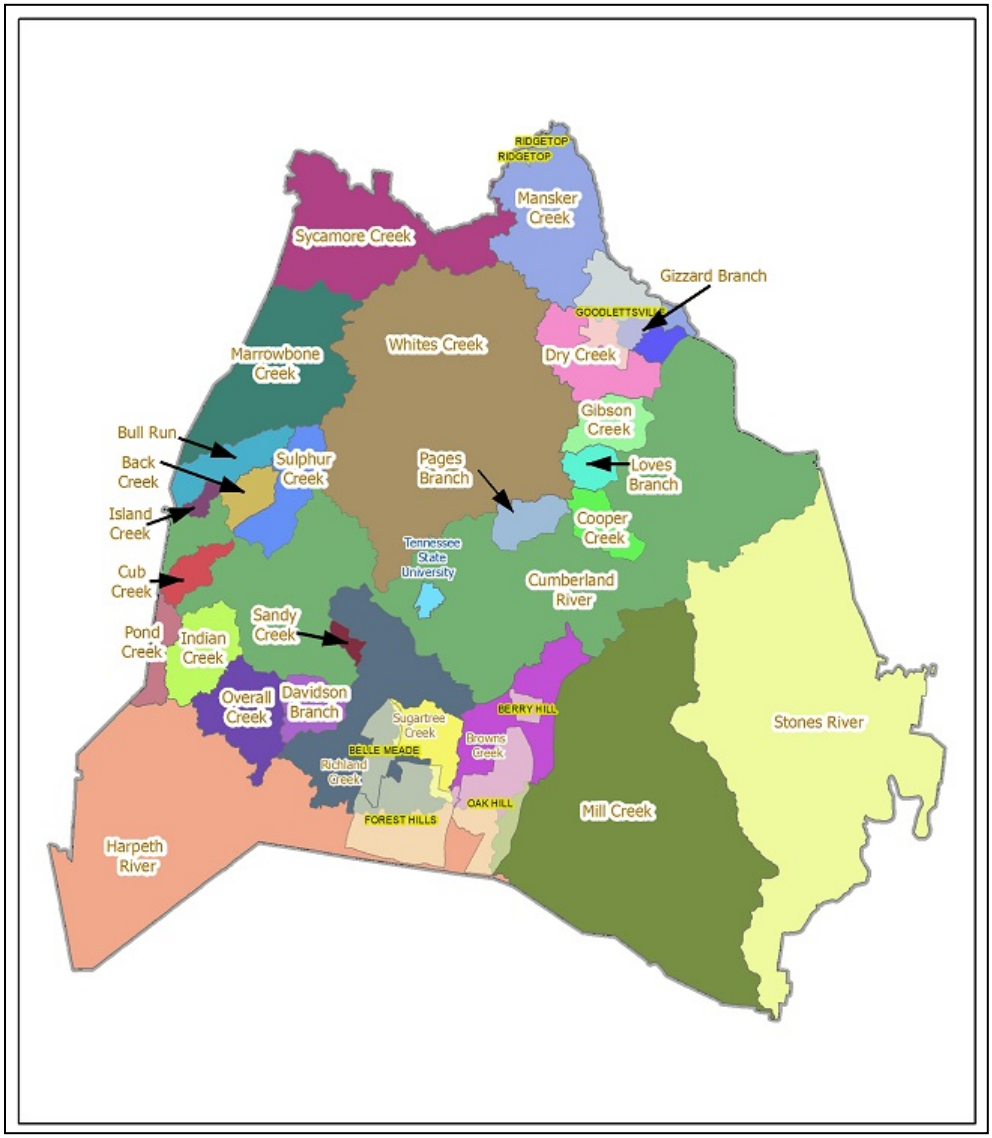


Figure 4-20: Watersheds of Davidson County

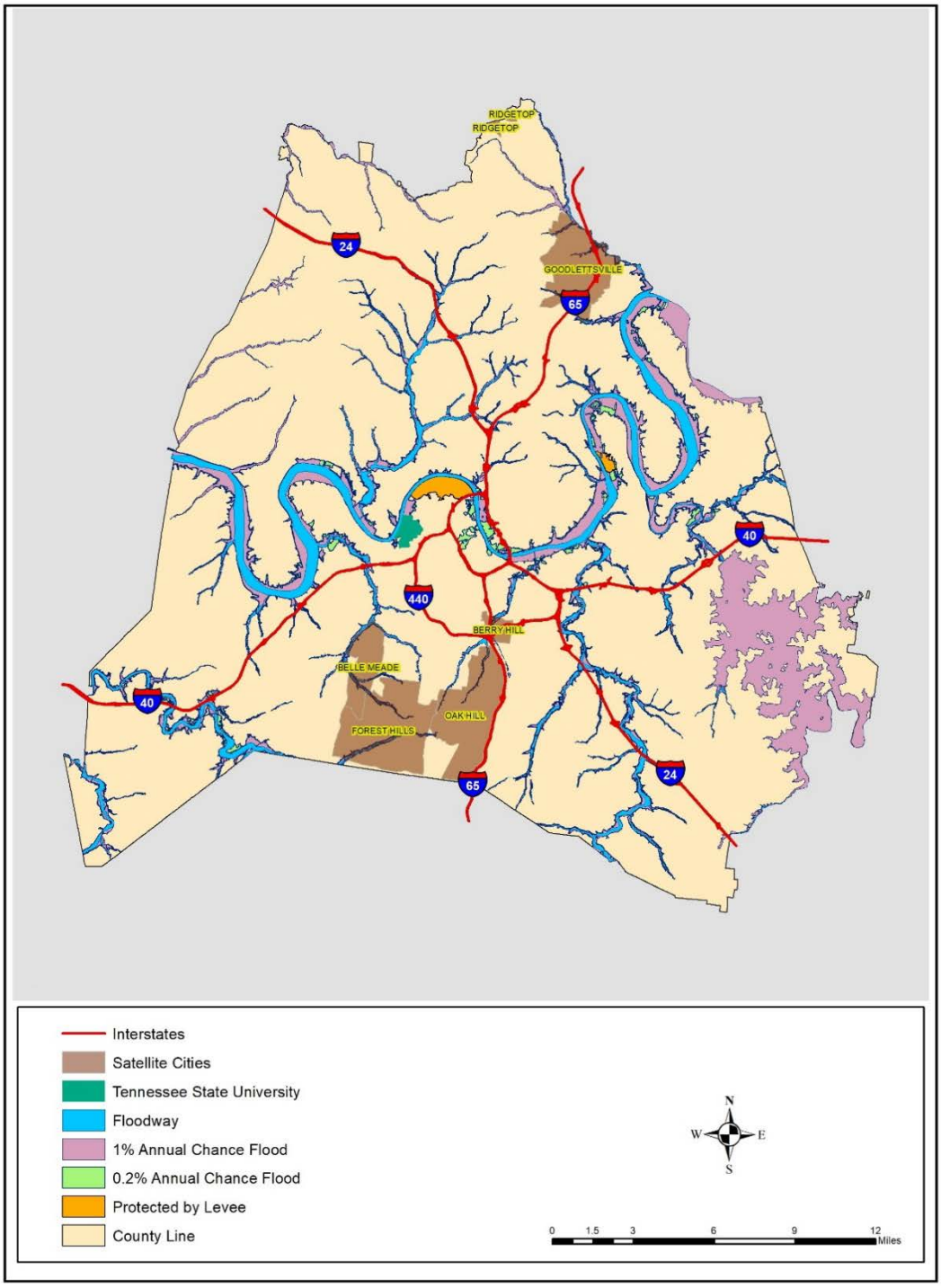


Figure 4-21: Flood Hazard Areas of Davidson County

Table 4-9: Major Sources of Flooding

Watershed	Contributing Drainage Area Within Davidson County (Sq.Mi.)	Flooding Source	Jurisdiction	Reach Length (miles)		Flood Insurance Study	
				Studied by Detailed Methods	Studied by Approximate Methods	Average Velocities (ft/s)	Average Depth of Water (ft)
Back Creek	2.6	Back Creek	Metro	N/A	N/A	N/A	N/A
Browns Creek	16.6	Browns Creek	Metro Berry Hill	4.36		5.07	17.21
		East Fork Browns Creek	Metro Berry Hill	2.27		4.37	17.21
		Middle Fork Browns Creek	Metro Oak Hill	3.04		4.82	
		West Fork Browns Creek	Metro Oak Hill	3.57		5.45	
Bull Run	4	Bull Run Creek	Metro		5.07	N/A	N/A
Cooper Creek	4.9	Cooper Creek	Metro	4.04	2.08	4.43	6.79
		Cooper Creek – Tributary 1	Metro	1.15		4.8	
		Cooper Creek - Tributary 2	Metro	1.02	0.5	6.28	
Cub Creek	2.5	Cub Creek	Metro		3.79	N/A	N/A
Cumberland River	90.9	Cumberland River	Metro	53.3		4.99	54.95
Davidson Branch	3.8	Davidson Branch	Metro	1.66	1.78	6.26	15.36
		Ewin Branch	Metro	1.49	1.4	5.88	
Dry Creek	8.8	Dry Creek	Metro Goodlettsville	3.83		5.57	13.22
Gibson Creek	4.3	Gibson Creek	Metro	2.23		5.94	9.33
		Gibson Creek Tributary	Metro	1.04		5.35	
		Gibson Creek Tributary 1	Metro	N/A	N/A	5.7	
		Gibson Creek Tributary 1.1	Metro	N/A	N/A	3.6	
		Gibson Creek Tributary 2	Metro	N/A	N/A	3.2	
Gizzard Branch	1.7	Gizzard Branch	Metro	N/A	N/A	N/A	N/A
Harpeth River	56.7	Harpeth River	Metro Forest Hills	15.2		3.58	35.33
		Buffalo Creek	Metro	3.05		5.88	
		East Fork Creek	Metro	1.51		4.5	
		Little East Fork Creek	Metro	0.83		6.83	
		Flat Creek	Metro		0.78	6.69	

Watershed	Contributing Drainage Area Within Davidson County (Sq.Mi.)	Flooding Source	Jurisdiction	Reach Length (miles)		Flood Insurance Study	
				Studied by Detailed Methods	Studied by Approximate Methods	Average Velocities (ft/s)	Average Depth of Water (ft)
Harpeth River (cont.)	56.7 (cont.)	Little Harpeth River	Metro	2.21		3.27	
		South Harpeth River	Metro	11		3.92	
		Highway 100 Tributary	Metro	1.92		6.24	
		Otter Creek	Metro Forest Hills Oak Hill	4.86		3.3	
		Poplar Creek	Metro	2.58		6.84	
		Trace Creek	Metro	1.02		6.98	
		Windemere Branch	Metro	1.25		3.68	
		Windemere Branch Tributary 1	Metro	0.38		3.37	
Indian Creek	5.8	Indian Creek	Metro	2.2	3.26	4.13	8.58
		Indian Creek Tributary 1	Metro	1.67		N/A	
		Indian Creek Tributary 2	Metro	0.36		N/A	
		Indian Creek West	Metro	N/A	N/A	5.62	
		Indian Creek West Tributary 1	Metro	N/A	N/A	4.89	
		Indian Creek West Tributary 2	Metro	N/A	N/A	6.25	
Island Creek	1	N/A	Metro	N/A	N/A	N/A	N/A
Loves Branch	2.3	Loves Branch	Metro	1.96		3.77	10.81
Mansker Creek	20.4	Mansker Creek	Metro Goodlettsville	9.68	0.95	5.11	15.74
		Bakers Fork	Metro Ridgetop		5.57	N/A	
		Goodlettsville Outlet Ditch	Metro Goodlettsville	0.59	0.55	4.65	
		Lumsley Fork	Metro Goodlettsville	0.88	0.49	5.77	
		Walkers Creek	Metro		3.11	N/A	
Marrowbone Creek	19.4	Marrowbone Creek	Metro		3.48	N/A	N/A
		Little Marrowbone Creek	Metro		6.63	N/A	
		Little Marrowbone Creek - Tributary 9	Metro		1.36	N/A	

Watershed	Contributing Drainage Area Within Davidson County (Sq.Mi.)	Flooding Source	Jurisdiction	Reach Length (miles)		Flood Insurance Study	
				Studied by Detailed Methods	Studied by Approximate Methods	Average Velocities (ft/s)	Average Depth of Water (ft)
Mill Creek	71.8	Mill Creek	Metro	21.78		4.99	23.58
		Collins Creek	Metro	1.41		5.33	
		Franklin Branch	Metro	2.74		4.86	
		Franklin Branch - Tributary 1	Metro	1.65		4.33	
		Franklin Branch - Tributary 2	Metro	0.75		6.83	
		Franklin Branch - Tributary 3	Metro	0.48		6.5	
		Holt Creek	Metro	2.46		4.49	
		Mill Creek - Tributary A	Metro	N/A	N/A	N/A	
		Mill Creek - Tributary B	Metro	N/A	N/A	N/A	
		Mill Creek - Tributary 1	Metro	N/A	N/A	N/A	
		Sevenmile Creek	Metro	7.03		4.56	10.49
		Sevenmile Creek - Tributary 1	Metro	1.75		5.56	
		Sevenmile Creek - Tributary 2	Metro	1.25		3.58	
		Sims Branch	Metro	2.08		5.74	
		Sorghum Branch	Metro	3.65		6.18	7.9
		Sorghum Branch Overflow	Metro	0.19		N/A	
		Turkey Creek	Metro	1.8		6.6	
		Whittemore Branch	Metro	3.52		5.52	9.7
		Unnamed Tributary to Whittemore Branch	Metro	0.11		5.05	
		Whittemore Branch Tributary	Metro	1.31		7.62	
Overall Creek	7.8	Overall Creek	Metro	3.65	3.88	4.28	10.1
		Tributary 1 to Overall Creek	Metro	0.99	0.99	5.62	
Pages Branch	3.2	Pages Branch	Metro	2.69		4.68	11.72
		Pages Branch - Tributary A	Metro	1.1	1.07	4.66	
		Pages Branch - Tributary B	Metro	0.76	0.76	4.83	

Watershed	Contributing Drainage Area Within Davidson County (Sq.Mi.)	Flooding Source	Jurisdiction	Reach Length (miles)		Flood Insurance Study	
				Studied by Detailed Methods	Studied by Approximate Methods	Average Velocities (ft/s)	Average Depth of Water (ft)
Pond Creek	2.5	Pond Creek	Metro	N/A	N/A	N/A	N/A
Richland Creek	28.5	Richland Creek	Metro Belle Meade	11.7		5.04	12.26
		Ewin Branch	Metro		1.4	5.88	
		Belle Meade Branch	Metro Belle Meade Forest Hills	2.05		5.58	
		Jocelyn Hollow	Metro	1.55		N/A	
		Jocelyn Hollow Branch	Metro	N/A	N/A	7.2	
		Jocelyn Hollow Creek	Metro	N/A	N/A	N/A	
		Tributary to Richland Creek	Metro	1.54		5.07	
		Sugartree Creek	Metro Belle Meade Forest Hills	3.45		6.23	8.23
		Vaughns Gap Branch	Metro	1.96		6.63	
		Vaughns Gap Branch Overflow	Metro	0.44		N/A	
Sandy Creek	0.7	Sandy Creek	Metro	N/A	N/A	N/A	N/A
Stones River	77.2	Stones River	Metro	6.86		6.98	44.66
		Dry Fork	Metro	N/A	N/A	6.58	
		Dry Fork Creek	Metro	3.66		5.82	
		Dry Fork Creek Tributary 1	Metro	N/A	N/A	5.83	
		Dry Fork Creek Tributary 2	Metro	N/A	N/A	6.1	
		East Fork Hamilton Creek	Metro	1.69		4.91	7.4
		Elm Hill Tributary	Metro	1.35		4.4	
		Tributary 1 to East Fork Hamilton Creek	Metro	1.43		5.01	
		Tributary 2 to East Fork Hamilton Creek	Metro	1.39		4.38	
		Hurricane Creek	Metro	2.28	4.87	5.96	
		West Branch Hurricane Creek	Metro	0.73	0.68	6.08	
		J. Percy Priest Reservoir	Metro	11.8		N/A	

Watershed	Contributing Drainage Area Within Davidson County (Sq.Mi.)	Flooding Source	Jurisdiction	Reach Length (miles)		Flood Insurance Study	
				Studied by Detailed Methods	Studied by Approximate Methods	Average Velocities (ft/s)	Average Depth of Water (ft)
Stones River (cont.)	77.2 (cont.)	McCrory Creek	Metro	5.68		5.84	14.19
		Pulley Tributary	Metro	1.36		6.66	
		Scotts Creek	Metro	1.30		5.87	7.82
		Scotts Creek Tributary	Metro	N/A	N/A	6.2	
		Scotts Hollow	Metro	0.89		5.83	
		Stoners Creek	Metro	5.54		4.75	
		Stoners Creek - Tributary 7	Metro		0.06	N/A	
Sulphur Creek	6	Sulphur Creek	Metro		4.6	N/A	N/A
		Sulphur Branch	Metro		2.87	N/A	
Sycamore Creek	21.7	Long Creek	Metro		5.02	N/A	N/A
		Long Creek - Tributary 2	Metro		1.14	N/A	
		South Fork Sycamore Creek	Metro		8.99	N/A	
		South Fork Sycamore Creek - Tributary 1	Metro		2.03	N/A	
Whites Creek	62.8	Whites Creek	Metro	12.8		4.12	17.37
		Bear Hollow Branch	Metro	0.75		6.83	
		Carney Creek	Metro	0.66		5.5	
		Claylick Creek	Metro	0.26		5.36	
		Claylick Overflow	Metro	0.47		N/A	
		Crocker Springs Branch	Metro	1.96		4.75	
		Crocker Springs Branch Tributary	Metro	0.48		7.43	
		Cummings Branch	Metro	2.83		5.35	
		Drakes Branch	Metro	1.69		5.43	
		Earthman Fork	Metro	4.97		5.4	
		Earthman Fork - Tributary 2	Metro	0.68		6.92	
		Earthman Fork - Tributary 3	Metro	0.63		6.92	
		Earthman Fork - Tributary 4	Metro	0.47		5.85	
		Eaton Creek	Metro	3.39		4.8	
		Ewing Creek	Metro	4.24		5.65	
		Ewing Creek - Tributary 1	Metro	0.97		3.98	

Watershed	Contributing Drainage Area Within Davidson County (Sq.Mi.)	Flooding Source	Jurisdiction	Reach Length (miles)		Flood Insurance Study	
				Studied by Detailed Methods	Studied by Approximate Methods	Average Velocities (ft/s)	Average Depth of Water (ft)
Whites Creek (cont.)	62.8 (cont.)	Ewing Creek - Tributary 2	Metro	0.52	0.32	5.4	
		Johnson Hollow	Metro	1.58		4.29	
		Little Creek	Metro	3.93		4.65	
		Little Creek - Tributary 1	Metro	1.81		5.1	
		Little Creek - Tributary 2	Metro	1.06		7.4	
		North Fork Ewing Creek	Metro	3.57		4.01	
		North Fork Ewing Creek - Tributary 2	Metro	1.29		5.3	
		North Fork Ewing Creek - Tributary 3	Metro	0.43		5.85	
		North Fork Ewing Creek - Tributary 4	Metro	0.40		3.7	
		North Fork Ewing Creek - Tributary 5	Metro	0.32		4.45	
		North Fork Ewing Creek - Tributary 6	Metro	0.29		2.95	
		North Fork Ewing Creek - Tributary 7	Metro	0.92		5.55	
		North Fork Ewing Creek - Tributary 8	Metro	0.29		8.25	
		Shaws Branch	Metro	2.67		6.97	
		Trantham Creek	Metro	2.74		6.61	
		Vhoins Branch	Metro	1.23		3.3	
		Whites Creek Tributary	Metro	1.15		5.5	

All streams within Metro Nashville, identified in Table 4-9, are subject to flooding and backwater flooding. The primary effect of flooding on these streams appears to be inundation, although higher water velocities become significant to persons and structures under more extreme flooding situations. Calculated floodplain velocities range from 1.0 to 5.0 feet per second (fps), and these are generally considered to be dangerous magnitudes. Table 4-10 outlines the critical depths and velocities that will harm residents and structures during a flood event.

Depth (threat to life)	In stagnant backwater areas (zero velocity), depths in excess of about 1m (3.3ft) are sufficient to float young children, and depths above 1.4m (4.6ft) are sufficient to float teenage children and many adults.
Velocity (threat to life)	In shallow areas, velocities in excess of 1.8m/s (5.9 ft/s) pose a threat to the stability of many individuals.
Depth and Velocity (threat to life)	The hazards of depth and velocity are closely linked as they combine to effect instability through an upward buoyant force and a lateral force. A product of less than or equal to $0.4m^2/s$ ($43\ ft^2/s$) defines a low hazard provided the depth does not exceed 0.8m (2.6ft) and the velocity does not exceed 1.7m/s (5.6 ft/s).
Vehicular access (emergency access)	Most automobiles will be halted by flood depths above 0.3-0.5m (1.0-1.7ft). A maximum flood velocity of 3m/s (9.8 ft/s) would be permissible, providing that flood depths are less than 0.3m (1.0ft). A depth of 0.9-1.2m (2.9-3.9 ft) is the maximum depth for rapid access of large emergency vehicles.
Structural Integrity (structures above ground)	A depth of 0.8m (2.6ft) is the safe upper limit for the above ground/super structure of conventional brick veneer, and certain types of concrete block buildings. The structural integrity of elevated structures is more a function of flood velocities (e.g. Erosion of foundations, footings or fill) than depth. The maximum velocity to maintain structural stability depends on soil type, vegetation cover, and slope but ranges between 0.8-1.5m/s (2.6-4.9 ft/s)
Fill (stability)	In general, fill may become susceptible to erosion/instability at depths of 1.8-2.4m (5.9-7.9ft).

Table 4-9: Critical Flood Depths and Velocities

Identified Problem Areas

The first step to mitigate a flooding disaster is to identify the areas of the Nashville-Davidson County community that are prone to a flood. The streams throughout Davidson County, as previously identified, experience flooding during extreme rainfall events. The Metropolitan Government of Nashville and Davidson County and the Nashville District of the United States Army Corps of Engineers have documented potential flood damages countywide in numerous studies. Figure 4-21 displays a map of the known flood hazards in the community known as the Special Flood Hazard Area, SFHA.

A number of documents have been reviewed for this plan, which were prepared by or for the Metropolitan Public Works (MPW) and the U.S. Army Corps of Engineers (USACE), Nashville District. MDPW documents consist of basin plans for the following streams: Browns Creek, including West and Middle Forks; Cooper Creek; East Fork Hamilton Creek; Gibson Creek; McCrory Creek; Sorghum Branch, Sevenmile Creek, and Tributary 1 of Mill Creek; Pages Branch; Richland Creek; Scotts Creek; Sugartree Creek; Whites Creek; and Whittemore Branch. Each basin plan provides a detailed description of the watershed drainage area and associated hydrologic and hydraulic parameters, existing and predicted future flooding problems within the watershed, and alternative solutions for reducing flooding problems. USACE documents consist of a variety of reconnaissance reports, feasibility reports, and detailed project reports for select streams within Davidson County. These streams include:

- Cumberland River;
- Mill Creek;
- Richland Creek;
- Whites Creek;
- Dry Creek;
- Gibson Creek;
- Browns Creek; and
- McCrory Creek.

Additionally, Nashville Mayor Karl Dean commissioned a study, called the Unified Flood Preparedness Plan (UFPP) following the May 2010 flood event, to identify and evaluate flood damage reduction measures on the Cumberland River and its five major tributaries – Harpeth River, Whites Creek, Browns Creek, Mill Creek and Richland Creek. The plan summarizes the damage which occurred along these streams and identifies the locations that would benefit from flood damage reduction projects and the types of solutions that would be most beneficial for each location. The UFPP integrates the knowledge and experience of past and present flood mitigation efforts with the lessons learned from the May 2010 flood.

Flood Prone Buildings

As of December 2014, FEMA documents 6,528 active flood insurance policies within Nashville-Davidson County and has paid 3,122 flood insurance claims. It is important to note that these statistics do not reflect the widespread flooding which occurred in Davidson County in 1973, 1975, and 1979 since Metro Nashville did not enter the National Flood Insurance Program until 1982. Countywide damage estimates for the 1979 flood alone were in excess of $40 million. Table 4-11 presents a summary of flood insurance information for all jurisdictions as of 5/31/19.

Jurisdiction	Total Number of Flood Insurance Policies	Total Number of Paid Losses	Total Value of Paid Losses
Belle Meade	72	6	$77,531
Berry Hill	23	3	$87,734
Goodlettsville	139	63	$1,373,169
Oak Hill	44	22	$477,381
Forest Hills	81	15	$441,493
Ridgetop	2	1	$1,261
Nashville-Davidson County	5948	3310	$153,426,286
Total	**6,309**	**3,420**	**$155,884,855**

Table 4-11: Flood Insurance Summary as of 5/31/2019

Nationwide, properties which flood repetitively comprise approximately one percent of currently insured properties, but account for 25 to 30 percent of flood claims. Repetitive loss properties constitute a significant expense of the National Flood Insurance Program (NFIP), costing about $200 million annually. The NFIP defines a repetitive loss property as any insurable building for which two or more claims of more than $1,000 were paid by the NFIP within any rolling 10-year period since 1978. Within Nashville-Davidson County, the Federal Emergency Management Agency (FEMA) has identified 105 un-mitigated repetitive loss structures.

Repetitive Loss Areas have also been identified by Metro Nashville on 16 streams (see Table 4-15) to focus flood damage reduction efforts. Repetitive Loss Areas encompass a repetitive loss property, or a concentrated number of repetitive loss properties, and neighboring properties which are subject to a similar flood risk. Figure 4-22 presents the locations of the

identified Repetitive Loss Areas, which at the time of this plan, are all located within Metro Nashville jurisdiction, and not in any satellite cities. Individual Repetitive Loss Area Maps are provided in Appendix C. These Repetitive Loss Areas were updated to reflect the current repetitive loss structures, additional flood-prone neighboring structures identified following the May 2010 flood event, and all mitigation efforts (acquisition and elevation) that have occurred. Detailed descriptions of the Repetitive Loss Areas are provided in the following subsection *Flooding – Watershed Specific Data*.

NFIP Claims by Zone	Number of Claims
AE	2036
A	342
X, standard	315
X, Preferred	532
Total	3225

Table 4-12: NFIP Claims by Zone

NFIP Claims by Occupancy Type	Single Family	Residential (other)	Non-Residential	Total
Repetitive Loss	263	21	31	315
Severe Repetitive Loss	23	1	5	29
Other	2525	215	336	3076
Total	2811	237	372	3420

Table 4-13: NFIP Claims by Occupancy Type

NFIP Insured	Properties	Insured	Mitigated	% Insured	% Mitigated
Repetitive Loss	315	166	57	53%	18%
Severe Repetitive Loss	29	11	9	38%	31%
Total	344	177	66	51%	19%

Table 4-14: Repetitive Loss Mitigated and Insured Properties

The Nashville and Davidson County area contains 6,309 flood insurance policies and 344 of these properties are repetitive loss or severe repetitive loss. These repetitive loss properties are important target areas for mitigation projects. Metro Water Services has worked hard with TEMA and FEMA to obtain grants to be able to purchase these properties to return them to their natural floodplain state. Refer to the figure C-17 home buyout map in Appendix C to see the properties that have been restored.

Table 4-11 summarizes all the areas in Davidson County covered with flood insurance. The next table summarizes the Davidson County flood insurance claims by flood insurance zone. The next table summarizes the Davidson County flood insurance claims by occupancy types. The next table summarizes the Davidson County repetitive loss and severe repetitive loss properties insurance and mitigation status.

A repetitive loss property is any insurable building for which two or more claims of more than $1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978. A repetitive loss property may or may not be currently insured by the NFIP.

Severe repetitive loss properties are insurable buildings that have either made at least four claims of more than $5,000 each cumulating to $20,000 paid by the NFIP. Or at least two claims paid by the NFIP that exceeded the value of the property the day before each loss.

The data in the tables above were either found on a FEMA website or given to the community by FEMA. The raw information is subject to the privacy act of 1974. Personal information such as address is protected and not available to the public.

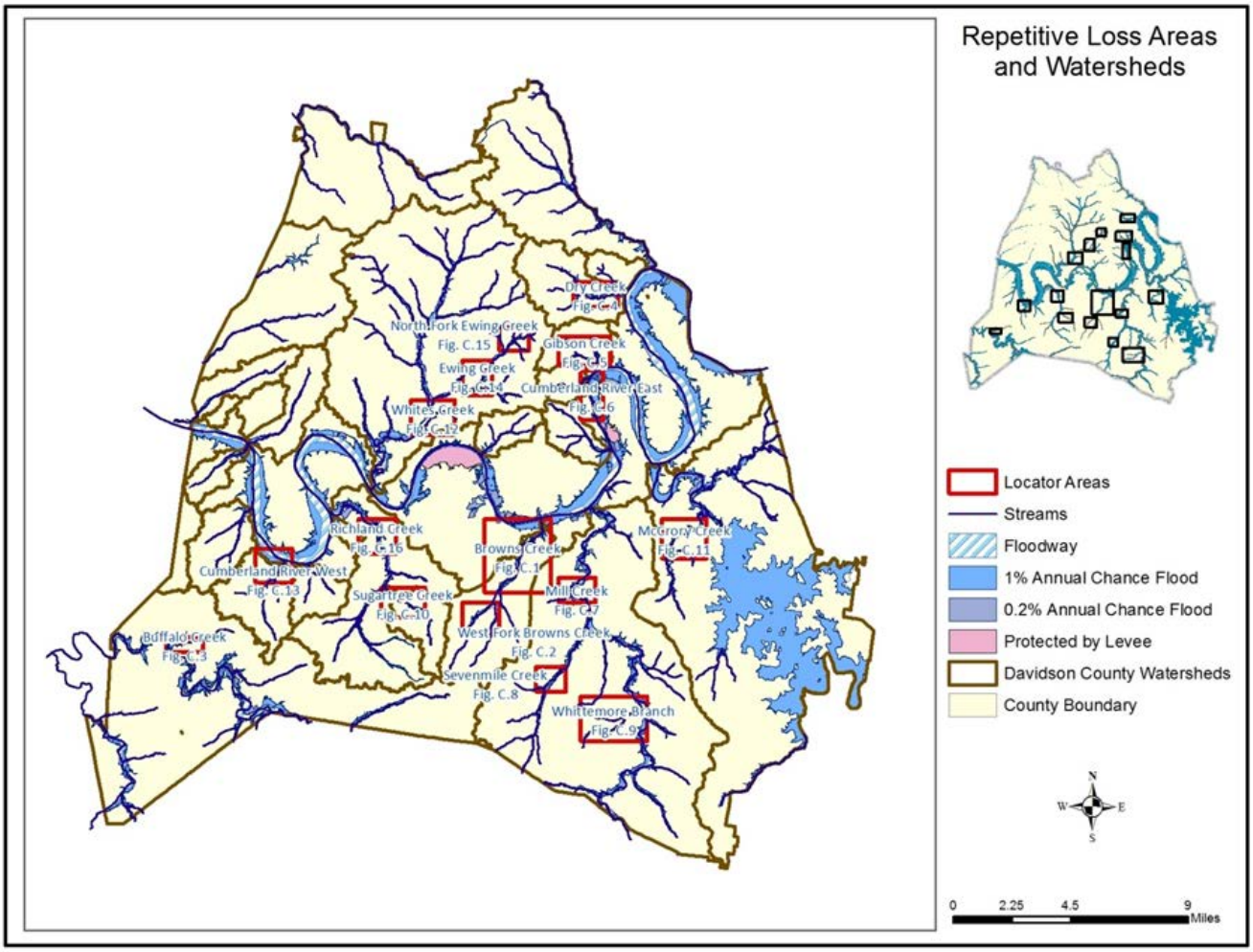
Table 4-15: Structures within the Repetitive Loss Areas

Repetitive Loss Area	Repetitive Loss Structures		Additional Non-Mitigated Structures	Mitigated Structures	Total Number of Parcels
	Residential	Non-Residential			
Browns Creek	0	3	28	1	32
West Fork Browns Creek	9	0	160	26	195
Cumberland River East	0	0	37	31	68
Cumberland River West	0	0	16	1	17
Dry Creek	0	1	40	1	42
Gibson Creek	3	0	53	21	77
Buffalo Creek	1	0	8	3	13
Mill Creek	0	0	104	17	121
Sevenmile Creek	12	0	123	24	158
Whitemore Branch	1	0	127	15	143
Richland Creek	0	0	32	61	93
Sugartree Creek	6	0	25	4	35
McCrory Creek	6	0	102	0	108
Ewing Creek	3	0	6	9	18
North Fork Ewing Creek	3	0	2	5	10
Whites Creek	3	0	141	42	186
SUBTOTAL	**47**	**4**	**1004**	**261**	**1316**
Outside of Identified Repetitive Loss Areas					
Browns Creek Watershed	0	3	2	7	12
Cooper Creek Watershed	0	0	0	3	3
Cumberland River Watershed	4	3	0	14	21
Davidson Branch Watershed	1	0	0	0	1
Dry Creek Watershed	4	0	1	3	8
Gibson Creek Watershed	0	0	7	1	8
Harpeth River Watershed	3	0	0	0	3
Mansker Creek Watershed	2	0	0	0	2
Mill Creek Watershed	6	3	9	10	28

Overall Creek Watershed	0	0	1	0	1
Pages Branch Watershed	0	0	0	7	7
Richland Creek Watershed	4	2	12	4	22
Stones River Watershed	8	0	5	6	19
Sycamore Creek Watershed	1	0	0	0	1
Whites Creek Watershed	10	0	1	14	25
SUBTOTAL	**43**	**11**	**38**	**69**	**162**
TOTAL	**90**	**15**	**1042**	**330**	**1477**

Note: There are no repetitive loss structures located within the satellite cities.

Figure 4-22: Repetitive Loss Areas



FLOODING – WATERSHED SPECIFIC DATA

Back Creek Watershed

The Back Creek watershed drainage area is about 2.6 square miles. There are no flood control structures in this watershed. No major creeks were studied in the Flood Insurance Study report for this watershed.

Browns Creek Watershed

The Browns Creek Watershed has a drainage area of 16.64 square miles, contains about 13.2 stream miles, and is located in south-central Davidson County. Browns Creek flows from south to north and discharges into the Cumberland River. West Fork and Middle Fork Browns Creek are major sub-basins located within the Browns Creek Watershed. West Fork combines with Middle Fork just upstream in the Interstate 440/Interstate 65 culvert.

The principal causes of flooding problems within this watershed are construction in the designated floodway and natural floodplain, and a lack of adequate stormwater controls in the developed areas upstream. Additional contributing factors include backwater flooding upstream from bridges. There are no flood control structures in this watershed.

Depth of Water

Using the Flood Insurance Study flood profile data for Browns Creek the mean average depth of flooding from the stream bed to the Regulatory Floodplain was found to be 17.2 feet. This data is derived from 17 cross sections of Browns Creek.

Velocities

Using the Flood Insurance Study flood profile data for Browns Creek the mean average velocity is 5.1 feet per second. The velocity is derived form 17 cross sections on Browns Creek. For more information on the Browns Creek watershed drainage area, flooding sources, lengths, velocities, and depth of water refer to table 4-10.

Repetitive Loss Areas

Two repetitive loss areas have been identified within the Browns Creek watershed. One on the mainstem of Browns Creek (Figure C.1) and one on West/Middle Fork Browns Creek (Figure C.2). Within these repetitive loss areas, there are three properties reporting repetitive losses due to flooding on Browns Creek and nine properties on West Fork and Middle Fork Browns Creek. In addition, the associated repetitive loss areas encompass 29 properties (1 mitigated, 28 un-mitigated) on Browns Creek and 186 properties (26 mitigated, 160 un-mitigated) on West/Middle Fork Browns Creek. The Browns Creek Storm Water Basin Plan, completed in 1990, further identifies the flood-prone areas and

alternative solutions to reduce flooding problems. Flood magnitudes in the repetitive loss areas are not expected to increase significantly because the Browns Creek Watershed is nearly totally developed.

Bull Run Watershed

The Bull Run watershed has drainage area of 4 square miles and contains about 5 stream miles. There are no flood control structures in this watershed. No major creeks were studied in the Flood Insurance Study report for this watershed.

Cooper Creek Watershed

The Cooper Creek Watershed has a drainage area of 4.9 square miles, contains about 6.2 stream miles, and is located in north-central Davidson County. Cooper Creek flows from an elevation of approximately 495 feet in a southeasterly direction and to an elevation of 391 feet where it empties into the Cumberland River at river mile 197.3. Three flood-prone structures have been mitigated within this watershed. There are no flood control structures in this watershed.

Depth of Water

Using the Flood Insurance Study flood profile data for Cooper Creek the mean average depth of flooding from the stream bed to the Regulatory Floodplain was found to be 6.8 feet. This data is derived from 12 cross sections of Cooper Creek.

Velocities

Using the Flood Insurance Study flood profile data for Cooper Creek the mean average velocity is 4.4 feet per second. The velocity is derived form 12 cross sections on Cooper Creek. For more information on the Cooper Creek watershed drainage area, flooding sources, lengths, velocities, and depth of water refer to table 4-10.

Cub Creek Watershed

The Cub Creek watershed has a drainage area of 2.5 square miles and contains about 3.8 stream miles. There are no flood control structures in this watershed. No major creeks were studied in the Flood Insurance Study report for this watershed.

Cumberland River

The Cumberland River is a major tributary of the Ohio River. It originates at the confluence of Poor and Clover Forks near the City of Harlan, Kentucky. The 694-mile river flows generally southwest to Nashville where it turns and flows northwest into western Kentucky and its confluence with the Ohio River. The Cumberland River Watershed has a drainage area of 17,914 square miles, with approximately 12,841 square

miles located upstream of Metro Nashville. The Cumberland River Watershed contains about 91 square miles and 53 stream miles in the Nashville-Davidson County area.

Flood Control Structures

The Cumberland River watershed contains the Metro Center Levee and the Opryland Levee. The Metro Center Levee protects an area of about 833 acres and several Metro Center area businesses and apartments. It is maintained by Metro Water Services Stormwater department. The Opryland Levee is privately owned and protects about 170 acres including the Opryland hotel and Grand Ole Opry.

Depth of Water

Using the Flood Insurance Study flood profile data for Cumberland River the mean average depth of flooding from the stream bed to the Regulatory Floodplain was found to be 55 feet. This data is derived from 115 cross sections of Cumberland River.

Velocities

Using the Flood Insurance Study flood profile data for Cumberland River the mean average velocity is 5 feet per second. The velocity is derived form 115 cross sections on Cumberland River. For more information on the Cumberland River watershed drainage area, flooding sources, lengths, velocities, and depth of water refer to table 4-10.

Repetitive Loss Areas

Two Repetitive Loss Areas are on the Cumberland River. The Cumberland River East area is located in the Pennington Bend area near the confluence of the Cumberland River and Gibson Creek. The repetitive loss areas encompass 68 properties (31 mitigated, 37 un-mitigated). There are no repetitive loss properties remaining within this identified flood-prone area. See Appendix C, Figure C.6.

The second Repetitive Loss Area, Cumberland River West, is located downstream of river mile 175, in the Cockrill Bend area. Several upstream control reservoirs provide the majority of flood damage abatement. However, in the repetitive loss area, flood problems are caused by the confluence of Overall Creek with the Cumberland River and inadequate stormwater controls on Overall Creek. The repetitive loss areas encompass 17 properties (1 mitigated and 16 un-mitigated). There are no repetitive loss properties remaining within this identified flood-prone area. See Appendix C, Figure C.13.

Davidson Branch Watershed

The Davidson Branch watershed drainage area is about 3.8 square miles. There are not flood control structures in this watershed.

Depth of Water

Using the Flood Insurance Study flood profile data for Davidson Branch the mean average depth of flooding from the stream bed to the Regulatory Floodplain was found to be 15.4 feet. This data is derived from 8 cross sections of Davidson Branch.

Velocities

Using the Flood Insurance Study flood profile data for Davidson Branch the mean average velocity is 6.3 feet per second. The velocity is derived form 8 cross sections on Davidson Branch. For more information on the Davidson Branch watershed drainage area, flooding sources, lengths, velocities, and depth of water refer to table 4-10.

Dry Creek Watershed
(Includes portions of Goodlettsville)

The Dry Creek Watershed has a drainage area of 8.8 square miles, contains 3.8 stream miles, and is located in northeast Davidson County, and separates Davidson and Sumner Counties. Dry Creek flows from west to east and discharges into the Cumberland River at river mile 214.4.

A detailed analysis was performed for approximately 2.65 river miles of Dry Creek. An alternative analysis on Dry Creek by the USACE resulted in the elevation of several homes. The purpose of the project was to reduce flood damages within the Gateway Subdivision, located between Interstate 65 and the Seaboard Systems Railroad. The project also included a detention structure and flood proofing. The detention structure reduced flooding for all houses in the subdivision, with the exception of 19 structures whose first floor elevations remained below the 100-year flood elevation. The remaining 19 homes were raised between March 1989 and June 1990.

Flood Control Structure

The dry creek watershed contains the dry creek weir. This weir regulates the flow of the cross drain under interstate 65. It protects downstream houses from flooding along the creek.

Depth of Water

Using the Flood Insurance Study flood profile data for Dry Creek the mean average depth of flooding from the stream bed to the Regulatory Floodplain was found to be 13.2 feet. This data is derived from 14 cross sections of Dry Creek.

Velocities

Using the Flood Insurance Study flood profile data for Dry Creek the mean average velocity is 5.6 feet per second. The velocity is derived form 14 cross sections on Dry

Creek. For more information on the Dry Creek watershed drainage area, flooding sources, lengths, velocities, and depth of water refer to table 4-10.

Repetitive Loss Areas

The current repetitive loss area is located downstream of the former project area along both the right and left banks of Dry Creek mainstem between the Seaboard Systems Railroad and north Gallatin Pike (Appendix C, Figure C.4). Flood damages within this area are attributable to rapid residential development without adequate stormwater controls in the upstream watershed areas combined with development along streams whose floodplain areas were not previously defined and regulated.

Currently, there is one property reporting repetitive losses due to flooding within the identified repetitive loss area. In addition, the associated repetitive loss areas encompass 41 (1 mitigated, 40 un-mitigated) properties.

Gibson Creek Watershed

The Gibson Creek Watershed has a drainage area of 4.3 square miles, contains about 3.3 stream miles, and is located in northeast Davidson County. Gibson Creek flows from west to east and discharges into the Cumberland River at river mile 200.9. The repetitive loss area is located along Emmitt Avenue between the East Meade Avenue intersection and Walnut Street intersection, and along Denson Ave between Emmitt Avenue and Gibson Creek.

The principal causes of flooding problems within the repetitive loss area are construction in the designated floodways and natural floodplains, and lack of adequate stormwater controls in the developed areas. Additional contributing factors include backwater flooding from the Cumberland River and backwater flooding upstream from bridges and relatively narrow floodplains in the tributaries that cause rapid concentration of runoff with very little peak attenuation. There are no flood control structures in this watershed.

Depth of Water

Using the Flood Insurance Study flood profile data for Gibson Creek the mean average depth of flooding from the stream bed to the Regulatory Floodplain was found to be 9.3 feet. This data is derived from 7 cross sections of Gibson Creek.

Velocities

Using the Flood Insurance Study flood profile data for Gibson Creek the mean average velocity is 6 feet per second. The velocity is derived from 7 cross sections on Gibson Creek. For more information on the Gibson Creek watershed drainage area, flooding sources, lengths, velocities, and depth of water refer to table 4-10.

Repetitive Loss Areas

Currently, there are two properties reporting repetitive losses due to flooding on Gibson Creek. In addition, 76 properties (21 mitigated, 55 un-mitigated) are located within the associated repetitive loss areas (Appendix C, Figure C.5). The Gibson Creek Storm Water Basin Plan, completed in 1996, identifies the repetitive loss area and alternative solutions to reduce existing flooding problems.

Gizzard Branch Watershed

The Gizzard Branch watershed drainage area is 1.7 square miles. There are no flood control structures in this watershed. No major creeks were studied in the Flood Insurance Study report for this watershed.

Harpeth River Watershed

(Includes portions of Forest Hills and Oak Hill)

The Harpeth River watershed drainage area is about 56.7 square miles, and contains about 46.6 stream miles. There are no flood control structures in this watershed.

The Buffalo Creek Basin has a drainage area of 5.59 square miles and is located in southwestern Davidson County. Buffalo Creek flows from east to west and discharges into the Harpeth River.

A detailed analysis was performed on Buffalo Creek as a part of the Flood Insurance Study for Metro Nashville in 1993. No additional basin plans or alternative analysis have been performed. Primarily a rural portion of the county, flood damages within this watershed are generally attributable to rapid residential development without adequate stormwater controls in the upstream watershed areas combined with development along streams whose floodplain areas were not previously defined and regulated.

Depth of Water

Using the Flood Insurance Study flood profile data for Harpeth River the mean average depth of flooding from the stream bed to the Regulatory Floodplain was found to be 35.3 feet. This data is derived from 40 cross sections of Harpeth River.

Velocities

Using the Flood Insurance Study flood profile data for Harpeth River the mean average velocity is 3.6 feet per second. The velocity is derived form 40 cross sections on Harpeth River. For more information on the Harpeth River watershed drainage area, flooding sources, lengths, velocities, and depth of water refer to table 4-10.

Repetitive Loss Areas

The repetitive loss area is located at the confluence with the Harpeth River (Appendix C, Figure C.3). Currently, there are two properties reporting repetitive losses due to flooding on Buffalo Creek. In addition, the associated repetitive loss areas encompass 11 properties (3 mitigated, 8 un-mitigated).

Indian Creek Watershed

The Indian Creek watershed has a drainage area of 5.8 square miles and contains about 4.2 stream miles. There are no flood control structures in this watershed.

Depth of Water

Using the Flood Insurance Study flood profile data for Indian Creek the mean average depth of flooding from the stream bed to the Regulatory Floodplain was found to be 8.6 feet. This data is derived from 11 cross sections of Indian Creek.

Velocities

Using the Flood Insurance Study flood profile data for Indian Creek the mean average velocity is 4.1 feet per second. The velocity is derived form 11 cross sections on Indian Creek. For more information on the Indian Creek watershed drainage area, flooding sources, lengths, velocities, and depth of water refer to table 4-10.

Island Creek Watershed

The Island Creek watershed drainage area is 1 square mile. There are no flood control structures in this watershed. No major creeks were studied in the Flood Insurance Study report for this watershed.

Loves Branch Watershed

The Loves Branch watershed drainage area is 2.3 square miles and contains about 2 stream miles. There are no flood control structures in this watershed.

Depth of Water

Using the Flood Insurance Study flood profile data for Loves Branch the mean average depth of flooding from the stream bed to the Regulatory Floodplain was found to be 10.8 feet. This data is derived from 7 cross sections of Loves Branch.

Velocities

Using the Flood Insurance Study flood profile data for Loves Branch the mean average velocity is 3.8 feet per second. The velocity is derived form 7 cross sections on Loves Branch. For more information on the Loves Branch watershed drainage area, flooding sources, lengths, velocities, and depth of water refer to table 4-10.

Mansker Creek Watershed

(Includes portions of Goodlettsville and Ridgetop)

The Mansker Creek watershed has a drainage area of 20.4 square miles and contains about 19.8 stream miles. There are no flood control structures in this watershed.

Depth of Water

Using the Flood Insurance Study flood profile data for Mansker Creek the mean average depth of flooding from the stream bed to the Regulatory Floodplain was found to be 15.7 feet. This data is derived from 41 cross sections of Mansker Creek.

Velocities

Using the Flood Insurance Study flood profile data for Mansker Creek the mean average velocity is 5.1 feet per second. The velocity is derived form 41 cross sections on Mansker Creek. For more information on the Mansker Creek watershed drainage area, flooding sources, lengths, velocities, and depth of water refer to table 4-10.

Marrowbone Creek Watershed

The Marrowbone Creek watershed drainage area covers about 19.4 square miles and contains about 11.5 stream miles. There are no flood control structures in this watershed. No major creeks were studied in the Flood Insurance Study report for this watershed.

Mill Creek Watershed

The Mill Creek Watershed has a drainage area of 71.8 square miles, contains about 54 stream miles, and is located in southeastern Davidson County. Mill Creek flows in a northerly direction and discharges into the Cumberland River.

Mill Creek flows through several miles of highly developed properties and, therefore, provides valuable green space to thousands of local residents. The stream's vegetated riparian zones provide a natural corridor for urban wildlife, shade the stream, and furnish opportunities for scenic and recreational experiences in an urban setting.

The Mill Creek Watershed is experiencing intense pressure from adjacent and surrounding development. Surface runoff, point source pollution, riparian zone destruction, bank

erosion, and floodplain encroachment are causing significant water quality deterioration and loss of natural floodplain functions and values. Future flooding conditions and stream ecological degradation will worsen as land development continues to stress Davidson County watersheds.

Depth of Water

Using the Flood Insurance Study flood profile data for Mill Creek the mean average depth of flooding from the stream bed to the Regulatory Floodplain was found to be 23.6 feet. This data is derived from 52 cross sections of Mill Creek.

Velocities

Using the Flood Insurance Study flood profile data for Mill Creek the mean average velocity is 5 feet per second. The velocity is derived form 52 cross sections on Mill Creek. For more information on the Mill Creek watershed drainage area, flooding sources, lengths, velocities, and depth of water refer to table 4-10.

Repetitive Loss Areas

The repetitive loss area is identified as the right bank of Mill Creek mainstem extending approximately from Thompson Lane downstream to Murfreesboro Pike (Appendix C, Figure C.7). The repetitive loss areas encompass 121 properties (17 mitigated, 104 un-mitigated). Six repetitive loss properties have been removed from this area.

Mill Creek Watershed - Sevenmile Creek

Sevenmile Creek is located in southeastern Davidson County. It is the largest tributary to Mill Creek, having a drainage area of 17.7 square miles, with the confluence located immediately downstream of an Interstate 24 crossing. The stream flows through several miles of highly developed urban properties and provides valuable green space to thousands of local residents. Vegetated riparian zones provide a natural corridor for urban wildlife and birds, shades the stream, and furnishes opportunities for scenic and recreational experiences in an urban setting.

The principal causes of flooding problems in the repetitive loss areas are construction in the designated floodway and natural floodplain and a lack of adequate stormwater controls in the developed areas. Additional contributing factors include backwater flooding upstream from bridges, and relatively narrow floodplains in the tributaries that cause rapid concentration of runoff with very little peak attenuation. Without the use of stormwater controls, flood magnitudes in several of the flood prone areas are expected to increase significantly at predicted ultimate development conditions. There are several undeveloped areas in the watershed that have the potential to cause localized flooding once they are developed, if no stormwater controls are required.

Repetitive Loss Areas

The repetitive loss area is located between Nolensville Pike and Briarwood Drive (see Appendix C, Figure C.8). Currently, there are 12 properties reporting repetitive losses due to flooding on Sevenmile Creek. In addition, the associated repetitive loss areas encompass 146 properties (24 mitigated, 122 un-mitigated). The Sevenmile Creek Storm Water Basin Plan, completed in 2001, identifies these flood-prone areas and alternative solutions to reduce existing flooding problems.

Mill Creek Watershed – Sorghum Branch

The Mill Creek Sorghum Branch Watershed is located in southeast Davidson County and drains an area of 2.72 square miles. Stream flow within the watershed is generally in a northerly direction and empties into Mill Creek at Stream Mile 8.45 of Mill Creek. Maximum elevation at the upstream watershed divide reaches about 850 feet and drops to elevation 465 feet at the main stream confluence with Mill Creek. The Sorghum Branch watershed was divided into 14 sub-basins and is a relatively long and narrow watershed. Sorghum Branch is typified by narrow valleys with steep side slopes that transition into a rolling terrain on top of the ridges.

Depth of Water

Using the Flood Insurance Study flood profile data for Sorghum Branch the mean average depth of flooding from the stream bed to the Regulatory Floodplain was found to be 7.9 feet. This data is derived from 17 cross sections of Sorghum Branch.

Velocities

Using the Flood Insurance Study flood profile data for Sorghum Branch the mean average velocity is 6.2 feet per second. The velocity is derived form 17 cross sections on Sorghum Branch.

Mill Creek Watershed - Whittemore Branch

The Whittemore Branch Watershed has a drainage area of 3.7 square miles and is located in southeastern Davidson County. The mainstem flows in a northeasterly direction until its confluence with Mill Creek. The repetitive loss area extends from the upstream face of the bridge at Interstate 24 to the downstream face of the bridge at Bell Road.

The principal cause of flooding problems in the repetitive loss area is construction in the designated floodways and natural floodplains, in addition to the lack of adequate stormwater controls in the developed areas. Additional contributing factors include backwater flooding upstream from bridges, steep terrain, and relatively narrow floodplains in the tributaries that cause rapid concentration of runoff with little peak attenuation.

Without the use of stormwater controls, flood magnitudes in the majority of the flood prone areas are expected to increase under predicted ultimate development conditions.

Depth of Water

Using the Flood Insurance Study flood profile data for Whittemore Branch the mean average depth of flooding from the stream bed to the Regulatory Floodplain was found to be 9.7 feet. This data is derived from 12 cross sections of Whittemore Branch.

Velocities

Using the Flood Insurance Study flood profile data for Whittemore Branch the mean average velocity is 5.5 feet per second. The velocity is derived form 12 cross sections on Whittemore Branch.

Repetitive Loss Areas

Currently, there is one property reporting repetitive losses due to flooding on Whittemore Branch. In addition, the associated repetitive loss areas encompass 142 properties (15 mitigated, 127 un-mitigated. See Appendix C, Figure C.9. The Whittemore Branch Storm Water Basin Plan, completed in 1996, identifies these flood-prone areas and alternative solutions to reduce existing flooding problems.

Homes are flooded at the existing conditions 10-year level and none at the 2-year level. However, analyses indicate flood damages begin at a recurrence interval of approximately 1 year. This occurs because the damage assessment analysis model assigns damage beginning when flood waters reach eight feet below the first finished floor.

Overall Creek Watershed

The Overall Creek watershed drainage area covers an area of 7.8 square miles and contains about 4.6 stream miles. There are no flood control structures in this watershed.

Depth of Water

Using the Flood Insurance Study flood profile data for Overall Creek the mean average depth of flooding from the stream bed to the Regulatory Floodplain was found to be 10.1 feet. This data is derived from 11 cross sections of Overall Creek.

Velocities

Using the Flood Insurance Study flood profile data for Overall Creek the mean average velocity is 4.3 feet per second. The velocity is derived form 11 cross sections on Overall Creek. For more information on the Overall Creek watershed drainage area, flooding sources, lengths, velocities, and depth of water refer to table 4-10.

Pages Branch Watershed

The Pages Branch Watershed is located in north-central Davidson County. Pages Branch originates at an elevation of approximately 680 feet and flows in a southwesterly direction to an elevation of approximately 374 feet at its mouth. The watershed drains an area of 3.23 square miles, contains about 4.6 stream miles, and empties into the Cumberland River at river mile 188.5. There are no flood control structures in this watershed.

The watershed is divided into 4 sub-basins: Upper, Dickerson, Middle, and Lower. Two major tributaries empty into Pages Branch Mainstem. The watershed is characterized by flat to gently rolling plains with scattered, steep-sided hills reaching elevations up to 810 feet. Floodplain areas throughout the watershed are typically narrow and steep except in the lower reaches of the mainstem where they are flat. Seven flood-prone structures have been mitigated within this watershed.

Depth of Water

Using the Flood Insurance Study flood profile data for Pages Branch the mean average depth of flooding from the stream bed to the Regulatory Floodplain was found to be 11.7 feet. This data is derived from 9 cross sections of Pages Branch.

Velocities

Using the Flood Insurance Study flood profile data for Pages Branch the mean average velocity is 4.7 feet per second. The velocity is derived form 9 cross sections on Pages Branch. For more information on the Pages Branch watershed drainage area, flooding sources, lengths, velocities, and depth of water refer to table 4-10.

Pond Creek Watershed

The Pond Creek watershed drainage area covers an area of 2.5 square miles. There are no flood control structures in this watershed. No major creeks were studied in the Flood Insurance Study report for this watershed.

Richland Creek Watershed
(Includes portions of Goodlettsville and Ridgetop)

The Richland Creek Watershed is located in southwestern Davidson County. Richland Creek originates at an elevation of approximately 1,100 feet and flows in a north to northwesterly direction to an elevation of approximately 375 feet at its mouth. The watershed drains an area of 28.45 square miles, contains about 24.1 stream miles, and empties into the Cumberland River at river mile 175.6. There are no flood control structures in this watershed.

The watershed is divided into 6 major sub-basins: Belle Meade, Vaughns Gap, Jocelyn Hollow, Sugartree, Middle, and Lower. There are five major tributaries that empty into Richland Creek Mainstem: Unnamed Tributary, Sugartree Creek, Jocelyn Hollow Branch, Vaughns Gap Branch, and Belle Meade Branch.

The watershed is characterized by rugged topography in the southern portion and flat to gently sloping plains with local hills reaching between 300-800 feet in the central and northern portions. Richland Creek and its tributaries flow through predominately urban settings.

Depth of Water

Using the Flood Insurance Study flood profile data for Richland Creek the mean average depth of flooding from the stream bed to the Regulatory Floodplain was found to be 12.3 feet. This data is derived from 34 cross sections of Richland Creek.

Velocities

Using the Flood Insurance Study flood profile data for Richland Creek the mean average velocity is 5 feet per second. The velocity is derived form 34 cross sections on Richland Creek. For more information on the Richland Creek watershed drainage area, flooding sources, lengths, velocities, and depth of water refer to table 4-10.

Repetitive Loss Areas

Following the May 2010 flood event, a repetitive loss area was identified on the mainstem of Richland Creek north of the Interstate-40 overpass. The repetitive loss areas encompass 93 properties (61 mitigated, 32 un-mitigated). There are no repetitive loss properties remaining within this identified flood-prone area. See Appendix C, Figure C.16.

Richland Creek Watershed - Sugartree Creek

(Includes portions of Belle Meade and Forest Hills)

Sugartree Creek, a major tributary of Richland Creek, is located in southwestern Davidson County. The Sugartree Creek basin has a drainage area of 4.91 square miles and Sugartree Creek flows northwest and combines with Richland Creek downstream of West End Avenue. Sugartree Creek flows through predominantly urban settings. The repetitive loss area is located on both sides of Sugartree Creek along Dartmouth Avenue extending from the cul-de-sac of Wimbledon Road downstream to Woodmont Lane, with additional areas located downstream to Revere Private Road.

Depth of Water

Using the Flood Insurance Study flood profile data for Sugartree Creek the mean average depth of flooding from the stream bed to the Regulatory Floodplain was found to be 8.2 feet. This data is derived from 12 cross sections of Sugartree Creek.

Velocities

Using the Flood Insurance Study flood profile data for Sugartree Creek the mean average velocity is 6.2 feet per second. The velocity is derived form 12 cross sections on Sugartree Creek.

Repetitive Loss Areas

The principal causes of flooding in the repetitive loss area are construction in the designated floodways and natural floodplains and lack of adequate stormwater controls in the developed areas. Additional contributing factors include backwater flooding upstream from bridges and steep terrain and relatively narrow floodplains that cause rapid concentration of runoff with very little peak attenuation. Flood magnitudes in the repetitive loss areas are not expected to increase significantly at predicted ultimate development conditions compared to the level of existing urban development.

Currently, there are six properties reporting repetitive losses due to flooding on Sugartree Creek. In addition, the associated repetitive loss areas encompass 29 properties (4 mitigated, 25 un-mitigated) See Appendix C, Figure C.10. The Richland Creek Storm Water Basin Plan, completed in 1990, identifies these flood-prone areas and alternative solutions to alleviate existing flooding problems.

Sandy Creek Watershed

The Sandy Creek watershed drainage area covers an area of .7 square miles. There are no flood control structures in this watershed. No major creeks were studied in the Flood Insurance Study report for this watershed.

Stones River Watershed

The Stones River watershed drainage area covers an area of 77.2 square miles and contains about 46 stream miles. There are no flood control structures in this watershed.

Depth of Water

Using the Flood Insurance Study flood profile data for Stones River the mean average depth of flooding from the stream bed to the Regulatory Floodplain was found to be 44.7 feet. This data is derived from 16 cross sections of Stones River.

Velocities

Using the Flood Insurance Study flood profile data for Stones River the mean average velocity is 7 feet per second. The velocity is derived form 16 cross sections on Stones

River. For more information on the Stones River watershed drainage area, flooding sources, lengths, velocities, and depth of water refer to table 4-10.

Stones River Watershed – East Fork Hamilton Creek

The Stones River Watershed is located in southeast Davidson County. East Fork Hamilton Creek originates at an elevation of approximately 735 feet and flows in a northerly direction to an elevation of approximately 485 feet at Percy Priest Lake. The watershed drains an area of 3.45 square miles and empties into Percy Priest Lake near Smith Springs Road. The watershed is divided into 4 main basins: Upper, Lower, Rural Hill, and Bluewater. There are two main unnamed tributaries to East Fork Hamilton Creek Mainstem. The watershed is characterized by flat to gently rolling plains and scattered, gently sloping hills reaching elevations up to 735 feet. Floodplain areas throughout the watershed are typically wide and flat, except in the upper reaches of the tributaries, where they are steep.

Depth of Water

Using the Flood Insurance Study flood profile data for East Fork Hamilton Creek the mean average depth of flooding from the stream bed to the Regulatory Floodplain was found to be 7.4 feet. This data is derived from 10 cross sections of East Fork Hamilton Creek.

Velocities

Using the Flood Insurance Study flood profile data for East Fork Hamilton Creek the mean average velocity is 4.9 feet per second. The velocity is derived form 10 cross sections on East Fork Hamilton Creek.

Stones River Watershed - McCrory Creek

The McCrory Creek Watershed has a drainage area of 9.31 square miles and is located in southeastern Davidson County. McCrory Creek flows north and discharges into the Stones River. The repetitive loss area is located on McCrory Creek Mainstem immediately downstream from Interstate 40 and extending from Elm Hill Pike to Stewart's Ferry Pike. These reaches encompass older and more established neighborhoods with a long history of flooding problems.

Flood damages within this watershed are generally due to rapid residential development without adequate stormwater controls in the upstream watershed areas combined with development along streams whose floodplain areas were not previously defined and regulated. Additional contributing factors include coincident peak flows from two-sub-basins within the watershed having approximately equal times-of-concentration located immediately upstream from the flood-prone areas, and steep terrain and narrow

floodplains which cause a rapid concentration of runoff with very little peak attenuations. Table 4-22 provides specific damage information for each reach.

Depth of Water

Using the Flood Insurance Study flood profile data for McCrory Creek the mean average depth of flooding from the stream bed to the Regulatory Floodplain was found to be 14.2 feet. This data is derived from 18 cross sections of McCrory Creek.

Velocities

Using the Flood Insurance Study flood profile data for McCrory Creek the mean average velocity is 5.8 feet per second. The velocity is derived form 18 cross sections on McCrory Creek.

Repetitive Loss Areas

Currently, there are six properties reporting repetitive losses due to flooding on McCrory Creek. In addition, the associated repetitive loss area encompasses 102 un-mitigated properties (see Appendix C, Figure C.11). The McCrory Creek Storm Water Basin Plan, completed in 1988, identifies this flood-prone area and alternative solutions to reduce existing flooding problems.

Stones River Watershed - Scotts Creek

The Scotts Creek watershed has a drainage area of 3.39 square miles and is located in northeast Davidson County. Scotts Creek flows from north to south and empties into Stoner Creek at river mile 4.1. The watershed is divided into 19 sub-basins. Scotts Creek originates at an elevation of 600 feet and flows south to an elevation of 435 feet at its mouth. The watershed is characterized by flat to gently rolling plains with scattered, steep-sided hills reaching elevations of up to 600 feet. Floodplain areas throughout the watershed are typically narrow and steep, except in the lower reaches of the mainstream where they are flat and sometimes wide. There are two tributaries that flow into Scotts Creek at Stream Mile 0.9 (Tributary No. 2) and Stream Mile 0.21 (Tributary No. 3).

Depth of Water

Using the Flood Insurance Study flood profile data for Scotts Creek the mean average depth of flooding from the stream bed to the Regulatory Floodplain was found to be 7.8 feet. This data is derived from 6 cross sections of Scotts Creek.

Velocities

Using the Flood Insurance Study flood profile data for Scotts Creek the mean average velocity is 5.9 feet per second. The velocity is derived form 6 cross sections on Scotts Creek.

Sulphur Creek Watershed

The Sulphur Creek watershed drainage area covers an area of 6 square miles and contains about 7.5 stream miles. There are no flood control structures in this watershed. No major creeks were studied in the Flood Insurance Study report for this watershed.

Sycamore Creek Watershed

The Sycamore Creek watershed drainage area covers an area of 21.7 acres and contains about 17.2 stream miles. There are no flood control structures in this watershed. No major creeks were studied in the Flood Insurance Study report for this watershed.

Whites Creek Watershed

The Whites Creek Watershed has a drainage area of 62.8 square miles, contains about 51.5 stream miles, and is located in north-central Davidson County. Whites Creek flows south and discharges into the Cumberland River. There are no flood control structures in this watershed.

Depth of Water

Using the Flood Insurance Study flood profile data for Whites Creek the mean average depth of flooding from the stream bed to the Regulatory Floodplain was found to be 17.4 feet. This data is derived from 16 cross sections of Whites Creek.

Velocities

Using the Flood Insurance Study flood profile data for Whites Creek the mean average velocity is 4.1 feet per second. The velocity is derived form 16 cross sections on Whites Creek. For more information on the Whites Creek watershed drainage area, flooding sources, lengths, velocities, and depth of water refer to table 4-10.

Repetitive Loss Areas

The repetitive loss area is located on the right bank of Whites Creek mainstem extending from Knight Road downstream to Clarksville Pike. Flood damages within this repetitive loss area are due to construction in the natural floodplain. Flood damages have been aggravated by upstream and local urbanization, and backwater from several bridges.

Currently, there are 3 properties reporting repetitive losses due to flooding on Whites Creek. In addition, the associated repetitive loss areas encompass 183 properties (42 mitigated, 141 un-mitigated. See Appendix C, Figure C.12. The Whites Creek Storm Water Basin Plan, completed in 1988, identifies these flood-prone areas and alternative solutions to reduce existing flooding problems.

Two repetitive loss areas have also been identified along Ewing Creek within the Whites Creek watershed. One on the mainstem of Ewing Creek (Figure C.14) and one on North Fork Ewing Creek (Figure C.15). Within these repetitive loss areas, there are three properties reporting repetitive losses due to flooding on Ewing Creek and three properties on North Fork Ewing Creek. In addition, the associated repetitive loss areas encompass 15 properties (9 mitigated, 6 un-mitigated) on Ewing Creek and 183 properties (42 mitigated, 141 un-mitigated) on North Fork Ewing Creek.

Past Occurrences

There have been 140 recorded flood events within Davidson County since July 1780. These events are reported in the Chronology of Disasters in TN (A.P. Coggins) and by the National Climatic Data Center, National Weather Service, and Metro Water Services. These events are presented in a tabular format within Appendix B. The table lists the death and injury totals as well as property and crop damage, plus a description of each event.

The extent of flooding impacts to the Nashville-Davidson County community can be exhibited by the May 2010 flood. It was the worst recorded flood in terms of the impact to the community and economy. As reported in the Tennessean, “it resulted in about 13.5 inches of rainfall over a 36-hour period and the Cumberland River rose to a historic 51 feet. The flooding caused an estimated $2 billion in property and infrastructure damage as well as 26 deaths, 11 in Davidson County. About 11,000 properties were damaged and 10,000 people were displaced from their homes. Around 300-400 business closed.”

Since the last MHMP, Hurricane Harvey occurred. The greatest impact happened around the Texas coastline, but it also had an effect on the Nashville-Davidson County community as well. According to the Tennessean and the National Weather Service, “10 inches of rain fell in 24 hours. The Cumberland River rose to 27 feet, flood level is 40 feet. Whites Creek rose from 3 feet to 15 feet. Evacuations along Whites Creek were voluntary, but about 30 people left their homes and stayed at a Nashville shelter set up for flood victims. 13 Residents along Browns Creek near the Nashville fairgrounds fled to safety. The Nashville National Weather Service confirmed two Nashville tornadoes during the storm, an EF1 tornado touched down in the Bordeaux area and an EF-0 near Lake Sevier in Shelby Park. The EF-1 tornado north of Nashville brought winds of about 95 mph and traveled about .7 miles. It caused damage to a house’s roof and caused exterior damage to others. Two car ports also collapsed, and several large trees were snapped or uprooted. No injuries or fatalities were reported. Nashville deactivated its emergency operations center after less than 24 hours. Most of the damage was contained, although at one point about 10,000 homes were without power.”

More recently, February 2019 set a record for that month, totaling 13.5 inches of rainfall. The average rainfall for the month of February is about 3 inches. As reported in the Tennessean, "no fatalities were reported in the Nashville-Davidson County community. However, 3 deaths were reported in Tennessee. In the community, The Office of Emergency Management, OEM, partially activated the emergency operations center. An American Red Cross shelter was opened, the Metro Nashville Police Department urged residents in the Pennington Bend Road, Opryland, Miami Avenue neighborhood, the KOA Campground and Old Hickory areas to evacuate before water levels rose. The rainfall caused a landside along Interstate 24 in the North Nashville area resulting in a portion of the eastbound interstate to close. Crews in the community had to rescue someone unable to come to shore while on a houseboat at Four Corners Marina. Residents at the Grand Ole RV Resort in Goodlettsville were displaced as RV's flooded. Across Nashville, the fire department responded to at least 60 water rescue calls in one evening, though none involved serious injuries. Tennessee governor Bill Lee declared a State of Emergency, due to rising flood waters and the potential for more severe weather."

Two outstanding historic floods that produced maximum flood heights on much of the Cumberland River were those of December 1926-January 1927 and January 1937. However, the flood of March 1975 exceeded the 1-percent-annual-chance flood elevation in existence prior to this occurrence and caused over $6.6 million worth of damage in Davidson County alone. USACE Nashville District considers the May 2010 event as a historical event when computing the flood frequency discharges based on the extreme magnitude of this flood. Treating the May 2010 event as a historical event extends the period of record for the analysis. Now the May 2010 flood is treated as the largest since 1926 and more accurately estimates the exceedance probability of this event.

Two recent flood events include the May 2010 Flood and the February 2019 Flood. The May 2010 Flood was caused by two days of heavy rain on May 1st and 2nd. Total rainfall amounts ranged from 10 to 20 inches, with 13.57 inches measured at the Nashville International Airport. This broke many rainfall records, and May 2010 became the Wettest May on record, in addition to becoming the Wettest Month on record. Many of the creeks and streams around Nashville surpassed levels not seen since the 1979 Flood. River gauges on Browns Creek, Whites Creek, Mill Creek and Richland Creek all set record crests. The Cumberland River level at downtown Nashville crested at 52.55 feet, making it the 3rd highest level on record, behind the 1937 Flood (53.90 feet) and the highest level recorded on January 1st, 1927 (56.20 feet).

In February 2019, widespread persistent rainfall from the 19th through the 24th capped off a wet month that ended up being the wettest February on record with 13.47 inches of rain measured at Nashville International Airport. This caused rivers across Middle Tennessee to slowly rise, with many reaching flood stage around February 23rd and 24th. Even though this rain was significantly less intense than the May 2010 rainfall, it did fall in a similar pattern to the December 1926 rainfall that caused the record crest on the Cumberland River at Nashville. The two events are eerily similar not only with the amount of rain that fell, but also with the location and time frame it fell. The U.S. Army Corps of Engineers was able to manage the flow of the Cumberland River so that the water level peaked at 40.93 feet, well below the

1927 crest of 56.20 feet. The river level at downtown Nashville remained elevated for several weeks afterward as the water held by upstream projects was routed through the Cumberland River basin

Likelihood of Future Occurrences

The terms "10-year," "50-year," "100-year," and "500-year" floods are used to describe the estimated probability of a flood event happening in any given year. A 10-year flood has a 10 percent probability of occurring in any given year, a 50-year event a 2 percent probability, a 100-year event a 1 percent probability, and a 500-year event a 0.2 percent probability. While unlikely, it is possible to have two 100 or even 500-year floods within years or months of each other. The 1-percent-annual-chance floodplain is presented in Figure 4-21 for all jurisdictions in the planning area according to the effective FEMA Flood Insurance Rate Map.

The potential for flooding can change and increase through various land use changes and changes to land surface. A change in environment can create localized flooding problems inside and outside of natural floodplains through the alteration or confinement of natural drainage channels. These changes can be created by human activities or by other events, such as wildfires, earthquakes, or landslides.

Based on data from NCDC, from 1996 to 2019, there were 93 records of flood or flash flood events over a 23-year period. The average number of flood and flash flood events calculates to 4 events per year. The probability was assigned a rank of **frequent or very likely** to occur: events usually have a high number of recorded incidents or anecdotal evidence. All jurisdictions with a mapped 1-percent annual chance floodplain are assigned this same probability.

The National Weather Service analyzed data in the Nashville-Davidson County area to predict the effects of climate change on the community. The following figures show the historical and predicted precipitation and temperature trends:

Figure 4-23: Nashville Precipitation Trends

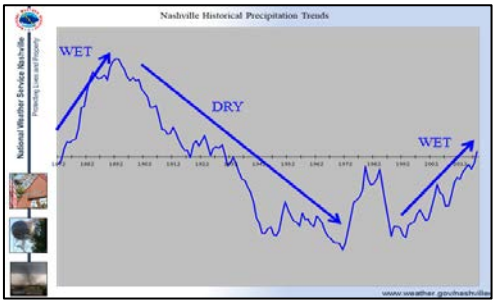


Figure 4-24: Nashville Temperature Trends

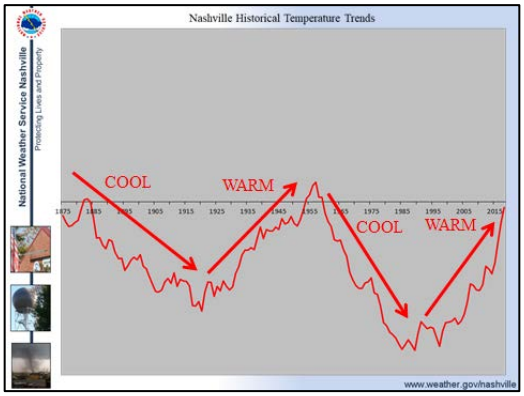


Figure 4-25: Nashville Historic Climate Trends

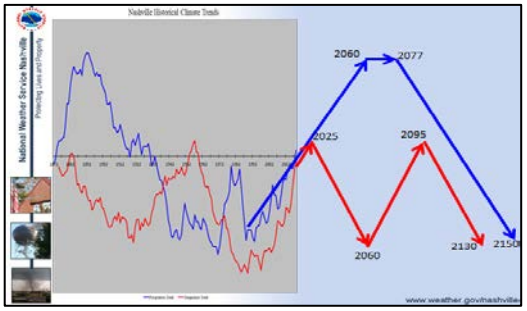
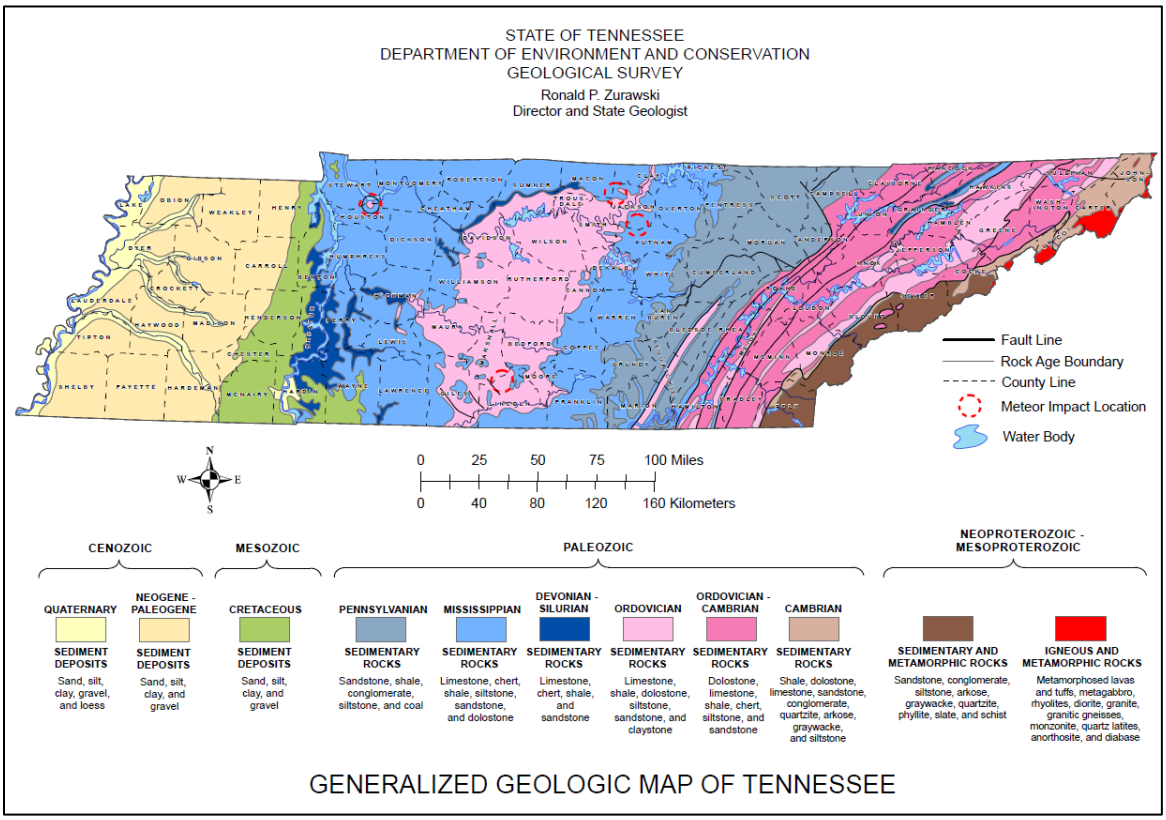


Figure 4-26: Generalized Geologic Map of TN



An earthquake is a shaking or trembling of the earth's surface caused by the lifting, shifting, breaking, or slipping of a fault line. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and cause the shaking that is felt during an earthquake.

Nashville is within proximity of two seismic zones the New Madrid Seismic Zone and the Southern Appalachian Seismic Zone, a portion of which is known as the East Tennessee Seismic Zone.

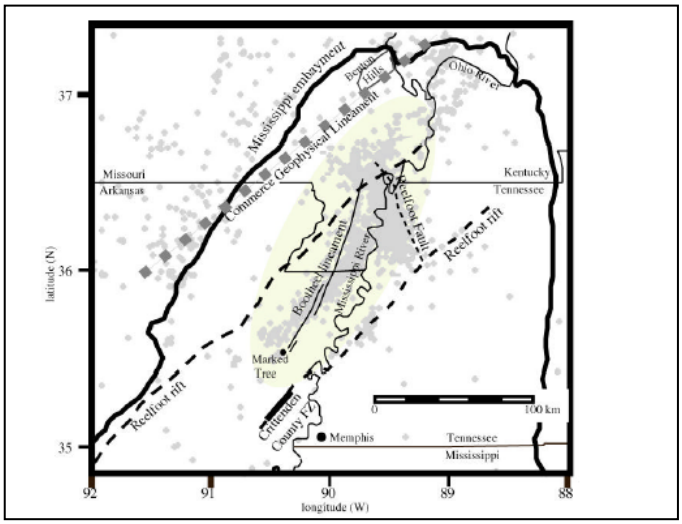


Figure 4-27a: Schematic Map of New Madrid Seismic Zone

The New Madrid Seismic Zone extends from west-central Mississippi northward past Cape Girardeau, Missouri. The center of this seismic zone is in New Madrid, Missouri, which is approximately 210 miles west of Nashville. It is the major source of seismic activity east of the Rocky Mountains. Although activity in the New Madrid Seismic Zone is less frequent than along the West Coast, when tremblers do occur, the destruction covers more than 20 times the area of an equivalent West Coast earthquake because of underlying geology. The largest earthquake in continental United States, according to the U.S. Geological Survey (USGS), occurred on the New Madrid fault in 1811.

Figure 4-27a, is a schematic map of the New Madrid Seismic Zone showing major tectonic features, state boundaries, and major rivers. Instrumentally recorded seismicity delineates faults that probably ruptured in 1811-1812. Currently, aseismic structures (dashed lines) may also represent potential earthquake sources such as the Reelfoot rift boundaries, the Commerce geophysical lineament, the Crittendon County fault zone, and the Bootheel lineament.

The Southern Appalachian Seismic Zone (SASZ) extends from Alabama to Virginia with the most recent activity extending from northwestern Georgia through east Tennessee (the portion known as the East Tennessee Seismic Zone or ETSZ) (Figure 4.27b). The ETSZ is the most active seismic region in the eastern United States. Given the rate of seismicity in the ETSZ, it is somewhat surprising that the largest known earthquake in the ETSZ was the 1973 Alcoa, Tennessee earthquake, which had a magnitude of only 4.6 on the Richter magnitude scale.

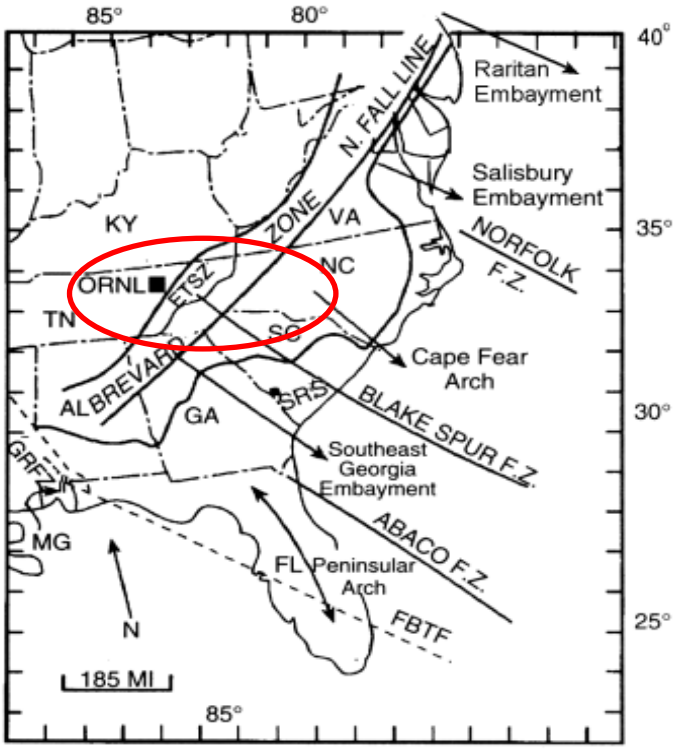


Figure 4-27b: Schematic Map of East Tennessee Seismic Zone

Several methods, compared in Table 4-16, have been developed to quantify the strength of an earthquake. The most recognized methods for measuring earthquake strength are:

Richter Magnitude is a measure of earthquake strength or the amount of energy released. Charles Richter originally developed this scale in 1935. Magnitude is expressed in whole numbers and decimals, with each succeeding whole number representing a tenfold increase in the energy released. There is only one Richter value calculated for the epicenter of a specific earthquake. (The epicenter is the location on the surface of the earth directly above where an earthquake originates. It is determined by measuring the amplitudes of ground motion on seismograms.)

Modified Mercalli Intensity Scale is an evaluation of the severity of ground motion at a given location measured relative to the effects of the earthquake on people and property. This scale was developed by Wood and Nueman in 1931, based on Mercalli's 1902 original version. Intensity is expressed in Roman numerals I – XII. The Mercalli scale is the most effective means of determining the approximate magnitude of a quake that occurred in historic time prior to the advent of uniform seismic detection devices and the Richter Scale.

Richter Magnitude	Mercalli Scale	Effects
2	I – II	Usually detected only by instruments
3	III	Felt Indoors
4	IV – V	Felt by most people; slight damage
5	VI – VII	Felt by all; damage moderate
6	VII – VIII	Damage moderate to major
7	IX – X	Major damage
8+	X - XII	Total and major damage

Table 4-16: Comparison of Richter Magnitude and Modified Mercalli Intensity Scales

Ground Motion Amplification

Ground motion is the movement of the earth's surface due to earthquakes or explosions. It is produced by waves generated by a sudden slip on a fault or sudden pressure at the explosive source and travels through the earth and along its surface. Ground motion is amplified when surface waves of unconsolidated materials bounce off of or are refracted by adjacent solid bedrock.

The ground motions being considered at a given location are those from all future possible earthquake magnitudes at all possible distances from that location. The ground motion coming from a particular magnitude and distance is assigned an annual probability equal to the annual probability of occurrence of the causative magnitude and distance.

The method assumes a reasonable future catalog of earthquakes, based upon historical earthquake locations and geological information on the recurrence rate of fault ruptures.

When all the possible earthquakes and magnitudes have been considered, a ground motion value is determined such that the annual rate of its being exceeded has a certain value. Therefore, as presented on Figure 4-28, for the given probability of exceedance, two percent, the locations shaken more frequently will have larger ground motions. Figure 4-28 shows Davidson County is split in half at 10-14% probability for the eastern part, and 14-20% probability for the western part.

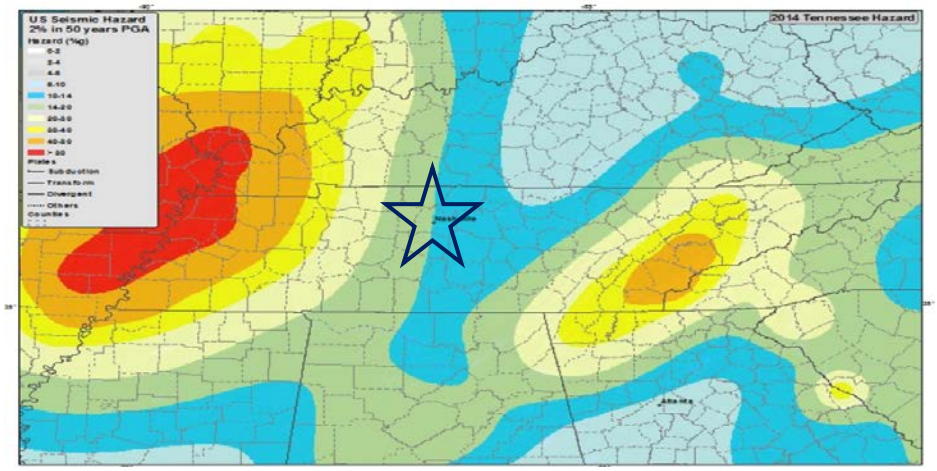


Figure 4-28: Peak Horizontal Acceleration with 2% Probability of Exceedance in 50 years. Source: USGS National Seismic Hazard Maps TN Region- 2014.

Past Occurrences

Earthquake events affecting the Nashville-Davidson County area are presented in Appendix B. The figure below presents earthquake activity from 2010 to 2018, in and surrounding Tennessee. This includes both the New Madrid Fault and the East TN Seismic Zone.

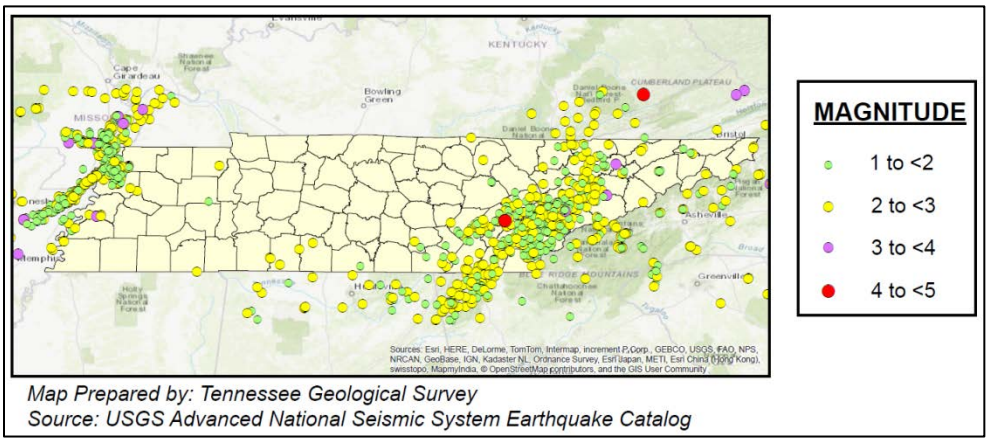


Figure 4-29: 2010-2018 Seismic Activities Through-out Tennessee

Likelihood of Future Occurrences

According to the Tennessee Emergency Management Agency, instead of a prediction of when an earthquake will strike, an estimate of the likelihood of an earthquake recurring within a given time frame should be given:

- The U.S. Geological Survey (USGS) postulates the recurrence interval for a 5.0 magnitude event to be 10-12 years, and for a 6.0 magnitude event to be 70-90 years.
- The USGS and the Center for Earthquake Research and Information estimate that for a 50-year time period, the probability of a magnitude 7.5-8.0 event is 7-10 percent, and for a magnitude 6.0 or larger event is 25-40 percent.
- The highest recurrence rate of large earthquakes in Tennessee occurs in the northwestern quadrant of the state.
- New zones of relatively small seismicity have been identified near the Georgia-Tennessee border at Chattanooga, and roughly along Interstate 75 between Chattanooga and Knoxville. This area has not been studied enough to ascertain the expectancy of seismic event histories or likelihoods.

The New Madrid Seismic Zone is an active seismic zone, averaging more than 180 events per year that measure 1.0 or more on the Richter scale. This is equivalent to approximately 15 events per month. Events measuring 2.5-3.0 on the Richter scale includes tremors large enough to be felt and are noted annually. Every 18 months, the New Madrid Seismic Zone releases a shock of 4.0 or more, capable of local minor damage. Magnitudes of 5.0 or greater occur approximately once per decade, can cause significant damage, and are felt in several states. A damaging earthquake in the New Madrid Seismic Zone (6.0 or greater) occurs about every 80 years (the last one occurred in 1895).

A major earthquake in the New Madrid Seismic Zone (7.5 or greater) happens every 200-300 years (the last one occurred in 1812). It is predicted that there is a 25 percent chance of a disastrous major earthquake by 2040. A New Madrid Seismic Zone rupture of this size would be felt throughout half the United States and damage would be expected in 20 states or more. Events measuring 6.0-7.6 have more significant probabilities in the near future. A 6.0 shock has a 90 percent chance of occurring by the year 2040.

Only one or two earthquakes with magnitudes equal to or greater than 3.0 are expected in the SASZ per year. The extrapolated, expected recurrence time for earthquakes with magnitudes of 6.0 or greater in the SASZ is 186 years (Bollinger et al., 1989).

Studies were conducted by the Mid-America Earthquake Center under a $12 Million contract for the Dept. of Homeland Security and FEMA from 2006 to 2009 for projected damage figures for a 7.7 New Madrid Earthquake Event. This data was used to conduct a scenario for the National Level Exercise 2011 for all Federal Agencies, including the Dept. of Defense and all 22 affected state jurisdictions. Detailed information for Davidson County is discussed in section 4.2.

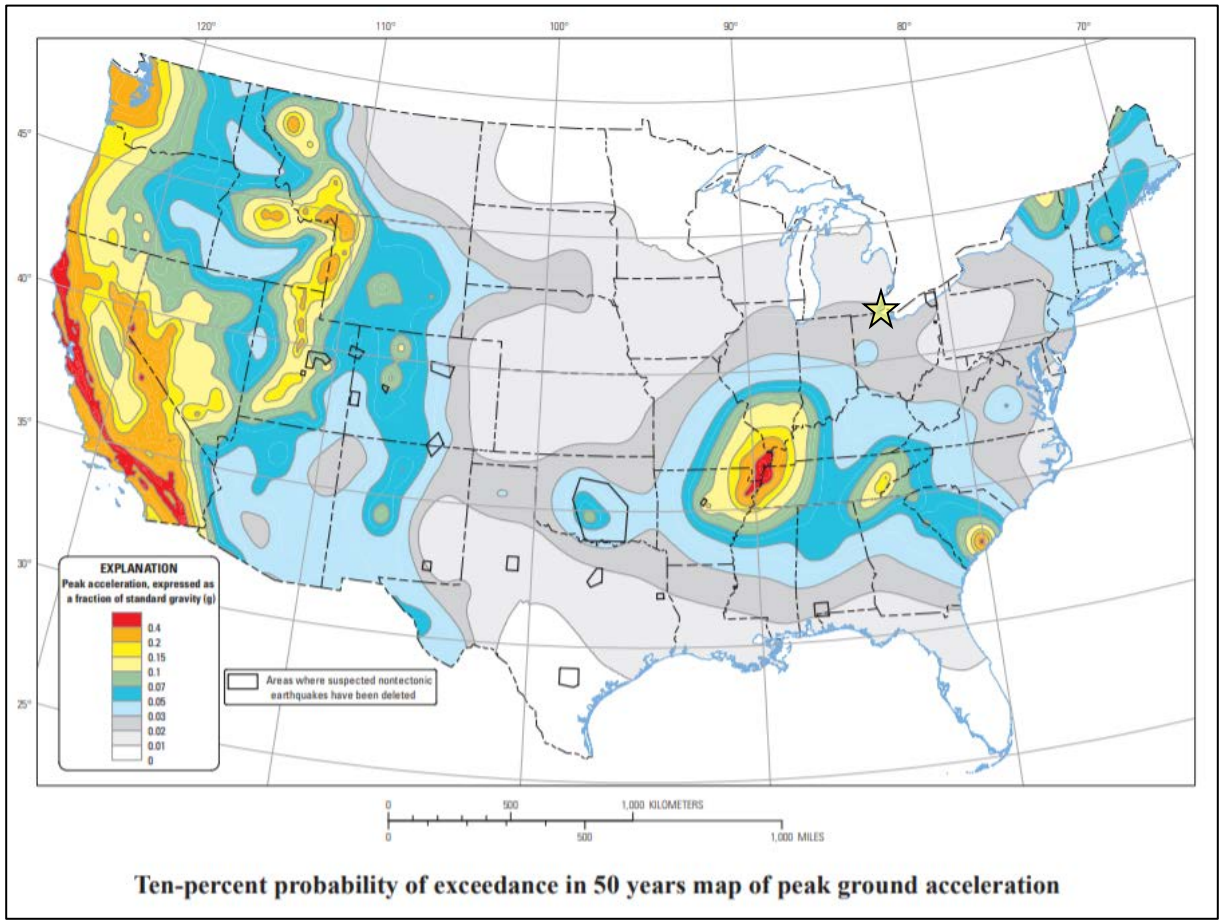


Figure 4-30: Seismic Hazard Map of US (as of November 2014)
(source: earthquake.usgs.gov)

LANDSLIDES

The term landslide includes a wide range of ground movement, such as rock falls, deep failure of slopes, and shallow debris flows. Although gravity acting on an over-steepened slope is the primary reason for a landslide, there are other contributing factors:

Figure 4-31: Landslide on I-24 E, Mile Marker 42, Feb. 23, 2019.

(Photo courtesy of TDOT)

- Erosion by rivers, glaciers, or ocean waves create over steepened slopes;
- Rock and soil slopes are weakened through saturation by snowmelt or heavy rains;
- Earthquakes create stresses that make weak slopes fail;
- Earthquakes of magnitude 4.0 and greater have been known to trigger landslides;
- Volcanic eruptions produce loose ash deposits, heavy rain, and debris flows; and
- Excess weight from accumulation of rain or snow, stockpiling of rock or ore from waste piles or from man-made structures may induce weak slopes to fail.

Landslides constitute a major geologic hazard because they are widespread, occurring in all 50 states, and cause $1 to 2 billion in damages and more than 25 fatalities, on average, each year. Landslides pose serious threats to highways and to structures that support fisheries, tourism, timber harvesting, mining, and energy production, as well as general transportation. Landslides commonly happen concurrently with other major natural disasters such as earthquakes and floods, which exacerbate relief and reconstruction efforts. Expanded development and other land uses have increased the incidence of landslide disasters.

Steep slopes, present throughout the Metro area, specifically in south-central Davidson and north-central Williamson Counties, have the potential to be unstable. Landslides have occurred in this area due to construction-altered colluvium soils on steep slopes adjacent to the Highland Rim escarpment. Colluvium soils are derived from the weathering and erosion of the siliceous Fort Payne Formation, and are composed chiefly of silt- to clay-sized fragments of silica with some fragments ranging up to boulder size.

Developments on steeper slopes in recent years have increased the number of landslides and the potential for land sliding in areas around Nashville, especially in the Bellevue area of southwestern Davidson County. Most recent landslide incidents have occurred on Dellrose soils at the base of the Fort Payne-Chattanooga slopes.

Figure 4-32 presents evidence of a landslide that occurred at an apartment complex along Edmondson Pike. The slides average about 200 feet in width, 150 feet in length, and have steep surfaces on the undisturbed ground at the upper edge of the landslide ranging from about 3 feet to 24 feet. These slides are significant because they occurred in residential subdivisions with resulting financial loss to many property owners. Damage ranged from minor cracks in retaining walls and foundations to major structural failure of residences. Roadways and driveways were crumpled, dislocated, or cracked.

Figure 4-32: Evidence of Landslides

Figure 4-33 shows pictures taken from Metro Planning's pictometry flights just days after the May 2010 flood.

Figure 4-33: Evidence of Landslides after May 2010 Flood

Past Occurrences

Several landslides occurred in Nashville in the early 1970s. In particular, many landslides occurred in 1975, partially because of heavy rainfall. Approximately 40 slides were visited after the rains of March 11-13, 1975. One special problem was created in the case of a Tennessee Valley Authority transmission line tower located adjacent to one of the slides. The upper scarp of a slide that occurred March 11, 1975 (one occurred in the same location in 1974) was only 30 feet downhill from the lower legs of the tower. Within the following month, transverse cracks and scarps were forming all around the tower, causing the tower legs to buckle; the base was moved outward and downward, where the tower was tilting uphill. The tower has since been removed from the site.

During the construction of U.S. Highway 70 across Nine Mile Hill, fill failure over colluvium caused continuing problems. In 1973, there was subsequent collapse of deeply weathered Fort Payne and Chattanooga material onto the roadway at the same time.

Old alluvium in a cut on Interstate Highway 40 just northeast of the U.S. Highway 70 South interchange failed, requiring construction of a reinforced retaining wall. Failure of the same material at a service station at this intersection required similar construction.

Many landslides occurred as a result of the May 2010 flooding as shown in Figure 4-26a and in Appendix B.

The most recent landslide happened on the side of Interstate 24, eastbound, on February 23rd, 2019, as seen in figure 4-31. The interstate was impassable and subsequently shutdown for 19 days as TN Department of Transportation crews worked to remove approximately 36,000 cubic yards of material, and make a temporary widening around the site to temporarily accommodate the 2 lanes of traffic affected. Permanent slope repairs included additional excavation of the slope and installation of a rock buttress behind a rock bench approximately 50 feet wide. This work took several months, and approximately $8 million dollars.

Slopes greater than 25% are presented in Figure 4-34b.

Likelihood of Future Occurrences

Although the physical cause of many landslides cannot be removed, geologic investigations, good engineering practices, and effective enforcement of land use management regulations can reduce landslide hazards. Metro subdivision regulations designate lots with steeps slopes as critical lots, which require review of planned buildings on the lots. Lots are designated critical during the preliminary plat review process based on soil conditions, degree of slope or other lot features, and to address concerns relating to the feasibility of construction. However, outside of subdivision development, the critical lot concept is not utilized.

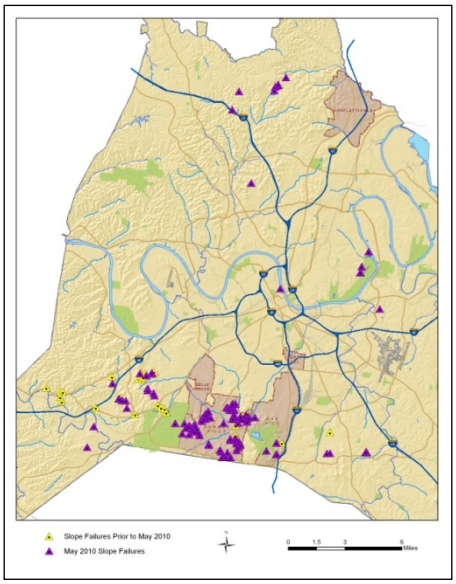


Figure 4-34a: Slope Failure

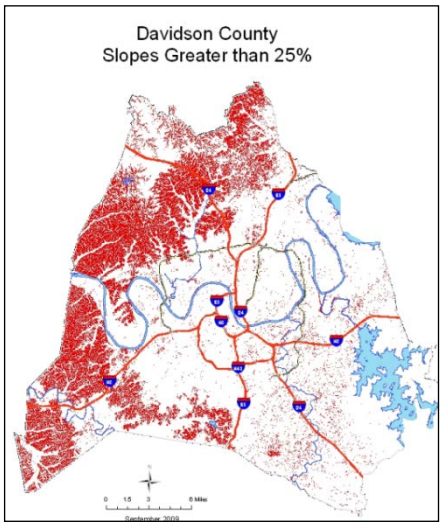


Figure 4-34b: Slopes greater than 25%

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SINKHOLES

Karst is a distinctive topography in which the landscape is shaped by the dissolving action of water on carbonate bedrock (usually limestone, dolomite, or marble). Davidson County is characterized by gently folded and flat-lying carbonate rocks, indurated limestone, and dolomite that have not been strongly deformed. Dissolution in this region may produce solution, collapse, and cover-collapse sinkholes.

Solution sinkholes form as the limestone dissolves, creating sunken areas in the land surface. Collapse sinkholes form when caves collapse and suddenly drop a portion of the land surface above. Damage to buildings commonly results from collapse of soil and/or rock material into an open void space near or beneath man-made structures. As shown in figure 4-35, these three photos from different parts of the county proves that sinkholes happen all over the county; downtown, west and southeast.

Figure 4-35: Local Sink Holes

Ground subsidence into even a small opening may be very costly if a structure sits on the overlying surface. Sinkhole collapses are often unpredicted and sudden, although they occur more frequently after heavy rainfall. Heavy rainfalls increase the soil's weight and decrease its strength and stability. Construction can also trigger collapses by directing runoff into a vulnerable area, or weakening the cover of an incipient collapse. Finally, lowering of the water table by a nearby well or from quarry pumping can also trigger collapse when the buoyant effect of groundwater is removed.

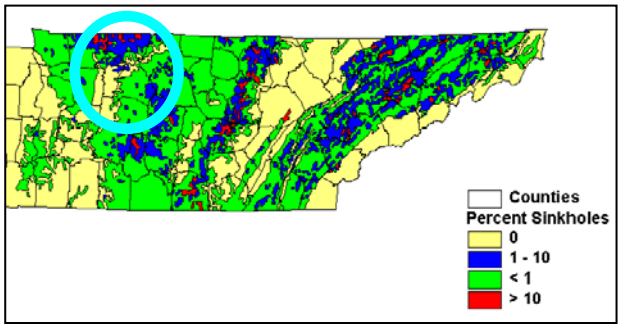


Figure 4-36a: Karst Hazard Map of Tennessee

(Source: TDEC Ground Water 305b Water Quality Report, November2002)

Within Metropolitan Nashville-Davidson County, areas susceptible to sinkhole formations have been noted adjacent to J. Percy Priest Lake (see Figures 4-36a-b & 4-37).

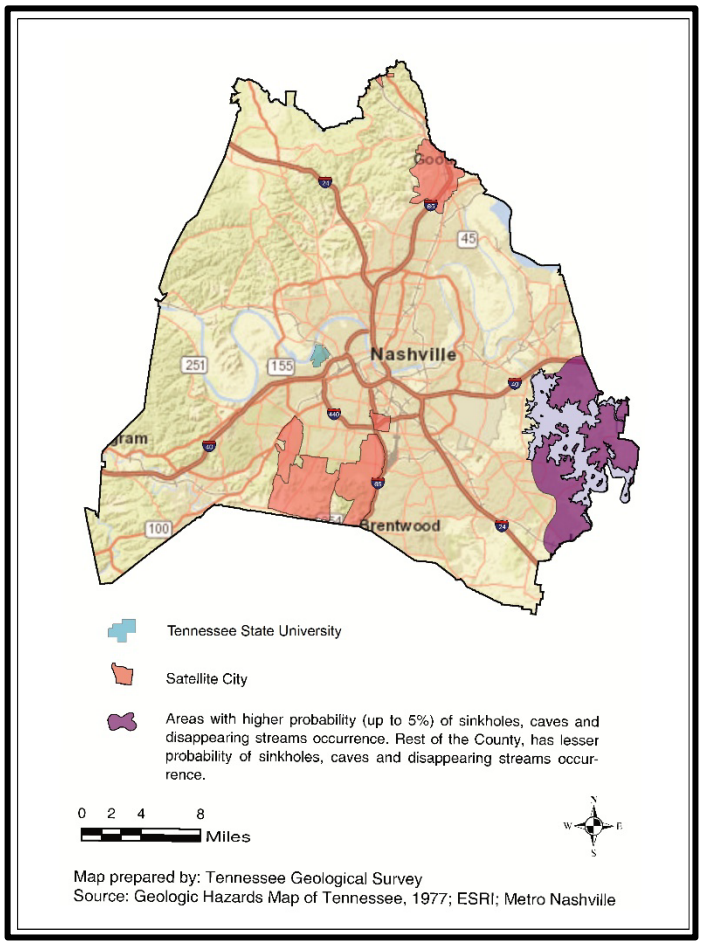


Figure 4-36b: Map of Davidson County- Jurisdictional Sinkhole Probability

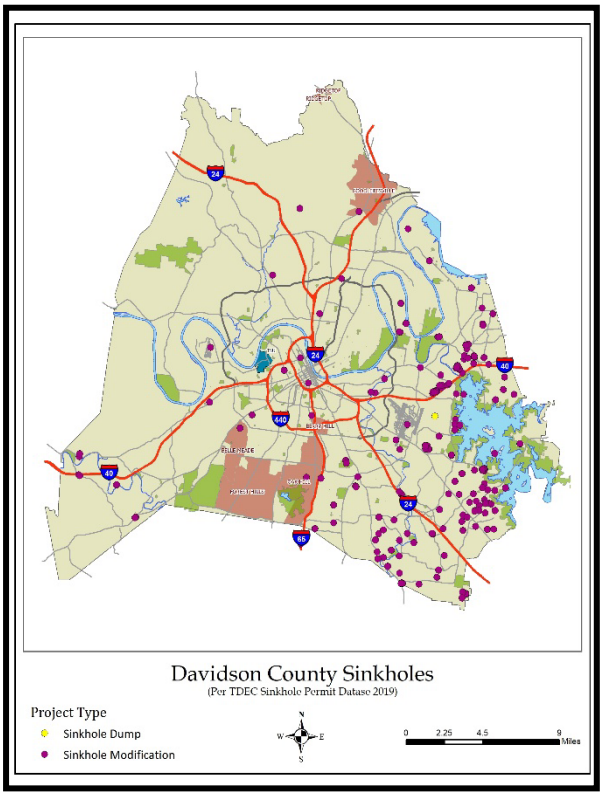
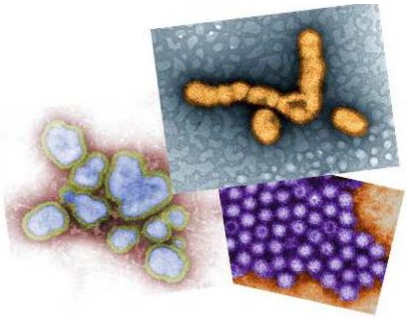


Figure 4-37: Map of Davidson County Sinkholes per TDEC Sinkhole Permit Database 2019
(Provided by Metro Water Services)

COMMUNICABLE DISEASES/PUBLIC HEALTH

Communicable diseases, sometimes called infectious diseases, are illnesses caused by organisms such as bacteria, viruses, fungi and parasites. Communicable diseases may be spread directly from one infected person to another, from an animal to a human or from some inanimate object (doorknobs, table tops, etc.) to an individual.



Past Occurrences

Examples of communicable disease outbreaks seen historically in TN are West Nile Virus (mosquito-borne), bed bugs and pertussis (whooping cough). The most recently declared worldwide communicable disease emergency that affected TN was the H1N1 (swine flu) pandemic in 2010.

In 2017-2019, Nashville experienced a Hepatitis A outbreak that infected more than 200 residents of Davidson County. The outbreak has spread throughout Tennessee and to other states. Populations impacted are jails, people that use recreational drugs, and persons in close contact with symptomatic infected person. Prior to this outbreak on average Davidson County encounters one confirmed case per year and Tennessee Department of Health reports a total of 13 case per year in the state.

Likelihood of Future Occurrences

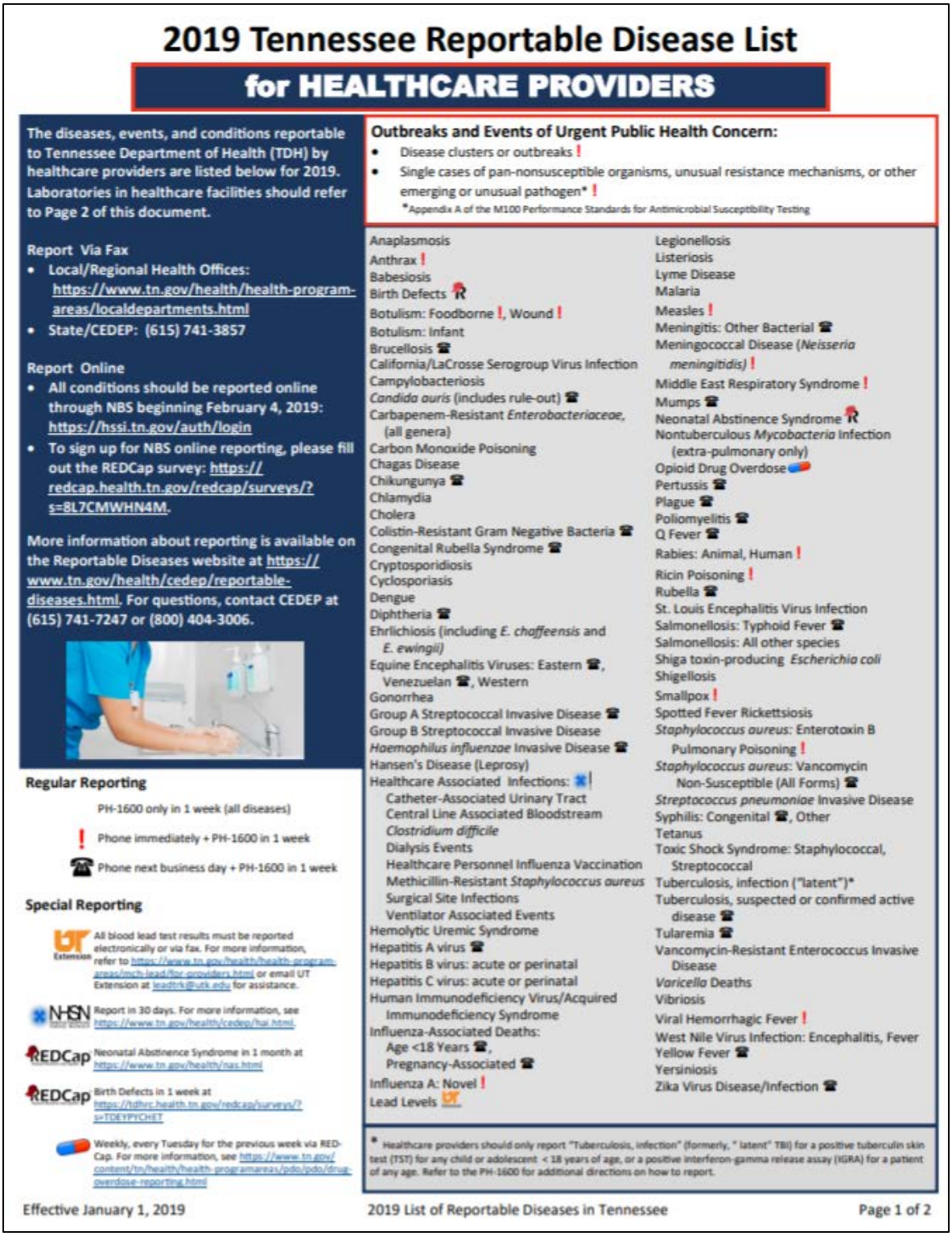
Because there are so many different types of communicable diseases, prevention and mitigation are dependent on the specific outbreak. Depending on the disease, prevention and mitigation could range from washing hands to covering cough to isolation and quarantine. It is the responsibility of the Director of Health to recognize various characteristics of the communicable disease and create/implement prevention and mitigation measures.

Hepatitis A is a vaccine preventable infection and as part of the outbreak response Metro Public Health Department with the Tennessee Department of Health launched a campaign to vaccinate the most vulnerable populations with free immunizations to combat the spread of the virus. With education and vaccine treatment reoccurrence can be mitigated which will reduce the likely hood of another Hepatitis A outbreak.

As of 2019 there is a movement in the United States to not get any vaccinations against know preventable viruses. As a result possible outbreaks are likely to occur for population refusing vaccinations against known preventable infectious. Metro Public Health Department continues to promote and educate Nashville residents to get vaccinated. A full list of reportable diseases follows.

Davidson County communicable disease surveillance and control activities are coordinated by the Metro Public Health Department in conjunction with the Tennessee Department of Health.

Figure 4-38: TN Reportable Disease List 2019



2019 Tennessee Reportable Disease List

for HEALTHCARE PROVIDERS

The diseases, events, and conditions reportable to Tennessee Department of Health (TDH) by healthcare providers are listed below for 2019. Laboratories in healthcare facilities should refer to Page 2 of this document.

Report Via Fax
- **Local/Regional Health Offices: https://www.tn.gov/health/health-program-areas/localdepartments.html**
- **State/CEDEP: (615) 741-3857**

Report Online
- **All conditions should be reported online through NBS beginning February 4, 2019: https://hssi.tn.gov/auth/login**
- **To sign up for NBS online reporting, please fill out the REDCap survey: https://redcap.health.tn.gov/redcap/surveys/?s=8L7CMWHN4M.**

More information about reporting is available on the Reportable Diseases website at https://www.tn.gov/health/cedep/reportable-diseases.html. For questions, contact CEDEP at (615) 741-7247 or (800) 404-3006.

Regular Reporting

PH-1600 only in 1 week (all diseases)

! Phone immediately + PH-1600 in 1 week

☎ Phone next business day + PH-1600 in 1 week

Special Reporting

All blood lead test results must be reported electronically or via fax. For more information, refer to https://www.tn.gov/health/health-program-areas/mch-lead/for-providers.html or email UT Extension at leadtrk@utk.edu for assistance.

Report in 30 days. For more information, see https://www.tn.gov/health/cedep/hai.html.

Neonatal Abstinence Syndrome in 1 month at https://www.tn.gov/health/nas.html

Birth Defects in 1 week at https://tdhrc.health.tn.gov/redcap/surveys/?s=TDEYPYCHET

Weekly, every Tuesday for the previous week via RED-Cap. For more information, see https://www.tn.gov/content/tn/health/health-programareas/pdo/pdo/drug-overdose-reporting.html

Outbreaks and Events of Urgent Public Health Concern:
- Disease clusters or outbreaks !
- Single cases of pan-nonsusceptible organisms, unusual resistance mechanisms, or other emerging or unusual pathogen* !

*Appendix A of the M100 Performance Standards for Antimicrobial Susceptibility Testing

Anaplasmosis
Anthrax !
Babesiosis
Birth Defects R
Botulism: Foodborne !, Wound !
Botulism: Infant
Brucellosis ☎
California/LaCrosse Serogroup Virus Infection
Campylobacteriosis
Candida auris (includes rule-out) ☎
Carbapenem-Resistant *Enterobacteriaceae*, (all genera)
Carbon Monoxide Poisoning
Chagas Disease
Chikungunya ☎
Chlamydia
Cholera
Colistin-Resistant Gram Negative Bacteria ☎
Congenital Rubella Syndrome ☎
Cryptosporidiosis
Cyclosporiasis
Dengue
Diphtheria ☎
Ehrlichiosis (including *E. chaffeensis* and *E. ewingii)*
Equine Encephalitis Viruses: Eastern ☎, Venezuelan ☎, Western
Gonorrhea
Group A Streptococcal Invasive Disease ☎
Group B Streptococcal Invasive Disease
Haemophilus influenzae Invasive Disease ☎
Hansen's Disease (Leprosy)
Healthcare Associated Infections: N !
Catheter-Associated Urinary Tract
Central Line Associated Bloodstream
Clostridium difficile
Dialysis Events
Healthcare Personnel Influenza Vaccination
Methicillin-Resistant *Staphylococcus aureus*
Surgical Site Infections
Ventilator Associated Events
Hemolytic Uremic Syndrome
Hepatitis A virus ☎
Hepatitis B virus: acute or perinatal
Hepatitis C virus: acute or perinatal
Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
Influenza-Associated Deaths:
Age <18 Years ☎,
Pregnancy-Associated ☎
Influenza A: Novel !
Lead Levels

Legionellosis
Listeriosis
Lyme Disease
Malaria
Measles !
Meningitis: Other Bacterial ☎
Meningococcal Disease (*Neisseria meningitidis)* !
Middle East Respiratory Syndrome !
Mumps ☎
Neonatal Abstinence Syndrome R
Nontuberculous *Mycobacteria* Infection (extra-pulmonary only)
Opioid Drug Overdose
Pertussis ☎
Plague ☎
Poliomyelitis ☎
Q Fever ☎
Rabies: Animal, Human !
Ricin Poisoning !
Rubella ☎
St. Louis Encephalitis Virus Infection
Salmonellosis: Typhoid Fever ☎
Salmonellosis: All other species
Shiga toxin-producing *Escherichia coli*
Shigellosis
Smallpox !
Spotted Fever Rickettsiosis
Staphylococcus aureus: Enterotoxin B Pulmonary Poisoning !
Staphylococcus aureus: Vancomycin Non-Susceptible (All Forms) ☎
Streptococcus pneumoniae Invasive Disease
Syphilis: Congenital ☎, Other
Tetanus
Toxic Shock Syndrome: Staphylococcal, Streptococcal
Tuberculosis, infection ("latent")*
Tuberculosis, suspected or confirmed active disease ☎
Tularemia ☎
Vancomycin-Resistant Enterococcus Invasive Disease
Varicella Deaths
Vibriosis
Viral Hemorrhagic Fever !
West Nile Virus Infection: Encephalitis, Fever
Yellow Fever ☎
Yersiniosis
Zika Virus Disease/Infection ☎

* Healthcare providers should only report "Tuberculosis, infection" (formerly, " latent" TBI) for a positive tuberculin skin test (TST) for any child or adolescent < 18 years of age, or a positive interferon-gamma release assay (IGRA) for a patient of any age. Refer to the PH-1600 for additional directions on how to report.

Effective January 1, 2019 — 2019 List of Reportable Diseases in Tennessee — Page 1 of 2

Hazardous Materials Incidents

This section of the plan highlights the potential factors for Nashville Davidson County to recognize the significance for all that passes through the County.

Nashville - Davidson County is unique with four major Interstate systems (I-65, I- 40, I-24 and I-440) that converge on the County. Then combine that with Briley Parkway and Ellington Parkway, which are state highways, which makes for an often congested hub and one of the few unique cities in the nation that has that number of major motorways converging in one area such as Nashville. Nashville - Davidson County also boasts a major inter-coastal waterway (Cumberland River), two major rail lines (CSX North/South line and East/West) and one (Music City Star) commuter rail line. Nashville, with the growth spell it's had in recent years also has a busy International Airport bringing visitor's from all over the world to enjoy the culture, history and music. Nashville has a major fuel pipeline (Colonial Pipeline) and natural gas line (Duke Energy) as well as major fuel depots that support the mid-state Region in addition to the County. There are many chemical companies, research laboratories and industry that have potential for hazardous materials incidents, which makes Nashville and Davidson County have a higher probability for a hazardous materials incident. Nashville is also a unique city in that it's a frequent corridor for hauling radioactive and spent nuclear material, munitions and fuel rods from the region.

Submission of Tier II forms is required under Section 312 of the Emergency Planning and Community Right-to-know Act of 1986 (EPCRA). The purpose of this form is to supply officials and the public with specific information on potential hazards relating to hazardous chemicals at certain thresholds. Required information includes locations and amount of hazardous materials at the facility. Since September 1st, 2014, the State of Tennessee has required all facilities operating in the State to electronically file Tier II reports using E-Plan, and since 2015, Metro Nashville-Davidson County has gone to electronically filing using E-Plan as well, instead of facilities submitting paper copies to the Local Emergency Planning Committee (OEM) and Nashville Fire Department. Residents can requests specific facility Tier II requests to the State Emergency Response Commission in writing. Approved first responders do not have to pay to use this E-Plan program

Most of our hazardous materials incidents tend to be accidental; however there can be times where they're intentional such as chemical suicides, "white powder", or incidents with more nefarious intent. The majority of hazardous materials incidents in Nashville-Davidson County involve fuel spills from either damaged fuel tanks or overturned tankers. Fuel is delivered by pipeline, trucked in by semi and carried on the river by barges. In addition, there are numerous transports hauling chemicals through Nashville, such as: ammonia, oxygen, hydrogen, argon, nitrogen and acids to name a few.

The potential for hazardous materials incidents are high in the Nashville Davidson County area. Because of this, the Nashville Fire Department has two full time hazardous materials Teams that regularly respond to incidents. Historically speaking, there've not been any significant hazardous materials incidents in the county that weren't resolved within a few hours of inception. With that said, this potential "high-risk/low frequency" incident ranks high on the probability scale and makes it a high importance that hazardous materials teams,

Special Operations, amongst others, conduct exercises and train for those sort of High Risk Low Frequency incidents.

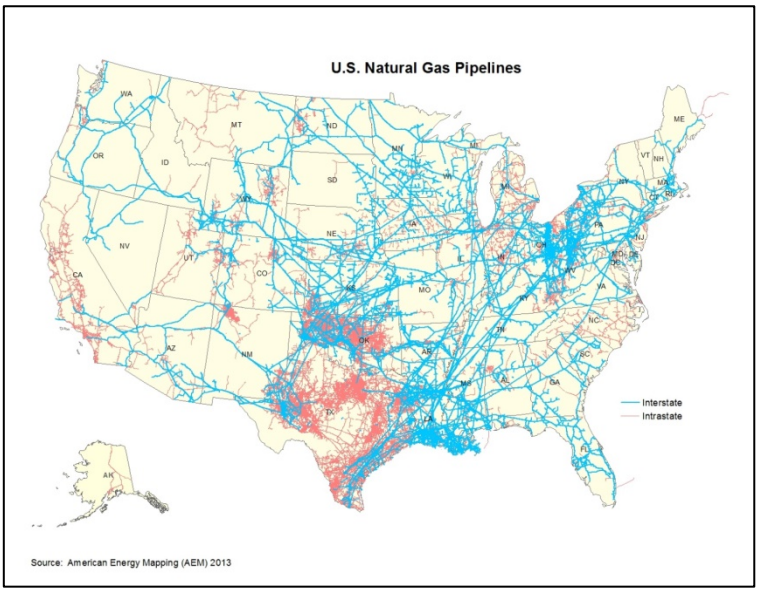


Figure 4-39: Map of Natural Gas Pipelines

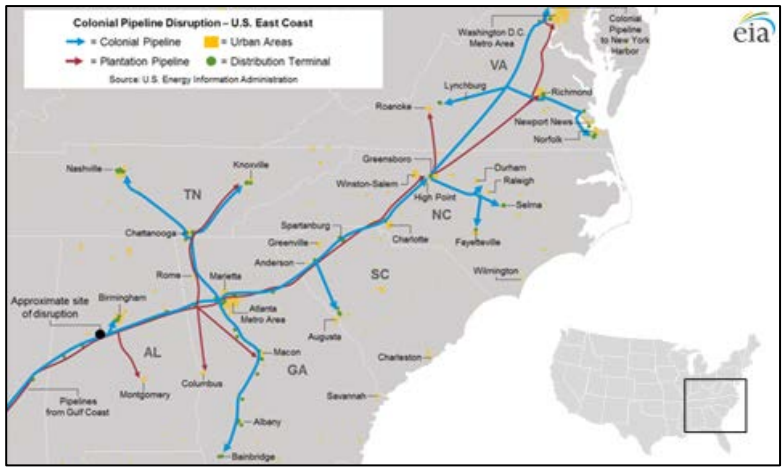


Figure 4-40: Map of Colonial Pipeline

Figure 4-41: Map of CSX Rail Line

WILDFIRES

Heavily wooded or forested areas cover only a small portion of Davidson County's total land area, however, wildfires are not only in forested areas, many occur in grassland areas such as yards and pastures, primarily due to escaped debris burns. According to the TN Division of Forestry, debris burning and arson are the two main causes of wildfires. Debris burning is not allowed within Davidson County without a permit.

Nonetheless, when the conditions are right, all these areas become vulnerable to devastating wildfires. Also, in the last few decades, the risks associated with Davidson County's wildfire hazard have increased dramatically due to the increase in urban development in and around forested areas.

Generally, there are three major factors that sustain wildfires and allow for predictions of a given area's potential to burn. These factors include:

- Fuel;
- Topography; and
- Weather.

Fuel is the material that feeds a fire and is a key factor in wildfire behavior. Fuel is generally classified by type and by volume. Fuel sources are diverse and include everything from dead tree needles, twigs, and branches to dead standing trees, live trees, brush, and cured grasses. Man-made structures and other associated combustibles are also to be considered as a fuel source. The type of prevalent fuel directly influences the behavior of wildfire. Light fuels such as grasses burn quickly and serve as a catalyst for spreading wildfires.

An area's topography (terrain and land slopes) affects its susceptibility to wildfire spread. Fire intensities and rates of spread increase as slope increases due to the tendency of heat from a fire to rise via convection and radiation. The natural arrangement of vegetation throughout a hillside can also contribute to increased fire activity on slopes

Weather components such as temperature, relative humidity, wind, and lightning also affect the potential for wildfire. High temperatures and low relative humidity dry out the fuels that feed the wildfire creating a situation where fuel will more readily ignite and burn more intensely. Wind is the most treacherous weather factor. The issue of drought conditions contributes to concerns about wildfire vulnerability.

The National Weather Service Fire Weather Program emerged in response to a need for weather support to large and dangerous wildfires. This service is provided to federal and state land management agencies for the prevention, suppression, and management of forest and rangeland fires. The National Weather Service Forecast Office in Nashville provides year-round fire weather forecasts for most of Middle Tennessee. Routine fire weather forecasts are issued daily for Tennessee Division of Forestry Districts. (Nashville/Davidson County is located within the Highland Rim District Figure 4-42).

Figure 4-42: Tennessee Forestry Districts

Past Occurrences

As shown in Table 4-17, wildfire calls have consistently declined since 2016. More information about past events is presented in Appendix B.

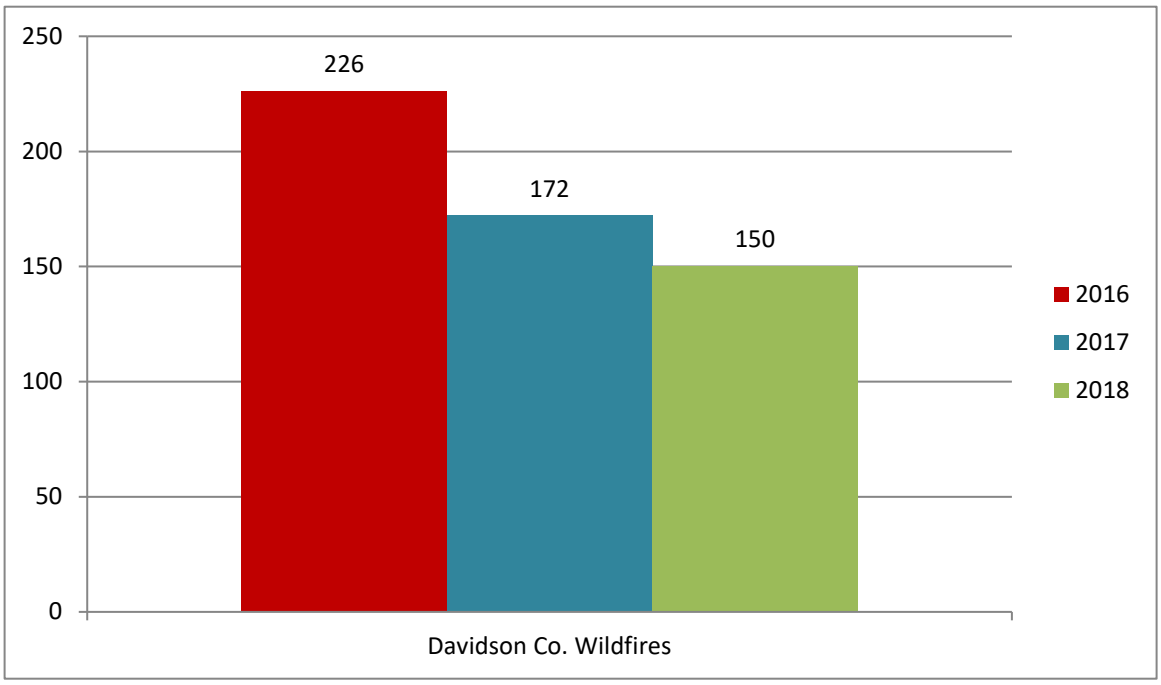


Table 4-17: Davidson County Wildfires

(Source: NFIRS reporting from Nashville Fire Dept., Fire Marshall's Office)

Highland Rim District Wildfire Statistics *Source: TN Division of Forestry, Highland Rim District Office*							
		Causes #		Causes %			
Year	Total Number Fires	Debris	Incendiary	Debris	Incendiary	Total Acres Burned	Avg Fire Size
1997	326	162	94	50%	29%	1893	5.8
1998	394	192	110	49%	28%	2354	6
1999	1026	421	323	41%	31%	8354	8.1
2000	668	292	228	44%	34%	3689	5.5
2001	552	273	147	49%	27%	3689	6.7
2002	302	148	86	49%	28%	1627	5.4
2003	290	142	93	49%	32%	892	3.1
2004	380	195	115	51%	30%	2061	5.4
2005	519	261	145	50%	28%	2128	4.1
2006	700	383	156	55%	22%	4441	6.3
2007	825	362	190	44%	23%	6092	7.4
2008	275	132	59	48%	21%	1633	5.9
2009	299	163	65	55%	22%	2221	7.4
2010	375	194	91	52%	24%	2878	7.7
2011	289	122	68	42%	24%	2523	8.7
2012	249	98	58	39%	23%	1528	6.1
2013	159	75	52	47%	33%	774	4.9
2014	272	145	50	53%	18%	1866	6.9
2015	180	72	53	40%	29%	1532	8.5
2016	240	79	68	33%	28%	2570	10.7
		Debris	**Undetermined**	**Debris**	**Undetermined**		
2017	135	53	24	39%	18%	860	6.4
2018	77	30	20	39%	26%	535	6.9
District Averages	**388**	**182**	**104**	**46%**	**26%**	**2552**	**6.5**

Table 4-18: TN Division of Forestry, Highland Rim District Office Response

Likelihood of Future Occurrences

Numerous products are created by or in conjunction with the US Forest Services and/or the National Weather Service to help forecast daily, monthly and seasonal forecasts. Over the next several months, the Middle TN area is expected to have below normal potential as presented in Figure 4-43, by the National Interagency Fire Center.

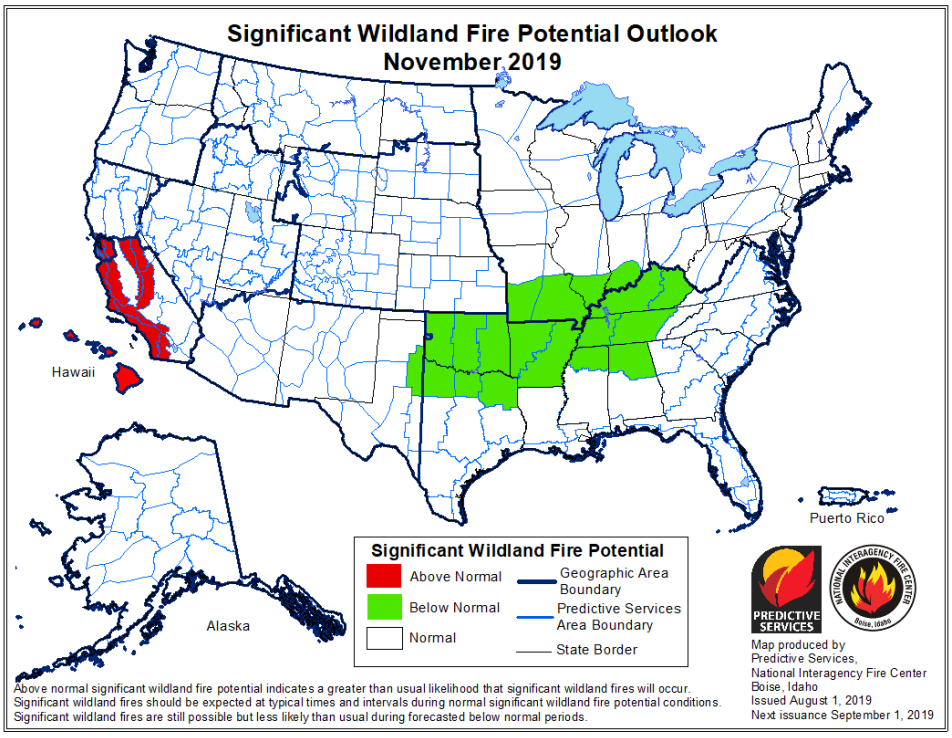


Figure 4-43: Wildfire Potential outlook

MAN-MADE HAZARDS

For the purpose of this plan, "man-made hazards" are technological hazards and terrorism. These are distinguished from natural hazards in that they originate from human activity. The term "technological hazards" refers to the origins of incidents that can arise from human activities such as the manufacture, transportation, storage, and use of hazardous materials. Although this can also include potential damage from ground shaking or airborne materials resulting from blasting operations at quarries or construction sites, this hazard is not addressed in the plan since the State Fire Marshalls Office in the Tennessee Department of Commerce and Insurance regulates all blasting operations in the state.

The term "terrorism" refers to intentional, criminal and malicious acts. Terrorism is officially defined in the Code of Federal Regulations as "...the unlawful use of force or violence against persons or property to intimidate or coerce a Government, the civilian population, or any segment thereof, in furtherance of political or social objectives." For the purposes of mitigation planning, "terrorism" refers to the use of Weapons of Mass Destruction (WMD) including biological, chemical, nuclear, and radiological weapons; arson, incendiary, explosive, and armed attacks; industrial sabotage and intentional hazardous materials releases; and "cyber terrorism."

Mitigation planning refers to specific actions that can be taken to reduce loss of life and property from manmade hazards by modifying the built environment to reduce the risk and potential consequences of these hazards.

Preparedness includes plans and preparations made to save lives and property and to facilitate response operations. Response includes actions taken to provide emergency assistance, save lives, minimize property damage, and speed recovery immediately following an incident or disaster. Recovery includes actions taken to return to a normal or improved operating condition following an incident or disaster.

This Plan is intended to serve many purposes, including:

- **Increasing public awareness** to help residents of Davidson County better understand the natural and manmade hazards that threaten public health, safety, and welfare; economic vitality; and the operational capability of important institutions;
- **Enhancing decision making capacity** by providing information that managers and leaders of local government, business and industry, community associations, and other key institutions and organizations need to take action to address vulnerabilities to future disasters;
- **Developing a detailed community profile** that can be utilized to as reference when considering the potential impacts that a hazard can have on a range of community assets;
- **Providing inter-jurisdictional coordination of mitigation-related programming** to ensure that proposals for mitigation initiatives are reviewed and coordinated among the participating jurisdictions within the county; and
- **Promoting compliance with state and federal programming** to ensure that Davidson County and its communities can take full advantage of state and federal grant programs that encourage or mandate efficient hazard mitigation planning.

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SEVERE WEATHER

The severe weather evaluated as part of this risk assessment included: extreme temperatures, thunderstorms and lightning, tornadoes, and winter storms. In general, both the risk and vulnerability to Metro Nashville-Davidson County from severe weather is high. With weather records dating back to the 1870s, Nashville has a lengthy history of weather trends. Since the late 1980s, the average annual temperature and the average annual precipitation have been warmer and wetter than the historical normal. This trend will likely continue for the foreseeable future, putting Nashville at a greater risk for thunderstorm related hazards.

DROUGHT

A drought is a period of drier-than-normal conditions that results in water-related problems. Precipitation (rain or snow) falls in uneven patterns across the country. The amount of precipitation at a particular location varies from year to year but, over a period of years, the average amount is fairly constant. The average monthly precipitation for Nashville is presented in the Table 4-19.

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Nashville International Airport	3.75	3.94	4.11	4.00	5.50	4.14	3.64	3.17	3.41	3.04	4.31	4.24	47.25
Old Hickory Dam	3.50	4.06	4.23	4.08	5.17	3.98	3.87	2.94	3.48	3.16	3.95	4.73	47.15

Table 4-19: Precipitation Normals (inches)

When no rain or only a very small amount of rain falls, soils can dry out and plants can die. When rainfall is less than normal for several weeks, months, or years, the flow of streams and rivers decline and the water levels in lakes, reservoirs, and wells fall. If dry weather persists and water-supply problems develop, the dry period can become a drought. Lower river levels can also cause transportation interruptions on navigable streams.

A common indicator of drought is the Palmer Drought Severity Index (PDSI). The PDSI is a soil moisture algorithm calibrated for relatively homogeneous regions. It is used by many U.S. government agencies and states to trigger drought relief programs. It was also the first comprehensive drought index developed in the United States. The classifications of the PDSI are presented in Table 4-20.

Palmer Classifications	
4.0 or more	Extremely wet
3.0 to 3.99	Very wet
2.0 to 2.99	Moderately wet
1.0 to 1.99	Slightly wet
0.5 to 0.99	Incipient wet spell
0.49 to -0.49	Near normal
-0.5 to -0.99	Incipient dry spell
-1.0 to -1.99	Mild drought
-2.0 to -2.99	Moderate drought
-3.0 to -3.99	Severe drought
-4.0 or less	Extreme drought

Table 4-20: Palmer Classifications

However, there is a newer index, Standardized Precipitation Index (SPI) that is based on the probability of precipitation for any time scale. The SPI can be computed for different time scales, and can provide early warning of drought and help assess drought severity, and is less complex than the Palmer Index.

The Western Regional Climate Center calculates the Standardized Precipitation Index (SPI) for a variety of time scales ranging from 1 month to 72 months. Figure 4-44 depicts the 72 month SPI as of August 2019, and shows the central portion of Tennessee was very wet for that time period. During periods of drought, historically the Governor or Mayor has called for a ban of open burning in an effort to reduce the risk of wildfire.

The beginning of a drought is difficult to determine. Several weeks, months, or even years may pass before people recognize that a drought is occurring. The end of a drought can occur as gradually as it began. Dry periods can last for 10 years or more. The first evidence of drought usually is seen in records of rainfall. Within a short period of time, the amount of moisture in soils can begin to decrease. The effects of a drought on flow in streams and rivers or on water levels in lakes and reservoirs may not be noticed for several weeks or months. Water levels in wells may not reflect a shortage of rainfall for a year or more after a drought begins.

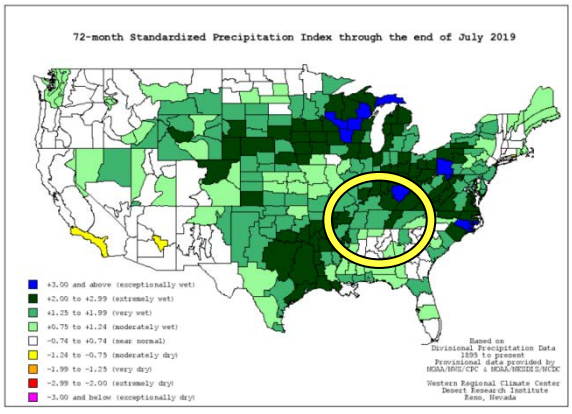


Figure 4-44: Standardized Precipitation Index

Past Occurrences

There have been over 21 recorded droughts encompassing the Nashville-Davidson County area since 1797. Drought events are presented in Appendix B. The last recorded Exceptional Drought (D4) in Middle Tennessee began in July 2007 and persisted until March 2008, which included the Nashville-Davidson County area.

Likelihood of Future Occurrences

The Climate Prediction Center (CPC) of the National Weather Service, together with the United States Department of Agriculture, the National Drought Mitigation Center in Lincoln, Nebraska, and NOAA's National Climatic Data Center, issues a weekly drought assessment for the United States. This assessment provides a consolidated depiction of national drought conditions based on a combination of drought indicators and field reports. The CPC also issues a Seasonal United States Drought Outlook each month in conjunction with the weekly release of the long-lead temperature and precipitation outlooks near the middle of the month. The probability of drought developing across the Nashville-Davidson County area is higher when the Middle Tennessee region is experiencing a long-term trend of above normal temperatures. Abnormally Dry (D0) conditions briefly develop every 1 to 2 years. More persistent Moderate Drought (D1) conditions occur every 3 to 5 years, Severe Drought (D2) every 5 to 10 years, Extreme Drought (D3) every 10 to 20 years, and Exceptional Drought (D4) conditions every 25 to 50 years.

The example shown in figure 4-45 indicates the seasonal outlook for the United States as of June 2019. The Nashville-Davidson County area is not expected to experience drought based on this outlook.

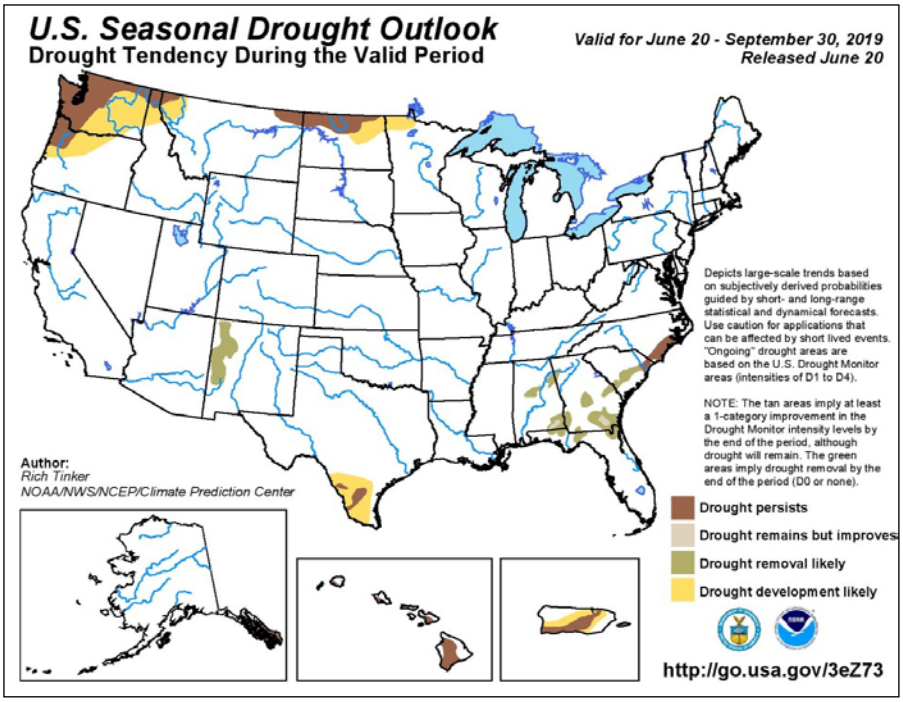


Figure 4-45: U.S. Seasonal Drought Outlook June 2019

EXTREME TEMPERATURES

Extreme temperature events, both hot and cold, can have severe impacts on natural ecosystems, agriculture and other economic sectors, and human health and mortality. The normal monthly temperatures for Nashville are presented in Table 4-21 and Figure 4-46.

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Nashville International Airport	37.7	41.7	50.0	59.0	67.5	75.7	79.4	78.7	71.5	60.3	49.8	40.4	59.3

Table 4-21: Temperature Normals (°F)

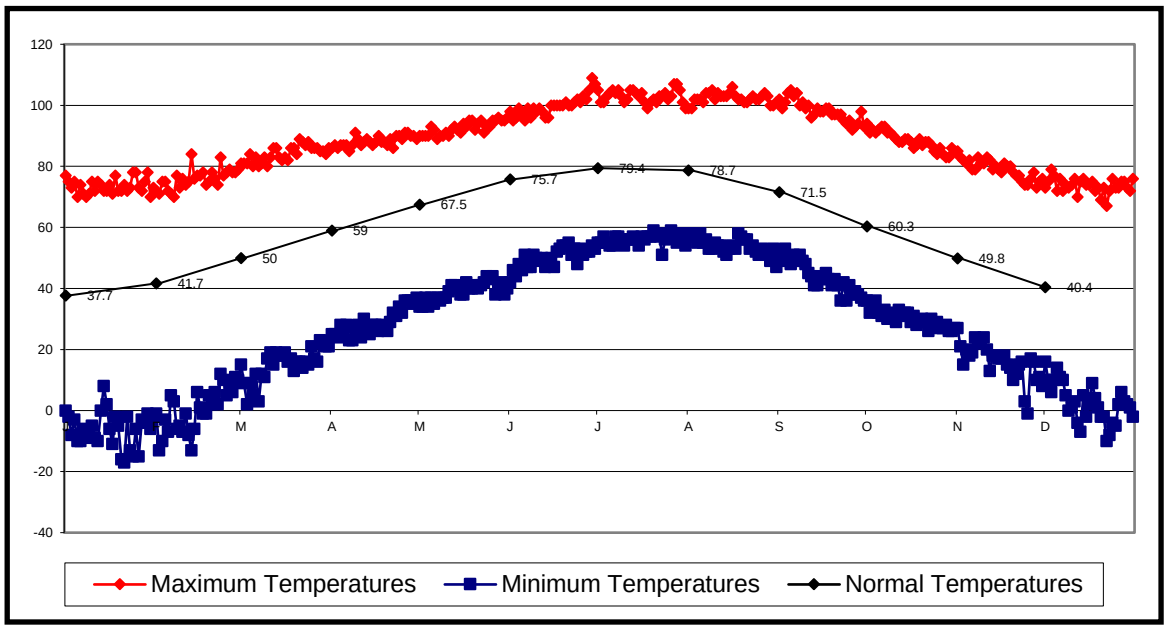


Figure 4-46: Normal Monthly Temperatures
(Source: http://www.nws.noaa.gov/climate/xmacis.php?wfo=ohx)

High Temperatures

Temperatures that remain 10 degrees or more above the average high temperature for the region and last for several weeks are defined as extreme heat by FEMA. Humid or muggy conditions, which add to the discomfort of high temperatures, occur when high atmospheric pressure traps damp air near the ground.

In an effort to alert the public to the hazards of prolonged heat and humidity episodes, the National Weather Service devised the "heat index". The heat index is an accurate measure of

how hot it feels to an individual when the effects of humidity are added to high temperature. Table 4-22 presents heat index values and their potential physical effects.

The National Weather Service will issue a *Heat Advisory* for Nashville-Davidson County when daytime heat indices are at or above 105°F. An *Excessive Heat Warning* is issued when the heat index equals or exceeds 115°F for three hours or longer. An *Excessive Heat Advisory* is also issued when heat advisory conditions persist for at least 3 days. In either of these scenarios, the heat becomes dangerous for a large portion of the population.

Heat Index Values (Combination of Heat and Humidity)	Heat Index Effects
80 to 90 degrees F	Fatigue possible with prolonged exposure and/or physical activity.
90 to 105 degrees F	Sunstroke, heat cramps, and heat exhaustion possible with prolonged exposure and or physical activity.
105 to 130 degrees F	Sunstroke, heat cramps or heat exhaustion likely, and heatstroke possible with prolonged exposure and/or physical activity.
130 degrees and higher F	Heatstroke/sunstroke highly likely with continued exposure.

Table 4-22: Heat Index Values and Effects

Cold Temperatures

The National Weather Service will issue a *Wind Chill Advisory* for Nashville-Davidson County when wind-chill temperatures are expected to reach –5°F to –15°F, and a *Wind Chill Warning* would be issued if it is expected to reach colder than -15°F.

In 2001, NWS implemented an updated Wind Chill Temperature (WCT) index. This index was developed by the National Weather Service to describe the relative discomfort/danger resulting from the combination of wind and temperature. Wind chill is based on the rate of heat loss from exposed skin caused by wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature and eventually the internal body temperature.

Specifically, the new WCT index:

- Calculates wind speed at an average height of five feet (typical height of an adult human face) based on readings from the national standard height of 33 feet (10m);
- Is based on a human face model;
- Incorporates modern heat transfer theory (heat loss from the body to its surroundings, during cold and breezy/windy days);
- Lowers the calm wind threshold to 3 mph;
- Uses a consistent standard for skin tissue resistance; and
- Assumes no impact from the sun (i.e., clear night sky).

Past Occurrences

There have been over a hundred recorded extreme temperature events in Davidson County since 1816. These events are presented in Appendix B.

Likelihood of Future Occurrences

On average, extreme temperature events have occurred once every 0.5 years, suggesting a similar recurrence period.

THUNDERSTORMS

Thunderstorms are defined as localized storms, always accompanied by lightning, and often having strong wind gusts, heavy rain and sometimes hail or tornadoes. Thunderstorms can produce a strong out-rush of wind known as a downburst, or straight-line winds which may exceed 120 mph. These storms can overturn mobile homes, tear roofs off of houses and topple trees.

Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena:

- Hail measuring 1 inch or greater;
- Winds gusting in excess of 50 knots (57.5 mph); or
- A tornado.

A *severe thunderstorm watch* is issued by the National Weather Service when the weather conditions are such that a severe thunderstorm is likely to develop. This is the time to locate a safe place in the home and to watch the sky and listen to the radio or television for more information.

A *severe thunderstorm warning* is issued when a severe thunderstorm has been sighted or indicated by weather radar. At this point, the danger is very serious and it is time to go to a safe place, turn on a battery-operated radio or television, and wait for the "all clear" from authorities.

Lightning

Lightning is defined as any and all of the various forms of visible electrical discharge caused by thunderstorms.

Cloud-to-ground lightning can kill or injure people by direct or indirect means. The lightning current can branch off to a person from a tree, fence, pole, or other tall object.

Objects can be directly struck and this impact may result in an explosion, fire, or total destruction, or objects may suffer indirect damage when the current passes through or near them. Sometimes, current may enter a building and transfer through wires or plumbing, and damaging everything in its path. In urban areas, lightning may strike a pole or tree and the current then travels to several nearby houses and other structures and enters them through wiring or plumbing.

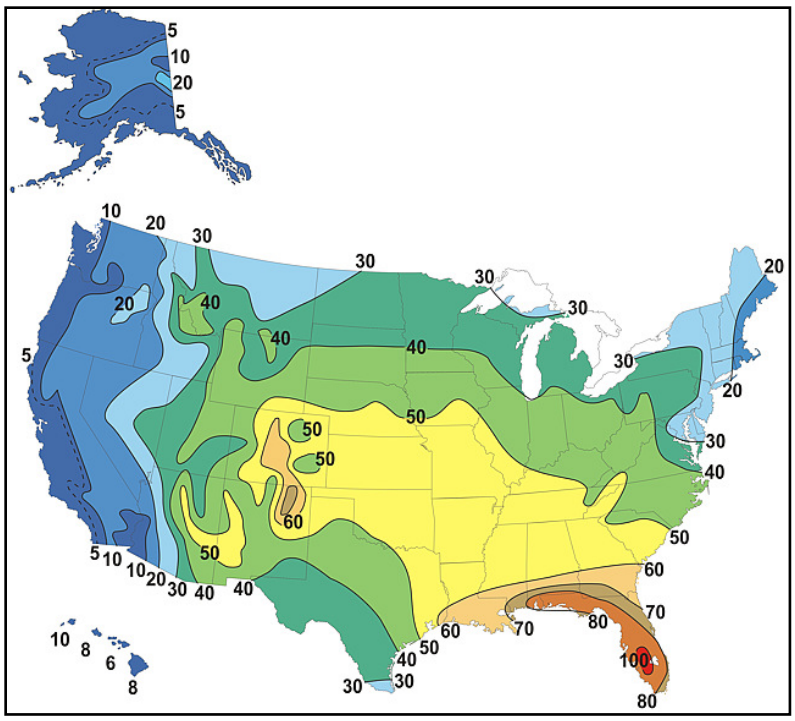


Figure 4-47: Average Number of Thunderstorm Days Per Year (source: NOAA)

Past Occurrences

There have been over 600 recorded thunderstorm/high wind events in Davidson County since 1872. These events are presented in Appendix B. *If damage reported from wind & hail events is under ~$100k, they are not significant enough to list in Appendix B, as of 2012*

Likelihood of Future Occurrences

Thunderstorms are very likely to occur in Nashville-Davidson County approximately 50 to 60 days each year (Figure 4-47). Even though thunderstorms occur regularly, severe thunderstorms are fairly uncommon. However, as the population grows and development increases the likelihood of a severe thunderstorm impacting Davidson County also increases. During the time span of 1990-2009 there were slightly more than 1 severe hail event and about 8 severe wind events per year. Since 2010 that has increased to about 2 severe hail events and 12 severe wind events per year.

TORNADOES

The National Weather Service defines a tornado as a violently rotating column of air pendant from a thunderstorm cloud that touches the ground. Tornados are generally considered the most destructive of all atmospheric-generated phenomena; an average of 800 touch down annually in the United States. More tornados occur during the months of May and June than in other months. Additionally, over 30 percent of recorded tornado activity has occurred between the hours of 3:00 pm and 6:00 pm, and an additional estimated 25 percent has occurred between 6:00 pm and 9:00 pm. Thus, over half of all tornadoes occur between 3:00 and 9:00 pm.

The typical tornado path is 16 miles long with a width of less than one-quarter mile. Tornadoes have resulted in some of the greatest losses to life of any natural hazard, with the mean national death toll being between 80 and 100 persons every year.

Tornados are classified using the tornado scale developed by Dr. Theodore Fujita. The Fujita Tornado Scale assigns a category to tornados based on their wind speeds and relates this to the general type of damage that is expected. Ratings range from F0 (light damage), to F5 (total destruction). The Fujita scale and revised Enhanced Fujita Scale is presented in Table 4-23. Approximately ninety percent of tornados nationwide recorded between 1956 and 2001 were F2, F1, and F0 tornados. Most of these (68 percent of all tornados) were F1 and F0 tornados.

FUJITA SCALE			DERIVED EF SCALE		**OPERATIONAL EF SCALE**	
F Number	Fastest 1/4-mile (mph)	3 Second Gust (mph)	EF Number	3 Second Gust (mph)	**EF Number**	**3 Second Gust (mph)**
0	40-72	45-78	0	65-85	**0**	**65-85**
1	73-112	79-117	1	86-109	**1**	**86-110**
2	113-157	118-161	2	110-137	**2**	**111-135**
3	158-207	162-209	3	138-167	**3**	**136-165**
4	208-260	210-261	4	168-199	**4**	**166-200**
5	261-318	262-317	5	200-234	**5**	**Over 200**

Table 4-23: Fujita & Enhanced Fujita Tornado Scale

Past Occurrences

Figure 4-48: Tornado Damage

Several severe tornadoes have passed through Nashville, damaging property and taking lives in many of those instances. The tornado that occurred on April 16, 1998 caused the most damage ever in Davidson County because its path was through downtown Nashville (Figure 4-49). As a result, 35 buildings in downtown Nashville were "red tagged", meaning they were rendered structurally unsound. The tornado continued east and hit the residential section of East Nashville where at least 300 homes were damaged. Over a thousand trees were blown down at Andrew Jackson's home, The Hermitage. Some of the trees were well over 200 years old, and a few of the trees that were destroyed were planted by Andrew Jackson himself. Nashville Electric Service reported that 75,000 customers lost power. In April 2006 at 1308 hours, an F3 tornado struck 2.6 miles W of Goodlettsville and continued into Sumner County. This tornado killed 7 people and injured 128 and was on the ground for over 22 miles. Tornado reports are illustrated in Figure 4-50. Updated list of these events are presented in Appendix B.

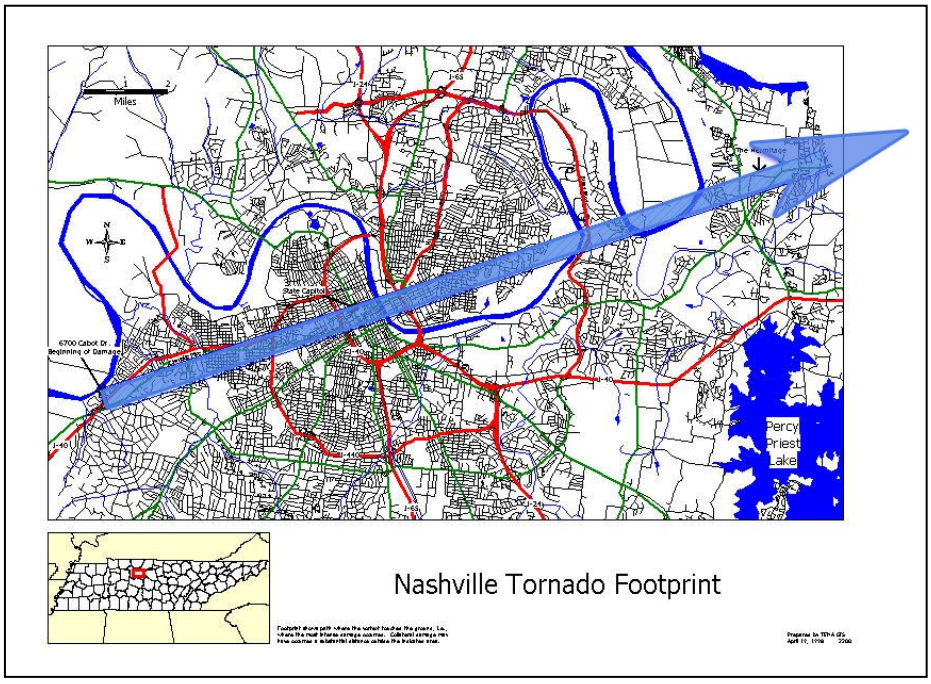
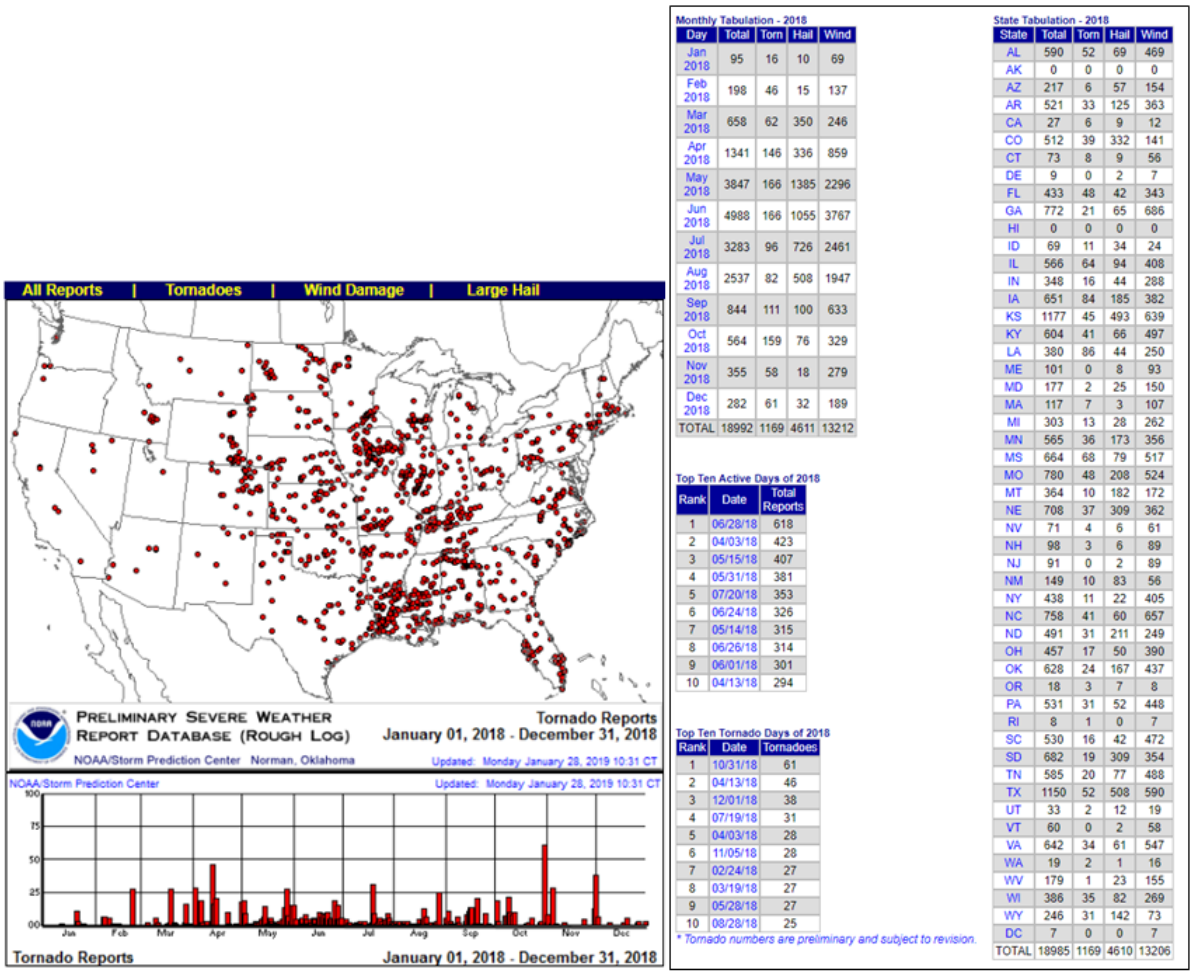


Figure 4-49: Footprint of April 16, 1998 Tornado



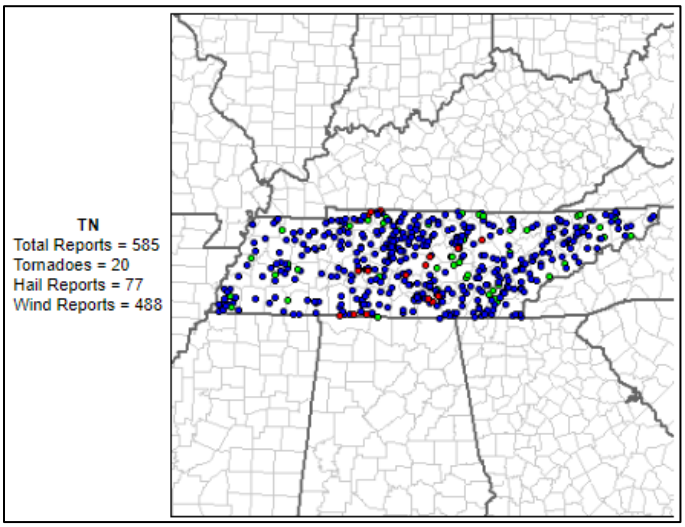


Figure 4-50: Tornado Reports 2018

Likelihood of Future Occurrences

Based on NOAA, Storm Prediction Center Statistics, Nashville is located in an area of High Risk for tornadoes. Thunderstorms that produce tornadoes are very rare with about 1 tornado touching down in Davidson County about every 3 years. However, as the population grows and development increases, the likelihood of a tornado touching down in Davidson County also increases. Since 1950, Davidson County has averaged about 1 event every 2 years, with an EF2 tornado touching down about every 6 years. When the statistics for the counties surrounding Davidson County are included, there are approximately 2.5 tornado events each year, and an EF2 event occurs every 1.5 years.

WINTER STORMS

Winter storms are especially hazardous in terms of closing emergency routes, creating power and utility system failures, and immobilizing economic activity. Commuters may become stranded, airports may close, and emergency and medical services may be disrupted. Accumulations of snow and ice can cause roofs to collapse and knock down trees and power lines. Ice can disrupt communications and power for days while utility companies repair extensive damage. Even small accumulations of ice can be extremely dangerous to motorists and pedestrians. Bridges and overpasses freeze before other surfaces and are particularly dangerous.

The types of winter precipitation that may occur in Davidson County include:

- **Snow Flurries** -- Light snow falling for short durations, resulting in a light dusting or no accumulation.
- **Snow Showers** -- Snow falling at varying intensities for brief periods of time. Some accumulation possible.
- **Blowing Snow** -- Wind-driven snow that reduces visibility and causes drifting. May be falling snow or loose snow picked up off the ground by the wind.
- **Blizzard** -- Winds of more than 35 miles per hour with snow and blowing snow, reducing visibility to near zero.
- **Sleet** -- Forms from raindrops that freeze into ice pellets before reaching the ground. Sleet usually bounces when hitting a surface and does not stick. It can, however, accumulate and make driving treacherous. Typically occurs at temperatures from 30 to 31 degrees on the ground and 32 to 34 degrees in the clouds.
- **Freezing Rain** -- Falls onto a surface with a temperature below freezing, causing it to freeze to surfaces such as trees, cars and roads and form a coating of ice. Can be very hazardous even in small accumulations. Typically occurs at temperatures from 30 to 33 degrees on the ground and 34 to 36 degrees in the clouds.

The average monthly snowfall for the Nashville-Davidson County area is presented below in Table 4-24.

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Nashville International Airport	2.3	2.2	0.7	---	---	---	---	---	---	---	0.1	0.6	5.5

Table 4-24: Snowfall Summary (inches), 1981-2010 National Climatic Data Center

**Dataset for Old Hickory Dam was missing two big snow years (1984-1986), so the normals are noticeably lower than the Nashville Int'l Airport.*

Past Occurrences

There have been over 200 recorded winter storm events in Davidson County since 1779. These events are presented in Appendix B.

Likelihood of Future Occurrences

Nashville and Davidson County may anticipate 6 to 12 inches of snowfall annually, according to the National Weather Service.

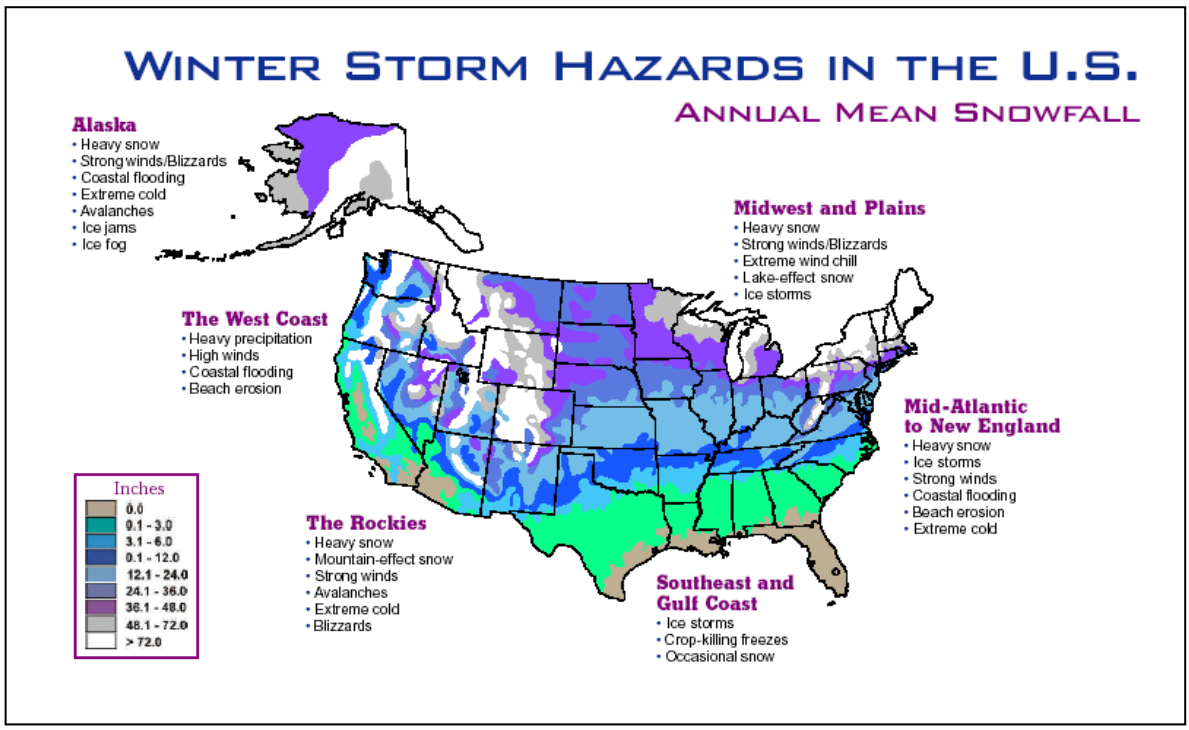


Figure 4-51: Annual Mean Snowfall
(Courtesy of NOAA)

Multi-Hazard Mitigation Plan
4.2 Vulnerability & Consequence Assessment

Once the hazard identification step was complete, the Community Planning Team (CPT) conducted a Vulnerability Assessment to describe the impact that each hazard identified in the preceding section would have upon Metropolitan Nashville-Davidson County, and subsequently completed consequence analysis for each hazard. The consequence analysis included the following items as described in the Emergency Management Accreditation Program:

1. Impact on the Public;
2. Impact on Responders;
3. Continuity of Operations & Continued Delivery of Services;
4. Infrastructure, Property and Facilities;
5. Environment;
6. Economic Conditions of the jurisdiction; and
7. Public Confidence in the jurisdictions governance.

As a starting point, the CPT used the parcel data available from the Metro Planning Department and Assessor of Property to define a baseline against which all other disaster impacts could be compared. The baseline is the catastrophic, worst-case scenario: the assessed value of the entire county as a whole.

Total Vulnerability of Metro Nashville-Davidson County to Catastrophic Disaster
Risk –Low; Vulnerability – Extremely High

The current total values of Metro Nashville-Davidson County, as maintained by the Assessor's office are presented in Table 4-25.

Table 4-25: Catastrophic Damages

Property Type	Total Number of Parcels	Number of Parcels with Improvement Value	Improvement Value
Commercial	5,000	4,887	$8,829,338,391
Office or Medical	3,319	3,229	$6,340,259,342
Industrial	2,393	2,316	$2,759,865,810
Community, Institutional or Utility	2,311	1,368	$2,170,344,797
Residential Single Family	153,758	153,524	$31,785,201,549
Residential Multi Family	57,294	57,177	$18,832,083,285
Residential Dormitory or Boarding House	106	104	$60,971,800
Park or Golf Course	154	24	$39,335,840
Auto Parking	1,512	1,427	$266,968,447
Farm	257	247	$5,557,400
Total	226, 104	224,303	71,089,926,661

Critical Facilities

Of significant concern with respect to a catastrophic event is the location of critical facilities within the Community. Critical facilities, as defined by the CPT, include both those facilities: (1) essential in providing services during the response and recovery operations, and (2) those that house discrete populations that may require greater assistance in the event of a hazard.

Cultural Resources

Additional vulnerability to the catastrophic event includes the current sites on the Tennessee Register of Historic Sites and Structures (State Register) and the National Register of Historic Places. As of July 2019, there are 10,209 parcels marked as a National Landmark, in a National Register Historic District, or eligible to be within a National Register Historic district within the county. The following table (Table 4-26) shows those historic structures which are located within the 100 year floodplain.

Table 4-26: Historic Places located within the 100 year floodplain

Historic Place And Location	Period of Significance	Date listed on the National Register
Belle Meade Golf Links Subdivision Historic District Roughly bounded by Windsor Dr., Blackburn and Pembroke Aves., Westover Dr. and Harding Pl.	1900-1924, 1925-1949, 1950-1974	2004 Site # 04000675
Cameron School 1034 1st Ave S, Nashville	1925-1949, 1950-1974	2005 Site # 05000180
Devon Farm (Ensworth School Property) 7401 Highway 100	1750-1799	1974 Structure # 74001908
Edwin Warner Park: (Warner Park Historic District): between Belle Meade Blvd, Highway 100, and Chickering Rd	1927-1930; 1935-1941	1984 Site # 84003528
The Hibbetage: 2160 Old Hickory Blvd	1938-1948	1998 Site # 98001305
Inglewood Place Historic District: Golf, Greenfield, Howard, Jakes, Katherine, Kennedy, Kirkland, McChesney, Riverside, Shelton, and Stratford Avenues	1909-1966	2016 Site # 16000117
Jackson Park Historic District: Brush Hill Ct, Brush Hill Rd, Earlene, Kenwood, Riverwood & E. Riverwood Drs, Eastdale & Plymouth Aves; Gallatin Pike, Winding Way	1923-1966	2016 Site # 16000483
Lebanon Road Stone Arch Bridge Over Brown's Creek at Lebanon Rd.	1875-1899	1987 Structure # 87000379
Longleat: 5819 Hillsboro Road	1928-1932	1984 Site # 84003509
Maybelle Carter Home (SMITH-CARTER HOUSE): 1020 Gibson Drive	1925; 1952-1968	2018 Site # 100003155

Historic Place And Location	Period of Significance	Date listed on the National Register
Newsom's Mill West of Nashville at Big Harpeth River	1850-1874	1976 Structure # 76001771
Sandbar Village Aka Site Number 40 DV 36 Address Restricted	1000-500 AD, 1499-1000 AD	1994 Site # 9400074
Tanglewood Historic District 4907, 4909, and 4911 Tanglewood Dr.	1925-1949	1998 District # 98000819

Source: National Park Service, National Register of Historic Places; and Metro Planning Department
https://www.nps.gov/subjects/nationalregister/database-research.htm#table

Natural Resources

Additional vulnerability to the catastrophic event would include natural resources within Metropolitan Nashville-Davidson County. The species listed in Table 4-27 are identified as endangered, threatened, or in recovery by the US Fish and Wildlife Service via the Environmental Conservation Online System.

Table 4-27: Natural Resources

GROUP	COMMON NAME	SCIENTIFIC NAME	POPULATION	STATUS
Clams	Yellow blossom (pearlymussel)	Epioblasma florentina florentina	Wherever found; Except where listed as Experimental Populations	Endangered
Clams	Pink mucket (pearlymussel)	Lampsilis abrupta	Wherever found	Endangered
Clams	Orangefoot pimpleback (pearlymussel)	Plethobasus cooperianus	Wherever found	Endangered
Clams	Ring pink (mussel)	Obovaria retusa	Wherever found	Endangered
Clams	Tan riffleshell	Epioblasma florentina walkeri (=E. walkeri)	Wherever found	Endangered
Clams	Cumberlandian combshell	Epioblasma brevidens	Wherever found; Except where listed as Experimental Populations	Endangered
Crustaceans	Nashville crayfish	Orconectes shoupi	Wherever found	Endangered
Flowering Plants	Short's bladderpod	Physaria globosa	Wherever found	Endangered
Flowering Plants	Price's potato-bean	Apios priceana		Threatened
Flowering Plants	Braun's rock-cress	Arabis perstellata	Wherever found	Endangered

Flowering Plants	Tennessee purple coneflower	Echinacea tennesseensis	Wherever found	Recovery
Flowering Plants	Leafy prairie-clover	Dalea foliosa	Wherever found	Endangered
Flowering Plants	Eggert's sunflower	Helianthus eggertii	Wherever found	Recovery
Flowering Plants	Guthrie's (=Pyne's) ground-plum	Astragalus bibullatus	Wherever found	Endangered
Mammals	Indiana bat	Myotis sodalis	Wherever found	Endangered
Mammals	Northern Long-Eared Bat	Myotis septentrionalis	Wherever found	Threatened

Historic and Natural Resources are important to identify before disasters for three reasons:

1. The community may decide that these sites are worthy of a greater degree of protection than currently exists, due to their unique and irreplaceable nature;
2. If these resources are affected by a disaster, cataloging them ahead of time allows for more prudent care in the immediate aftermath, when the potential for additional impacts are higher; and
3. The rules for repair, reconstruction, restoration, rehabilitation and/or replacement of these resources usually differ from ordinary procedures.

Climate Changes

According to the EPA's *Climate Change Impacts by State*, Tennessee's climate is changing. Although the average temperature did not change much during the 20th century, the state has warmed in the last 20 years. Average annual rainfall is increasing, and a rising percentage of that rain is falling on the four wettest days of the year. In the coming decades, the changing climate is likely to reduce crop yields, threaten some aquatic ecosystems, and increase some risks to human health. Floods may be more frequent, and droughts may be longer, which would increase the difficulty of meeting the competing demands for water in the Tennessee and Cumberland rivers.

For Metro Nashville-Davidson County, the severe weather evaluated as part of this risk assessment included: extreme temperatures, thunderstorms and lightning, tornadoes, and winter storms. In general, both the risk and vulnerability to Metro Nashville-Davidson County from severe weather is high. With weather records dating back to the 1870s, Nashville has a lengthy history of weather trends. Since the late 1980s, the average annual temperature and the average annual precipitation have been warmer and wetter than the historical normal. This trend will likely continue for the foreseeable future, putting Nashville at a greater risk for thunderstorm related hazards.

Development Trends for Metro

The Metro Planning Department is guided by the General Plan for Nashville and Davidson County, called *NashvilleNext.* It is an integrated plan for Nashville's future to help ensure the city's prosperity and well-being for the next 25 years. *NashvilleNext* was adopted in 2015, with a minor update in 2017.

The Planning Department maintains 14 Community Plans and develops plans for neighborhoods, corridors, and other smaller study areas within them. This process involves visioning, goal-setting, applying and tailoring community character policies that are used to guide the form and character of future development throughout the community, developing open space and multi-modal transportation plans, and establishing an implementation strategy.

Demographics in Nashville have shifted so that those under the age of 35 and over the age of 65 are looking for similar housing opportunities. This usually means a home with less maintenance — smaller footprints and yards. Both age groups are also looking to not rely on a car as much as the past. Traffic counts and vehicle miles traveled, indicators of mobility, show a leveling off increased car usage despite increases in population. Development trends will continue to address these needs by focusing on creating a more efficient overall urban pattern with more housing opportunities and jobs within Downtown and activity centers throughout Davidson County. Redevelopment of arterial pikes to complement enhanced and high capacity transit service will be critical over the next 25 years. Much of the future population and job growth can be encouraged within the activity centers and corridors so that expansion of sewer service in some areas of Davidson County is discouraged and there is less impact upon slopes and within floodplains. The redevelopment should also include green practices that reduce energy use, lower the amount of impervious surfaces, preserves landscapes, promotes urban tree plantings, and minimizes storm water runoff. New development should contribute to a reduction in some of Nashville's most probable future hazards and their impacts, particularly flooding.

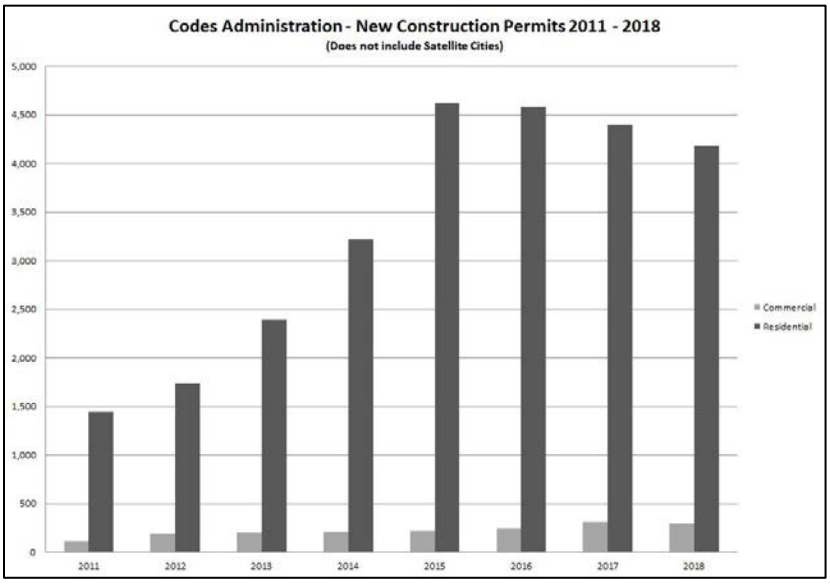


Figure 4-52: New Construction Permits 2011-2018

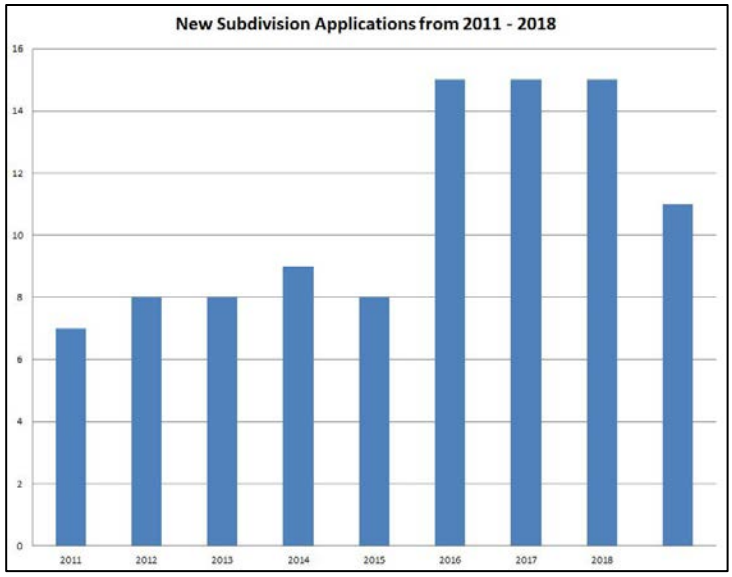


Figure 4-53: New Subdivision Applications 2011-2018

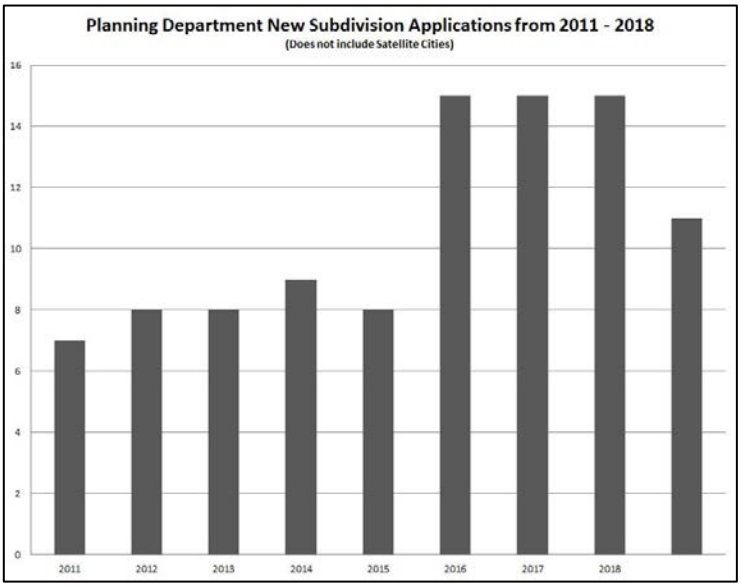


Figure 4-54: New Subdivision Applications (No Satellite Cities) 2011-2018

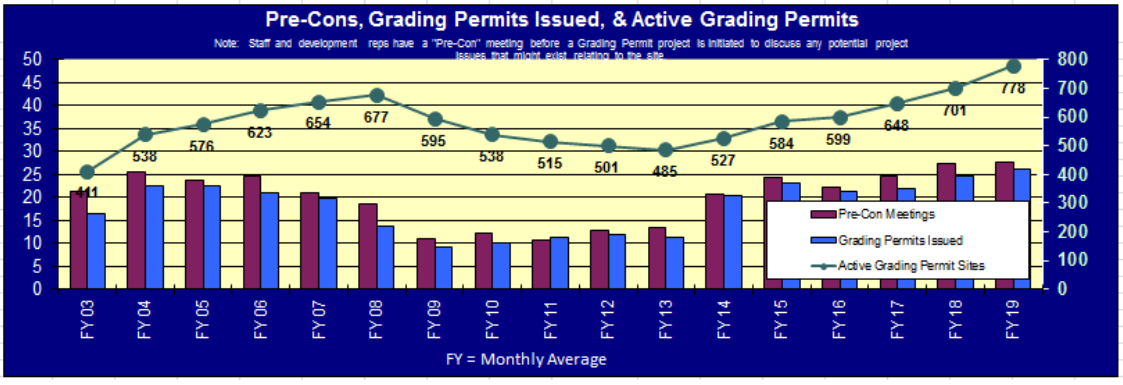


Figure 4-55: Grading Permits (Metro Water Services 2019)

Vulnerability of Metro Nashville-Davidson County to more Probable Disasters

On a more realistic scale, community vulnerability can be quantified in those instances where there is a known, identified hazard area, such as a mapped floodplain. In these instances the numbers and types of buildings subject to the identified hazard can be counted and their values tabulated. Further, other information can be collected, such as the location of critical community facilities (e.g., a fire station), historic structures, and valued natural resources (e.g., an identified wetland or endangered species habitat) that are within the specific hazard area. Together, these values portray the impact, or *vulnerability*, of that area to that hazard.

However, it is important to note that these values could be refined one step further, with regard to the percent of probable impact. For example, when a flood occurs, the event seldom causes the total destruction of an area. In fact, we know from NFIP insurance claims that a flood with an average depth of 2-feet above the ground is likely to cause approximately 20 percent damage to structures in the aggregate (those with basements, no basements, and second stories). Thus, if the 100-year flood were estimated to be 2-feet deep, a more accurate description of flood vulnerability would be a 1 percent annual chance of incurring a loss of 20 percent of the values tabulated in the 100-year floodplain, not including the additional impacts of damage to infrastructure and economic disruption. This allows a community to measure the cost-effectiveness of alternative mitigation projects under consideration. The benefits of a mitigation project are the future losses avoided, or in this example, that portion of the value of the 1 percent annual chance of 20 percent damage that is protected by the project.

The CPT identified one hazard to Metro for which specific geographical hazard areas have been defined: flood. For this hazard area, the CPT has inventoried the following as a means of quantifying the vulnerability within the hazard area:

- Total Values at Risk (i.e., types, numbers, and value of land and improvements);
- Identification of Critical Facilities at risk;
- Identification of Cultural and Natural Resource Sites at risk;
- Development Trends within the identified hazard area; and
- A general statement of community impact.

For the other hazards identified in the preceding section, information is available where the potential impacts can be developed or inferred, although this information is not tied to a specific area within the county. For these hazards, such as severe weather and drought, the entire county is at risk. In some cases, certain hazard characteristics suggest varying degrees of risk within different areas of Metro. For example:

- In earthquakes, certain soils are more susceptible to shaking than others, and certain types of building construction are more likely to sustain damage than others. Thus, in areas with higher concentrations of these types of soils or these types of buildings, greater damages can be expected. Any area that included *both* risky soils and vulnerable construction would be most likely to incur the greatest level of damage and disruption.

- West Nile Virus is spread through mosquito bites. Thus, people and livestock frequenting areas with the greatest concentration of mosquitoes, and during the times of greatest concentration, are most likely to become infected. Areas with standing water are where mosquitoes breed, and therefore are an area of higher risk. Standing water can be found in, for example, swimming pools, ponds, birdbaths, ditches, and old spare tires – so the risk areas could be in many locations and in differing concentrations.

DROUGHT

Drought impacts may include physical, bio-physical, social and economic consequences. Physically, there may be a reduction in water quality and supply for drinking, domestic, and irrigation purposes with a subsequent impact of increased pumping costs. The ground water level may be depleted and the flow of perennial water sources reduced. Bio-physical impacts include damage to crop quantity and quality, damage to wildlife habitat and wildlife, an increase in invasive/noxious weeds, and the deterioration of water quality. Economically, there may be a loss in livestock production and increased prices for commodities.

Drought is divided into 5 categories:

D0 - Abnormally Dry

Typically growth of crops, plants, or pastures may be slowed and the fire risk may be elevated due to short-term dryness of a few weeks.

D1 - Moderate Drought

Crops, plants, or pastures may have some damage, the fire risk continues to be elevated, water levels in area rivers, creeks, and streams are below normal, and water shortages and restrictions may develop. Moderate drought may take several weeks to develop, and can last for a few months. These conditions typically develop every few years.

D2 - Severe Drought

Agricultural losses may occur, the fire risk is very high, and water shortages are common and restrictions may be imposed. Below normal precipitation and/or above normal temperatures over several weeks to a few months can cause severe drought to develop, which typically lasts for several months.

D3 - Extreme Drought

Significant agricultural losses, extreme fire danger, and widespread water shortages and restrictions are common. It may take several months for extreme drought conditions to develop, which can persist through several seasons. Extreme droughts occur about once every 10 to 25 years.

D4 - Exceptional Drought

Water shortages and restrictions are widespread and there are major agricultural losses. Exceptional droughts occur roughly once every 50 years or so, and can persist from one year to the next. The last Exceptional Drought to impact Davidson County was in September and October of 2007, with drought conditions lasting for about 2 years.

The main water supply is the Cumberland River. The two water treatment plants, Omohundro and K. R. Harrington, have a daily maximum capacity output of 144 million gallons per day. On an average day, both plants pump 90 million gallons. If one plant is out of service, the other can supply the entire community's water needs.

Consequence Analysis

Drought is often associated with periods of long and intense heat, and can cause injury and even death particularly with children, elderly citizens, special needs populations and animals. Injuries and potential deaths are most likely to impact areas that lack air conditioning and immediate medical care.

The largest impact of prolonged drought would be the financial impact to farmers with crops and livestock. A serious drought would damage or possibly destroy annual crops and limit the number of livestock that could be properly cared for. The decline in quantity and quality of crops could result in increased prices to the consumer and decreased revenue for farmers. The financial impact could be widespread over the area of the drought particularly if it lasts for a long time or occurs at vital times in crop development.

Droughts may cause severe impacts to infrastructure, property and facilities. Water supplies may run low and pipes may crack, making hydration from readily available, clean water difficult. The cost of new water resources can be high. As temperatures increase, so does the demand for energy. Increased energy demands can lead to power outages and higher prices, as more expensive fuels are substituted for power. Roadways and bridges may become impassable due to fractured surfaces or landslides. Transportation infrastructure will also be impacted in the waters as streams, rivers, and canals become impossible to navigate. As the number of individuals affected by the drought increases, shelters and hospitals may become overcrowded and unable to handle the influx.

To determine the potential losses that could be associated with loss of water during a drought affecting the water supply, loss of use estimates for utilities were obtained from FEMA's BCA Reference Guide, 2009 which provides guidance on benefit-cost analysis of hazard mitigation projects. The loss of use estimate for loss of water supply is $93 per day per person. Table 4-28 provides the loss of use estimates if water supply was lost for the jurisdictions in Davidson County.

Table 4-28: Economic Damage Estimates for Loss of Water Supply

Jurisdiction	2017 Population Estimate	Loss of Water Estimate ($93 per person per day)
Metro Nashville-Davidson County	654,187	$60,839,391
Belle Meade	2,584	$240,312
Berry Hill	891	$82,863
Forest Hills	5,002	$465,186
Goodlettsville	16,935	$1,574,955
Oak Hill	4,681	$435,333
Total	**684,280**	**$63,638,040**

Prolonged drought (over a number of years) could have long-term environmental impacts on the area, including species endangerment and necessary changes to the local agricultural makeup. Plants, aquatic life and wildlife could all be negatively affected by drought conditions.

The manner and efficiency in which a response to a disaster is conducted could result in the loss of confidence in the program and the government's ability to protect the community. A strong and early show of the jurisdictions resources and capabilities can strengthen the public's trust and confidence. Effective planning, response, and resource coordination through mutual aid agreements, memorandums of understanding, and standby contracts can make or break the ability to respond and positively impact the public's perception of the response.

Table 4-29: Drought Impacts

CONSIDERATIONS	IMPACTS
Impact on the Public	Most damage is expected to be agricultural in nature; however, water supply disruptions may adversely affect people and animals with adverse health impacts.
Impact on Responders	With properly equipped and trained emergency responders, impact should be minimal. Emergency personnel and others involved in an incident should observe life safety and health standards/practices. Scene safety should be number one priority. The most likely hazards for responders would be dehydration and other exposure related illnesses. Firefighting impacts could be affected with low water pressure.
Continuity of Operations & Continued Delivery of Services	Minimal impact to Continuity of Operations and delivery of services. However, COOP's have addressed cascading events, and there could be added pressure to address more needs of its citizens and facilities. Impacts on infrastructure systems (energy/water) could cause negative effects on COOP implementation.
Infrastructure, Property & Facilities	Impact on pipes, causing hydrating to become a problem. Increased energy demands can cause power outages and high costs. Possible impact on TVA's power generation, nuclear and coal fired plants. Water navigation can become a problem with low levels. Hospitals may become overcrowded.
Environment	Plants, aquatic life and wildlife could all be negatively affected by drought conditions since they all rely on water to sustain life.
Economic Conditions of the Jurisdiction	Local economy and finances dependent on abundant water supply adversely affected for duration of drought.
Public Confidence in the Jurisdictions Governance	The ability to respond and recover to the situation may be questioned and challenged if planning, response and recovery are not timely and effective.

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DAM & LEVEE FAILURES

The USACE maintains the National Inventory of Dams (NID) as authorized by the *National Dam Safety and Security Act of 2002*, and the *Dam Safety Act of 2006*, and most recently reauthorized as part of the *Water Resources Reform and Development Act of 2014*, and the *Water Resources Development Act of 2018*. Table 4-7 reflects information gathered from the National Inventory of Dams (NID).

According to the "*Federal Guidelines for Dam Safety*", published by FEMA, the following criterion explains what each classification means in Table 4-30. According to FEMA, any *probable* loss of human life would designate a High Hazard Potential, regardless of the magnitude of other losses. If no loss of life is probable, classifications would be given as significant or low respectively with other lifeline losses.

Based on Table 4-7 (which is also presented in Section 4.1), the average hazard classification for dams with-in Davidson County is High; however, the classifications given are based on worse case scenarios.

Hazard Potential Classification	Loss of Human Life	Economic, Environmental, Lifeline Losses
Low	None expected	Low. Generally limited to the owner
Significant	None expected	Yes
High	Probable. One or more expected.	Yes

Table 4-30: Dams Hazard Classification *(source: FEMA Federal Guidelines for Dam Safety)*

Dam Name	Owner / Regulator	Hazard Classification	EAP Req'd	Max Storage (acre-feet)
J. Percy Priest Lake	USACE	High	Y	652,000
Old Hickory Lake	USACE	High	Y	545,000
Radnor Lake	TDEC	High	Y	2,150
Marrowbone Lake	TWRA	High	Y	1,670
Collins #1	Private	High	N	410
South Harpeth	Private	Low	N	331
DuPont Retention Basin	Private	Low	N	290
Cheek Lake	Private	Low	N	210
Two Rivers	Metro Parks	High	Y	163
Misty River	Private	Low	N	145
Pal's Lake	Private	Significant	N	143
Lakewood	Private	High	Y	132
Collins #3	Private	High	N	90
Lake Ogallala	Private	Significant	N	80

Collins #2	Private	High	N	60
Lake Waterloo	Private	High	N	60
Browns	Private	High	N	50
Cedar Hill Park	Metro Parks	High	Y	50
Lake Hemmingwood	Private	High	Y	40
Rambling Breeze Ranch	Private	High	N	40
Randolph	Private	High	N	39
Chippewa Lake	Private	Significant	N	28
Lakeland Hills	Private	High	N	24
Enoree Lake	Private	Significant	N	23
Large Dams located outside of Davidson County				
Wolf Creek	USACE	High	Y	6,089,000
Center Hill	USACE	High	Y	2,092,000
Dale Hollow	USACE	High	Y	1,706,000
Great Falls	TVA	High	Y	64,800

Table 4-7: Dams within or affecting Davidson County *(source: USACE National Inventory of Dams)*

Wolf Creek Dam is the largest dam east of the Mississippi River, and contains the ninth largest reservoir in the United States, and is located on the Cumberland River, 270 miles upstream. Due to erosion problems and an increased risk of a structural dam breach on Wolf Creek Dam in Kentucky, the USACE started a multi-year repair project in 2006, and the main construction phase was completed in 2013. Due to an increased risk of a breach during the time of renovations, Metro Nashville and Davidson County, along with numerous other jurisdictions, completed Wolf Creek Dam Emergency Operation Plans in 2007. Metro Nashville and Davidson County created plans for three different lake levels of minor flooding (680 ft.), moderate flooding (715 ft.), and worst case scenario of a 751 feet lake level dam breach.

Levee Name	Owner/Regulator	Hazard Classification	People at Risk	Structures at Risk	Property Value
Cumberland River Greenway Metro Center Levee	Metro Govt. of Nashville & Davidson County	High	14,667	341	$1.95B
Gaylord Opryland Levee	Private	High	1,545	38	$81.5M
Cumberland River Levee	Private	High	697	18	$33.4M

Table 4-8: Levees in Davidson County

Consequence Analysis

Flooding or infrastructure damage causing loss of life is the primary concern with any dam or levee compromise/full breech. Homes, bridges and roadways can be demolished in minutes.

Major impacts to the community include the sudden release of water possibly causing a flood surge, contaminants in floodwaters can cause risk to the public, and crop damage and long term soil deterioration, which often account for upwards of 75% of the economic impact.

Infrastructure that could be impacted includes electricity delivery, and water based cargo traffic. Electric distribution facilities in affected areas could be damaged with delayed repairs due to the flood waters. However, due to redundancies built in, NES should be able to maintain service to those not directly impacted by the flood waters. Cargo that is delivered via the inland waterways includes coal, which helps maintaining efficient energy supply. Hazardous waste, lumber and a number of durable foods that are too heavy for efficient roadway transport are also delivered via waterways.

Table 4-31: Dam & Levee Impacts

CONSIDERATIONS	IMPACTS
Impact on the Public	Localized impact expected to be severe for inundation area and moderate to light for other adversely affected areas.
Impact on Responders	Localized impact expected to limit damage to persons in the inundation area at the time of the incident.
Continuity of Operations & Continued Delivery of Services	Damage to facilities/personnel in the area of the incident may require temporary relocation of some operations. Localized disruption of roads and/or utilities may postpone delivery of some services.
Infrastructure, Property & Facilities	Localized impact to facilities and infrastructure in the inundation area of the incident. Some severe damage possible.
Environment	Localized impact expected to be severe for inundation area and moderate to light for other adversely affected areas, including aquatic life.
Economic Conditions of the Jurisdiction	Local economy and finances adversely affected, possibly for an extended period of time, depending on damage and length of event.
Public Confidence in the Jurisdictions Governance	Localized impact expected to primarily adversely affect dam owner, however localized impact is expected to adversely affect confidence in local, state, and federal government, regardless of the levee owner. Public education is important.

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FLOOD

Flooding impacts may include urban, residential, and commercial consequences. Buildings can experience significant damage, sometimes beyond repair. Household furnishings and business inventories can be lost if there is not adequate time to remove items to safe locations. Subsequent impacts include revenue loss to employees and businesses, as well as, local governments through tax loss.

Flooding and floodwaters can also impact human life, health, and public safety. Some examples as described by the World Health Origination, WHO, and the Center for Disease Control, CDC, "include drowning, trauma, and hypothermia. Also power outages could disrupt a water treatment plant, critical infrastructure, or critical operations and increase the risk of water-borne disease such as typhoid fever, cholera, leptospirosis and hepatitis A. As well as vector-borne diseases such as malaria, dengue, dengue hemorrhagic fever, yellow fever, and West Nile Fever. Dead bodies in floodwaters can also transmit tuberculosis. Including blood borne viruses such as Hepatitis B, C, HIV and gastrointestinal infections such as rotavirus diarrhea, salmonellosis, E. coli, typhoid/paratyphoid fevers, hepatitis A, shigellosis and cholera. Mold can also be a result of floodwaters. Mold may cause a variety of health effects or none at all. Some people are sensitive to molds. For these people, molds can cause nasal stuffiness, throat irritation, coughing or wheezing, eye irritation or in some cases skin irritation. Immune-compromised people and people with chronic lung illnesses such as obstructive lung disease may get serious infections in their lungs when they are exposed to mold."

In addition to being at risk because of floodwater, residents face the threat of explosions and fires caused by leaking gas lines along with the possibility of being electrocuted. Even wild animals, such as venomous snakes, forced out of their homes and brought into contact with humans by floodwaters, can be a threat.

Severe flooding can cause extensive damage to public utilities and disruptions to the delivery of services. Loss of power and communications can be expected. Drinking water and wastewater treatment facilities may be temporarily out of operation. Storm and sanitary sewers may also be impacted due to locations in flood prone areas for design purposes, such as gravity flow to minimize pumping charges.

Impacts of flooding on transportation are particularly significant. Flooded streets and roads block transportation and make it difficult for emergency vehicles to respond to calls for service. Floodwaters can washout sections of roadway and bridges. This disruption may extend to a regional, even national scale, particularly with regard to access to highways, railroads, and navigable waterways. Most importantly, the majority of fatalities that occur in floods are the result of people trying to dry on roads covered by floodwaters.

Existing Development, Critical Facilities & Infrastructure

Severe flooding can cause extensive damage to important public utilities known as critical facilities such as a wastewater treatment plant. The community rating system, CRS, defines a critical facility as "a structure or other improvement that, because of its function, size, service area, or uniqueness, has the potential to cause serious bodily harm, extensive property damage, or disruption of vital socioeconomic activities if it is destroyed or damaged or if its functionality is impaired. Critical facilities include health and safety facilities, utilities, government facilities, and hazardous materials facilities."

To analyze vulnerability to flood events and how this varies by jurisdiction, the critical facilities and number/types of structures located within the 1-percent annual chance floodplain were calculated using the preliminary Flood Insurance Study and associated digital Flood Insurance Rate Maps (FIRMs), dated April 5th, 2017 and the latest parcel information from Metropolitan Nashville-Davidson County. Figure 4-56 and Tables 4-32 and 4-33 present this data.

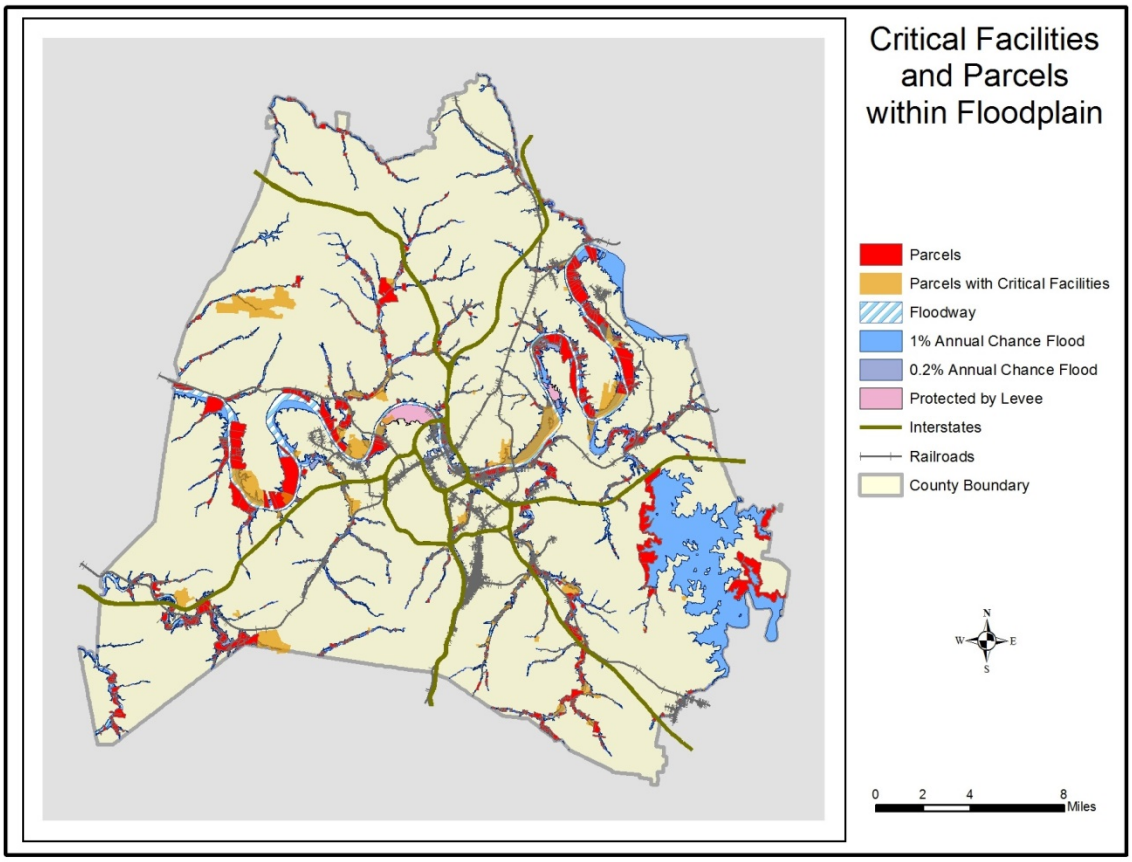


Figure 4-56: Critical Facilities & Parcels within Floodplain

Table 4-32: Critical Facilities within the 1% Annual Chance (100-year) Floodplain

Jurisdiction	Critical Facility Bldg. Footprints within 1% Annual Chance Floodplain
Belle Meade	0
Berry Hill	0
Goodlettsville	1
Oak Hill	0
Nashville-Davidson County	32
TOTAL	**33**

Source: Metro Planning Parcel Data

Critical facilities, as defined by the Office of Emergency Management and the Metropolitan Police Department, are located within the floodplain. These facilities include Metro facilities, and the following:

- Airports
- Schools and dormitories
- Fire/Police facilities
- Community Centers
- Headstart Centers
- Water Services facilities
- Tier II facilities
- Utility facilities
- Correctional facilities
- Hospitals
- Elderly care facilities

Improvement values for structures located within the 1-percent annual chance floodplain were then calculated using data from the Assessor of Property for Davidson County. There are approximately 11,715 parcels that intersect the floodplain with an improvement value greater than $0.00. These properties represent approximately 4.9 percent of the properties of Metropolitan Nashville and Davidson County (Table 4-33).

Table 4-33: Analysis of Parcels Located Within the 100-year Floodplain

Property Type	Total Number of Parcels	Number of Parcels with Improvement Value	Improvement Value
Bank / Finance	7	7	$5,291,100
Commercial	990	620	$1,389,288,462
Education *	42	14	$44,272,150
Emergency / Medical	35	31	$201,465,200
Industrial	480	339	$485,351,100
Other (Government/Institutional) **	101	14	$16,067,300
Recreational	52	23	$24,171,440
Religious	75	71	$89,027,400
Residential - Mobile Home Park	9	9	$16,733,700
Residential - Mobile Home	9	9	$156,300
Residential	10834	9146	$1,698,525,798
Rural	2153	1420	$227,434,700
Telecommunications	8	2	$76,900
Uncoded Parcels	197	10	$3,583,400
Satellite Cities	8	0	$0
Total	**15,000**	**11,715**	**$4,201,444,950**

* Metro Schools would be tax exempt and may not have an appraised value for improvement.

**Many of these properties would be tax exempt and may not have an appraised value for the improvement.

For the 2019 Plan Update, the most recent release of Hazus, version 4.0, was utilized to model flood vulnerability and estimate flood losses due to depth of flooding from the 1-percent-annual-chance flood. The current Flood Insurance Study and associated Flood Insurance Rate Maps (FIRMs), dated April 2017, did not include flood-depth grids and were therefore, not utilized in this analysis. The Hazus software was utilized to generate the flood hazard boundary and associated depth of flooding using:

- Thirty-meter resolution Digital Elevation Models (DEM) were used as the terrain base to develop hydrologic and hydraulic models;
- Streams and rivers with a minimum drainage basin area of 10 square miles were modeled as all experiencing a base flood at the same time;
- U.S. Geological Survey hydrologic regional regression equations and stream gage data were included in Hazus; and
- Census of Population and Housing, 2010

Based on the flood hazard boundary and associated depth of flooding, Hazus provides reports on the number of buildings impacted, building repair costs, and the associated loss of building contents and business inventory. Additionally, building damage can cause losses to a community as a whole by restricting the building's ability to function properly. Income loss data accounts for business interruption and rental income losses as well as the resources associated with damage repair and job

and housing losses. These losses are calculated by Hazus using a methodology based on the building damage estimates. Flood damage is directly related to the depth of flooding. For example, a two-foot flood generally results in about 20 percent damage to the structure (which translates to 20 percent of the structure's replacement value).

The Hazus analysis for a 100-year flood event produced the following loss estimates:

Table 4-34 Count of Expected Building Damage by Occupancy Type

Occupancy	Range of Damage					
	1-10%	11-20%	21-30%	31-40%	41-50%	>50%
Agricultural	0	0	0	0	0	0
Commercial	5	24	10	2	3	103
Education	0	0	0	0	0	0
Government	0	0	0	0	0	4
Industrial	0	1	0	0	1	21
Religion	0	2	0	0	0	1
Residential	109	288	222	232	426	3,400
TOTAL	**114**	**315**	**232**	**234**	**426**	**3,539**

Table 4-35 Count of Expected Building Damage by Building Type

Building Type	Range of Damage					
	1-10%	11-20%	21-30%	31-40%	41-50%	>50%
Concrete	0	1	0	0	0	18
Manufactured Housing	0	0	0	0	0	80
Masonry	1	10	6	4	20	289
Steel	0	8	4	0	1	44
Wood	108	293	224	231	412	3,135

Essential facilities, as identified within the Hazus software, are not subjected to significant damage due to flooding. The table below provides a summary of the expected damage to essential facilities.

Table 4-36 Count of Expected Damage to Essential Facilities

Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
EOCs	1	0	0	0
Fire Stations	40	0	0	0
Hospitals	19	0	0	0
Police Stations	30	1	0	1
Schools	285	0	2	2

The total economic loss estimated for the flood is $7,154.75 million, which represents approximately 11% of the total replacement value of the scenario buildings. These economic building-related 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 direct building losses were $4,660.34 million. The total business interruption losses were $2,494.41 or 35% of the total estimated losses. The residential occupancies made up 34% of the total loss. The table below provides a summary of the losses associated with the building-related damage.

Table 4-37 Building-Related Economic Loss Estimates ($M)

Category	Residential	Commercial	Industrial	Others	Total
Building Loss					
Building	1,359.19	642.90	161.08	139.55	2,302.74
Content	688.77	1,007.42	340.77	236.01	2,272.97
Inventory	0.00	26.30	57.21	1.13	84.64
Subtotal	2,047.96	1,676.62	599.07	376.69	4,660.34
Business Interruption					
Income	18.04	663.84	8.46	81.60	771.94
Relocation	207.52	166.99	7.68	38.17	420.36
Rental Income	110.07	118.54	1.95	5.01	235.57
Wage	42.42	687.64	11.49	324.99	1,066.55
Subtotal	378.05	1,637.07	29.58	449.77	2,494.41
Total	**2,426.01**	**3,313.63**	**588.64**	**826.46**	**7,154.75**

Vulnerability was further analyzed using a HAZUS Flood Average Annualized Loss (AAL) study conducted by FEMA in 2009-2010. FEMA conducted the HAZUS study for the entire continental United States using the MR4 release of HAZUS-MH. The inputs for the AAL included 30 meter Digital Elevation Model (DEM) and the default census block data in HAZUS MR4, which utilized the 2000 Decennial Census data.

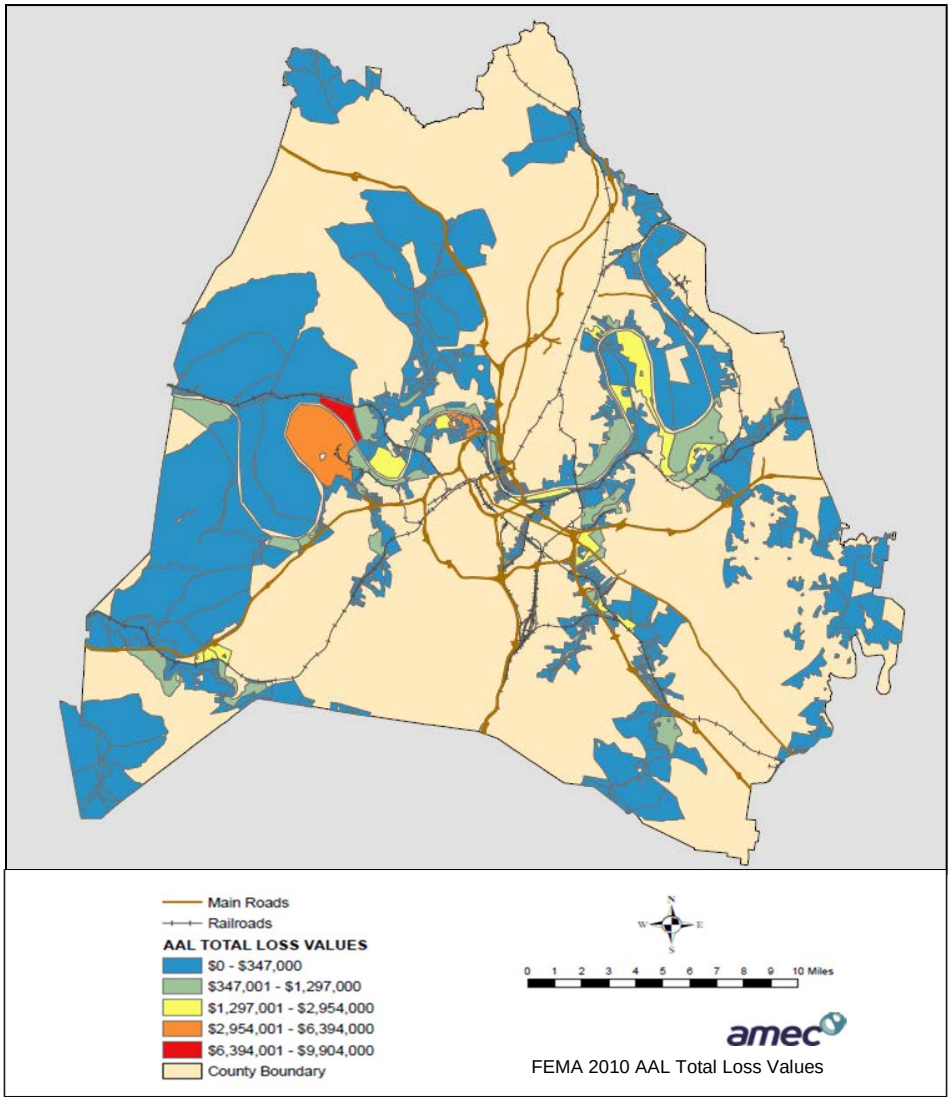
The analysis was performed at the county level using Level 1 methodology with national datasets. The purpose of the AAL study was to identify flood-prone areas and communicate relative flood risk in terms of people and property vulnerable to damage. The AAL study data provides potential dollar losses for four flood frequencies as follows: 10-percent (10-year), 2-percent (50-year), 1-percent (100-year), and 0.2 percent (500-year). The average annualized loss estimates are then calculated based on the aggregated dollar losses from the various flood frequencies (averaged and annualized). Figure 4-57 and Table 4-38 provide the detailed estimated AAL results for each jurisdiction in Davidson County.

Table 4-38: Average Annualized Losses by Jurisdiction *(FEMA 2010 Study)*

Jurisdiction	Building Damage ($)	Content Damage ($)	Business Disruption ($)	Total Loss ($)
Belle Meade	$754,000	$1,912,000	$105,000	$2,771,000
Berry Hill	$402,000	$1,435,000	$237,000	$2,074,000
Goodlettsville	$495,000	$383,000	$7,000	$885,000
Oak Hill	n/a	n/a	n/a	n/a
Nashville-Davidson County	$49,664,000	$70,674,000	$6,546,000	$126,884,000
Total County	$51,315,000	$74,404,000	$6,895,000	$132,614,000

Source: HAZUS-MR4

Figure 4-57: Average Annualized Loss (AAL) for Davidson County *(FEMA 2010 Study)*



Natural Floodplain Functions

As described by FEMA, "natural floodplains provide flood risk reduction benefits by slowing runoff and storing flood water. They also provide other benefits of considerable economic, social, and environmental value.

Floodplains frequently contain wetlands and other important ecological areas, including Nashville's rare/endangered crayfish habitat. Some of the benefits of floodplains to a functioning natural system include fish and wildlife habitat protection, natural flood and erosion control, surface water quality maintenance, groundwater recharge, biological

productivity, and higher quality recreational opportunities such as fishing, bird watching, boating, etc."

Table 4-39 displays a breakdown of the natural floodplain, wetlands, open space, and most notably the endangered crayfish habitat areas throughout the Nashville-Davidson County community.

Table 4-39: Natural Floodplain Functions

Area		Open Space (acres)	Wetlands (acres)	Floodplain (acres)	Crayfish Habitat (acres)	%
Within FHA		5,365	15,563	27,256 *(without waterbodies)*	43	85
Countywide	336,127	48,231	16,934	426,721 *(with waterbodies)*	86	50

Future Development (Development/Population Trends)

The risk of flooding to future development should be minimized by the floodplain management programs of the County and its jurisdictions, if properly enforced. For Nashville-Davidson County, the first floor elevations of residential property must be 4-feet above the base flood elevation. For non-residential properties, the standard is to either elevate or flood proof to 1-foot above the base flood elevation. Additionally, no new structures are allowed within the floodway.

Nashville-Davidson County also participates in the NFIP's Community Rating System (CRS) and takes steps above and beyond the minimum NFIP requirements to qualify for a 10-percent reduction in flood insurance premiums for structures within the SFHA and 5-percent reduction in flood insurance premiums for structures outside the SFHA. The floodplain management practices for CRS communities are reviewed on a periodic cycle, typically every five years.

The figure below exhibits the population trend for Nashville-Davidson County. Projections show the population trend is increasing every year. Which will likely lead to more development and redevelopment of several areas around the community.

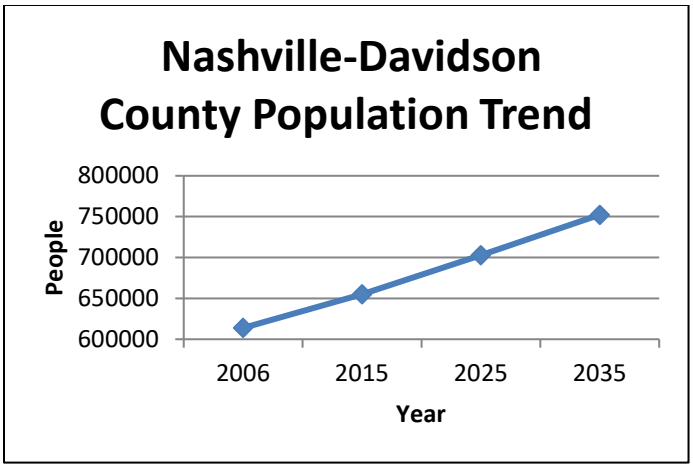


Figure 4-58: Nashville-Davidson County Population Trend (Nashville MPO)

The figures below show the development trends for the Nashville-Davison County community. The figures depict grading permit information which directly relates to the development in the community. The graphs show an up and down trend overall. Though, the past few years show a steady increase in grading permits. This means there is more development and redevelopment occurring in the community with each passing year.

Consequence Analysis (Impact of Future Flooding)

Historical data suggests floods are the most common hazard in the United States and have the potential of causing minimal to devastating damage to large areas, as well as injuries, fatalities, and severe emotional distress. Flooding or infrastructure damage causing loss of life is the primary concern with any flood situation. Homes, bridges and roadways can be demolished in minutes. In general, floods pose extreme hazards to individuals in vehicles, who may lose control, become trapped inside, and be washed away. Additionally, lack of visibility during a flood may cause drivers to become stranded or trapped when the road has been washed out.

Major impacts to the community include the sudden release of water possibly causing a flood surge, contaminants in floodwaters (and water sources) can cause risk to the public, along with mold that is developed after the water has receded.

Infrastructure that could be impacted includes water supply, electricity delivery, communication systems, waterway cargo. NES substations could be affected by floodwaters and may have to be taken off line, and repairs may be hampered due to floodwaters. Cargo that is delivered via the inland waterways includes coal, which helps maintaining efficient energy supply. Hazardous waste, lumber and a number of durable foods that are too heavy for efficient roadway transport are also delivered via waterways. During flood waters, debris is washed in and may impact the waterways.

Even with proper planning, training and exercising, first responders have a potential of being impacted during rescue operations. These potential dangers may include being swept away from flood waters, trapped in collapsed buildings, gas leaks/explosions etc.

As flooding in the community continues, the MWS home buyout program coordinates with FEMA, TEMA, and USACE to buy repetitive loss properties in high risk flood areas. These acquisitions help increase the natural floodplain area by restoring the properties to their natural state. This program purchases properties to promote natural floodplain functions.

Table 4-40: Flood Impacts

CONSIDERATIONS	IMPACTS
Impact on the Public	Localized impact expected to be severe for inundation area and moderate to light for other adversely affected areas.
Impact on Responders	Localized impact expected to limit response to persons in the inundation area at the time of the incident.
Continuity of Operations & Continued Delivery of Services	Damage to facilities/personnel in the area of the incident may require temporary relocation of some operations. Localized disruption of roads and/or utilities may postpone delivery of some services.
Infrastructure, Property & Facilities	Localized impact to facilities and infrastructure in the inundation area of the incident. Some severe damage possible, primary with water supply.
Environment	Localized impact expected to be severe for inundation area and moderate to light for other adversely affected areas, including aquatic life. Increase in wild animals, snakes, and mosquitos may be a major impact during event.
Economic Conditions of the Jurisdiction	Local economy and finances adversely affected, possibly for an extended period of time, depending on damage and length of event.
Public Confidence in the Jurisdictions Governance	Localized impact is expected to adversely affect confidence in local, state, and federal government. Public education is important. Response and recovery efforts to be the primary contributing factor in public confidence.

GEOLOGICAL HAZARDS

Earthquakes

Based on historic and scientific information, the risk to Metro Nashville-Davidson County from earthquakes is low.

A site-specific evaluation of the vulnerability of Metro to earthquakes was performed by AMEC Environmental, Inc. using the HAZUS software program. HAZUS-MH**,** is a nationally applicable standardized methodology and software program that contains models for estimating potential losses from earthquakes, floods, and hurricane winds. HAZUS-MH was developed by the Federal Emergency Management Agency (FEMA) under contract with the National Institute of Building Sciences (NIBS). NIBS maintains committees of wind, flood, earthquake, and software experts to provide technical oversight and guidance to HAZUS-MH development. Loss estimates produced by HAZUS-MH are based on current scientific and engineering knowledge of the effects of hurricane winds, floods, and earthquakes. Estimating losses is essential to decision-making at all levels of government, providing a basis for developing mitigation plans and policies on emergency preparedness and response and recovery planning.

The study used 2000 Census Bureau data for the region with the following assumptions:

- New Madrid Fault
- 7.5 Magnitude at 10 KM depth;
- 525 square mile region with 144 census tracts;
- 237,000 households;
- Population of 569,891 people;
- 181,000 buildings within the region;
- Total building replacement cost of 44,665 million dollars; and
- Approximately 97 percent of the buildings (and 76 percent of the building value) are associated with residential housing.

Studies were conducted by the Mid-America Earthquake Center under a $12 Million contract for the Dept. of Homeland Security and FEMA from 2006 to 2009 for projected damage figures for a 7.7 New Madrid Earthquake Event. These data were used to conduct a scenario for the National Level Exercise 2011 for all Federal Agencies, including the Dept. of Defense and all 22 affected state jurisdictions. Detailed information for Davidson County is following.

Davidson County Earthquake Hazard Damages					
Damages	Total	Moderate	Extensive	Complete	
Single Family Homes	159,343	52 units	10 units	0	
Other residential	16,555	55 units	0	0	
Commercial	3,658	11 units	0	0	
Industrial	356	1 unit	0	0	
Functionality	Totals	Day 1	Day 3	Day 7	Day 30
Hospital Functionality	5,307 beds	96.40%	96.50%	99.30%	99.90%
Police Station Functionality	23 sites	94.10%			
School Functionality	205 sites	94.10%			
Fire Station Functionality	37 sites	94.10%			
*Homes without Elec. Service	237,405	0%			
Homes without Water Service	237,405	0%			
Waste Water Facility Functionality	64 sites	89.79% No Damage; 9.43% Slight Damage			
Potable Water Facility Functionality	5 sites	89.79% No Damage; 9.43% Slight Damage			
Potable Water Lines Functionality	3,244 mi	18 Leaks; 4 Breaks			
Bridge Damage	521 bridges	98.52% No Damage; 0.82% Slight Damage			
Bridge Functionality	521 bridges	99.21%			
Communications Functionality	1,205	99.50%			
(Functionality % = percent that is functional)					

Table 4-41: Earthquake Hazard Damages

*This study did not take into consideration a possible cascading of consequences surrounding the Electric Power Grid throughout the Region. TVA and DHS/FEMA have produced electric grid studies which indicate the possibility of a temporary collapse of the East U.S. electric power grid similar to what happened during the Northeast Power failure in 2005. A temporary shutdown of nuclear and coal-fired generator plants could create a 48 to 72 hour loss of electric service before restoration could be completed. Almost all critical infrastructure and emergency services would have to rely on back-up power systems (generators). The lack of a coordinated Fuel Contingency Planning System for all Federal, State and Local jurisdictions would also cause numerous response issues.

Common impacts from earthquakes include damages to infrastructure and buildings (e.g., crumbling of un-reinforced masonry (brick); collapse of architectural facades; breakage of underground utilities, gas-fed fires; landslides and rock falls; and road closures). Less common, but possible damages would include dam failures and subsequent flash floods. However, with the distance of Metro Nashville from any major fault lines, the impact from an earthquake at the New Madrid fault would be minimal.

Landslides

The locations of past landslides (Figure 4-34, Section 4.1) were utilized to determine the vulnerability of the Metro area to future landslides. A 50-foot radius from the point of the landslide was overlaid onto the Metro parcel data. The properties that intersected the radii were then queried for property improvements greater than $0.00. This gave an indication of an improvement to a piece of property that touched the identified sites. There are approximately 45 properties that intersect the landslide areas with an improvement value greater than $0.00. These properties represent approximately 0.02 percent of the properties of Metropolitan Nashville and Davidson County. There are no critical facilities, as defined by the Office of Emergency Management and the Metropolitan Police Department, located within the landslide geological hazard areas.

Delineation of the Dellrose soils has not been completed for Davidson County. This information cross-referenced with steep slopes would provide an even more accurate estimation of vulnerability to landslides.

Table 4-42: Geological Hazard Damages

Property Type	Total Number of Parcels	Number of Parcels with Improvement Value	Improvement Value
Bank / Finance	0	0	0
Commercial	3	0	0
Education	0	0	0
Emergency / Medical	0	0	0
Industrial	0	0	0
Other (Government / Institutional)	2	1	$5,772,800
Residential – Mobile Home	0	0	0
Residential – Mobile Home Park	0	0	0
Residential	43	43	$767,1900
Rural	1	1	$245,500
Telecommunications	0	0	0
No Associated Land Use Code	1	0	0
TOTAL	50	45	$13,690,200

Of the 206,834 parcels located within the Metro area, 50 are located within a 50-foot radius of identified landslide locations, that is, 0.04 percent of the total properties. Similarly of the total $29.1 billion in improvement values, $13 million are located within a 50-foot radius of the identified landslide locations. This results in 0.02 percent of the total property value being located adjacent to an identified landslide area.

Landslides have resulted in direct damages to structures and roadways, e.g., shifting structures off foundations, deformation of walls and doors, and blocking major thoroughfares. Potential direct impacts may include damages to rail lines and bridges, damming of rivers, and subsequent “dam” failure. Indirect impacts included the cost of debris clearance, personal injuries, and economic loses from rail and roadway closures.

Consequence Analysis

Impacts are greatly dependent on a number of conditions, but primarily is the location of the epicenter (or landslide/sinkhole), and the size of the event (earthquake/sinkhole). Adverse impact expected to be severe for close events and minor to minimal for those farther away.

Table 4-43: Geological Impacts

CONSIDERATIONS	IMPACTS
Impact on the Public	Close proximity may have moderate to light impact. Falling debris and building instability are the largest adverse impacts.
Impact on Responders	Potential to be seriously injured in close proximity. Structural instability and broken power/gas lines.
Continuity of Operations & Continued Delivery of Services	Damage to facilities/personnel in the area of the incident may require relocation of operations and lines of succession execution. Disruption of lines of communication and destruction of facilities may extensively postpone delivery of services.
Infrastructure, Property & Facilities	Damage to facilities and infrastructure in the area of the incident may be extensive for facilities, people, infrastructure and hazmat. A major event could have significant impact on all stages of electric power, cause nuclear/coal generation put off line, and damage substations/transmission and distribution facilities.
Environment	May cause extensive damage to environment in the area of the incident.
Economic Conditions of the Jurisdiction	Local economy and finances adversely affected, possibly for an extended period of time in the area of the incident.
Public Confidence in the Jurisdictions Governance	Ability to respond and recover may be questioned and challenged if planning, response and recovery are not timely and effective.

SEVERE WEATHER

(Extreme Temperatures, Thunderstorms, Tornadoes, and Winter Storms)

The severe weather evaluated as part of this risk assessment included: extreme temperatures, thunderstorms and lightning, tornadoes, and winter storms. In general, both the risk and vulnerability to Metro Nashville-Davidson County from severe weather is high. With weather records dating back to the 1870s, Nashville has a lengthy history of weather trends. Since the late 1980s, the average annual temperature and the average annual precipitation have been warmer and wetter than the historical normal. This trend will likely continue for the foreseeable future, putting Nashville at a greater risk for thunderstorm related hazards.

Impacts to Metro Nashville-Davidson County as a result of severe weather could include damage to infrastructure, particularly damage to overhead power lines, road closures, and interruption in business and school activities. In the case of tornadoes, severe damages can occur to buildings. Utility outages can impact anything relying on electricity without a redundant power supply (e.g., a generator, solar power, or redistribution plan), and include secondary impacts such as interruption to water and sewage services, heat and refrigeration, fuel supplies, computers and cell phones. If interruption to business occurs for an extended period, economic impacts can be severe. Also of concern would be the impacts on populations with special needs such as the elderly and those requiring the use of electric medical equipment. Although typically short-lived, delays in emergency response services can also be of concern. Depending on the nature of a given storm, all areas within Metro are equally at risk; however, those areas relying on above ground utilities could suffer the greatest damage.

Extreme Temperatures

The health and safety of persons affected by extreme temperatures will vary, depending on the length and severity of the temperature condition. Both extreme heat and extreme cold can negatively impact individuals in the affected area. Tennessee is known to have temperatures well over 100 degrees in summer months, and as low as 20 degrees below zero in the winter. Historically, such extreme temperature events have been credited with numerous injuries and fatalities. Children, people with disabilities, and the elderly are especially susceptible to the effects of extreme temperatures, and those that are homeless, or have limited access to proper heating and cooling systems.

There are a number of health complications that can be associated with prolonged exposure to extreme heat. The stagnant atmospheric conditions and poor air quality that accompany extreme heat can put individuals at risk of developing a heat disorder, as the body becomes unable to circulate and/or sweats too much. Heat disorders can lead to serious health complications, such as heat cramps, heat exhaustion, and heat strokes. Individuals living in urbanized areas are at a greater risk than those in rural areas due in part to the overheated asphalt and concrete.

Similarly, extreme cold can impact individuals' health and safety. Wet areas may freeze, making driving dangerous. Continued exposure to extreme cold can result in serious health complications in those unable to generate body heat, such as hypothermia. Increased power demands for heating or cooling may result in brownout or blackout conditions, and carbon

monoxide poisoning from the use of space heaters and fireplaces can make the situation worse.

Based on information from the 2017 American Community Survey 5-Year Estimates, Table 4.44 compares the percentage of persons over age 65, below age 5, and the percentage of persons below the federal poverty level in the participating jurisdictions to state and national averages. The City of Belle Meade has the highest percentage of residents over age 65, at 23.9 percent. Metro Nashville has the highest percentage of residents under 5, at 6.9 percent, and Metro Nashville has the highest percentage of population below the poverty level, at 17.2 percent.

Table 4-44: Population over age 65, Under 5 and Below the Poverty Level

Jurisdiction	# Age 65 and Over	% Age 65 and Over	# Age Under 5	% Age Under 5	% Individuals Below Poverty Level
Metro Nashville-Davidson County	73,240	11.2	45,406	6.9	17.2
Belle Meade	617	23.9	125	4.8	3.9
Berry Hill	43	4.8	11	1.2	15.8
Forest Hills	1,071	21.4	176	3.5	3.7
Goodlettsville	3,019	17.8	841	5.0	12.1
Oak Hill	817	17.5	308	6.6	0.6

Source: 2017 American Community Survey 5-Year Estimates, U.S. Census Bureau

Table 4-45: Extreme Temperature Impacts

CONSIDERATIONS	IMPACTS
Impact on the Public	Localized impact expected to be moderate for affected areas, primarily with adverse health effects.
Impact on Responders	Adverse impact expected to be moderate for unprotected personnel and light for trained, equipped, and protected personnel.
Continuity of Operations & Continued Delivery of Services	Unlikely to necessitate execution of the Continuity of Operations Plan. Localized disruption of roads and/or utilities caused by incident may postpone delivery of some services.
Infrastructure, Property & Facilities	Localized impact to facilities and infrastructure in the areas of the incident. Increased power demand anticipated. NES customer load curtailments could result if TVA generation is not adequate. Power lines and roads most adversely affected.
Environment	Marginal impact. Impacts could include possible drought conditions, increased risk of wildfires.
Economic Conditions of the Jurisdiction	Local economy not anticipated to be adversely affected.
Public Confidence in the Jurisdictions Governance	Ability to respond and recover may be questioned and challenged if planning, response, and recovery not timely and effective.

Thunderstorms/Tornadoes

Populations affected by severe storms are dependent on numerous factors. These include the tornado's mass and strength at the time of impact, location of impact, and ability to respond to warnings. Tornadoes may strike quickly, with little to no warning, and can bring heavy rain and hail. Historical data suggests that tornadoes have the potential of causing minimal to devastating damage to an area, as well as hundreds of injuries, and even death. Most fatalities and injuries associated with tornadoes are caused by flying debris. Those in the affected area may also become trapped by a collapsing structure. Tornadoes may also damage power lines and cause gas leaks, making individuals susceptible to fires, electrocution, explosions, and exposure to harmful gases. It is also important to remember that tornadoes often accompany severe storms, and bring with them additional dangers of lightning and flash floods.

There are 93 pole-mounted sirens utilized by OEM to warn residents of tornado warnings for Davidson County. The sirens are designed to warn those people located outdoors and in public gathering places, such as parks or in the downtown business area. The warning sound from each siren is audible within a 1/2 to 1 1/2 mile radius, depending upon the terrain, humidity, foliage, and background noise, such as wind and rain.

Figure 4-59 presents the siren locations and their respective range. An upgraded siren system along with additional sirens was completed in 2013, and another upgrade with additional sirens is starting in 2019.

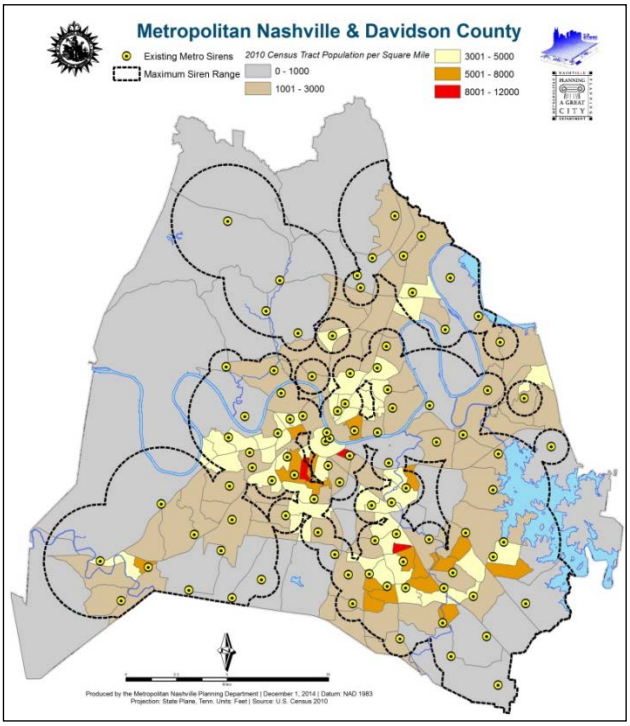


Figure 4-59: Tornado Siren Locations

Campers, manufactured homes, barns, and sheds and their occupants are particularly vulnerable as windstorm events in the planning area can be sufficient in magnitude to overturn these lighter structures. Table 4.46 provides the estimated numbers of manufactured homes in each jurisdiction in the planning area. Table 4-46 provides the estimated numbers of manufactured homes in each jurisdiction in the planning area.

Table 4-46 Manufactured Homes in Planning Area

Jurisdiction	# of Manufactured Homes
Metro Nashville-Davidson County	4,140
Belle Meade	0
Berry Hill	11
Forest Hills	6
Goodlettsville	185
Oak Hill	6

Source: 2017 American Community Survey 5-Year Estimates, U.S. Census Bureau

With the many variables associated with tornadoes, it is difficult to quantify potential losses to existing development. Tornado variables include, but are not limited to, the following: tornado intensity, tornado ground path length and width, time of day, development density of ground path, population density of ground path, and prevalent construction materials/methods in ground path. With these many unknown variables in mind, an attempt has been made to estimate losses based on several assumptions as well as statistics gathered from historical events. Since 1952, the average width and average length of tornado paths within Davidson County is 193 yards by 5.85 miles. Thus assuming an average .64 square mile area was affected by the tornadoes paths.

Using that assumption above, the number of houses in a .64 square mile area was figured for each jurisdiction based on the housing density. It should be noted that generally, the length of a tornado is greater than its width. However, to apply this methodology to multiple jurisdictions with varying dimensions, the path was converted to square miles. The number of homes was determined for .64 square miles and then multiplied by the average home value for each jurisdiction to arrive at an estimated value of homes in .64 square miles for each jurisdiction. This represents the value of homes exposed in an estimated tornado path. The level of damages would then depend on the magnitude of a specific tornado.

Table 4.47 provides the results of the vulnerability analysis. This vulnerability analysis methodology reveals that the City of Belle Meade has the highest value of homes in a .64 potential tornado path.

Table 4-47: Tornado Vulnerability Analysis

Jurisdiction	Land Area (sq. Miles)	Housing Units	Housing Density	Houses in 0.64 square miles	Average Home Value	Value of Homes in 0.64 sq. mi. (Exposure)
Metro Nashville-Davidson County	525	288,871	550.23	352.15	$191,400	$67,401,032
Belle Meade	3.1	1,080	348.39	222.97	$1,330,200	$296,591,690
Berry Hill	0.91	610	670.33	429.01	$197,700	$84,815,473
Forest Hills	9.3	1,903	204.62	130.96	$802,500	$105,094,710
Goodlettsville	14.15	7,594	536.68	343.47	$196,300	$67,423,986
Oak Hill	8	1,863	232.88	149.04	$594,400	$88,589,376

Source: 2017 American Community Survey 5-Year Estimates, U.S. Census Bureau

Table 4-48: Thunderstorm/Tornado Impacts

CONSIDERATIONS	IMPACTS
Impact on the Public	Localized impact expected to be severe for incident areas and moderate to light for other adversely affected areas.
Impact on Responders	Localized impact expected to be severe for personnel in the areas at the time of the incident.
Continuity of Operations & Continued Delivery of Services	Damage to facilities/personnel in the area of the incident may require temporary relocation of some operations. Localized and possible severe disruption of roads, facilities, and/or utilities caused by incident may postpone delivery of some services.
Infrastructure, Property & Facilities	Severe localized impact to facilities and infrastructure in the area of the incident possible. .
Environment	Localized impact expected to be severe for incident areas and moderate to light for other areas affected by the storm or HazMat spills.
Economic Conditions of the Jurisdiction	Local economy and finances adversely affected, possibly for an extended period of time.
Public Confidence in the Jurisdictions Governance	Ability to respond and recover may be questioned and challenged if planning, response, and recovery not timely and effective.

Winter Storms

There are many factors during a winter storm that can dictate methods and strategy for mitigation and clearing of roadways. The temperature, wind speed, amount of precipitation, and traffic all play a vital role in establishing a successful cleanup practice. Metro Nashville Public Works uses several techniques to help mitigate the effects of winter storms on its twenty-eight primary and secondary routes.

First is the direct application of brine onto the roads from the back of their eighteen distribution trucks, approximately twenty-four hours before the snow event takes place. This treatment applies brine directly to the roadway and assists in the prevention of ice formation and bonding to the pavement surface. The next technique used is the actual spreading of salt once accumulation has begun. To perform this application Metro Public Works uses twenty-eight route trucks and seven standby units to accommodate all mitigating factors that occur during a winter storm. This process requires traffic assistance to help activate the salt and the melting process.

In recent years, the department of Public Works added five trucks equipped with onboard wetting systems that apply brine or other liquid materials such as calcium chloride to dry rock salt as it exits the truck. The addition of this pre-wetting capability activates the salt & initiates the melting process. These units also contribute to the cleanup, with less material bouncing off of the roadways and going to our ground water supply via storm drains and inlets.

These resources assist in mitigating the effects of a winter storm on local infrastructure and the motoring public. They will also provide the department a faster and more efficient method of clearing roadways, while providing a more environmentally friendly approach to snow and ice removal.

The loss of use estimates provided in Table 4-49 below were calculated using FEMA's publication What is a Benefit?: Guidance on Benefit-Cost Analysis of Hazard Mitigation Project, June 2009. These figures are used to provide estimated costs associated with the loss of power in relation to the populations served in each jurisdiction. The loss of use is provided in the heading as the loss of use cost per person per day of loss. The estimated loss of use provided for each jurisdiction represents the loss of service of the indicated utility for one day for 10 percent of the population. These figures do not take into account physical damages to utility equipment and infrastructure.

Table 4-49: Loss of Use Estimates for Power Failure Associated with Severe Winter Storms

Jurisdiction	Population	Estimated Affected Population (10%)	Electric Loss of Use Estimate ($126 per person per day)
Metro Nashville-Davidson County	654,187	65418.7	$8,242,756
Belle Meade	2,584	258.4	$32,558
Berry Hill	891	89.1	$11,227
Forest Hills	5,002	500.2	$63,025
Goodlettsville	16,935	1693.5	$213,381
Oak Hill	4,681	468.1	$58,981
Total	**684,280**	**68,428**	**$8,621,928**

Source: 2017 American Community Survey 5-Year Estimates, U.S. Census Bureau

Table 4-50: Winter Storm Impacts

CONSIDERATIONS	IMPACTS
Impact on the Public	Localized impact expected to be severe for affected areas and moderate to light for other less affected areas.
Impact on Responders	Adverse impact expected to be severe for unprotected personnel and moderate to light for trained, equipped, and protected personnel.
Continuity of Operations & Continued Delivery of Services	Possible need to necessitate execution of the Continuity of Operations Plan, dependent on location of operations. Localized possibly severe disruption of roads and/or utilities caused by incident may postpone delivery of some services.
Infrastructure, Property & Facilities	Localized impact to facilities and infrastructure in the areas of the incident. Power lines and roads most adversely affected. If frigid temperatures, restoration efforts may be greatly hampered due to temperature and poor road conditions. Extreme temperature fluctuations may cause damage to older water mains, and could affect water distribution.
Environment	Environmental damage to trees, bushes, etc.
Economic Conditions of the Jurisdiction	Local economy and finances may be adversely affected, depending on damage.
Public Confidence in the Jurisdictions Governance	Ability to respond and recover may be questioned and challenged if planning, response, and recovery not timely and effective.

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COMMUNICABLE DISEASES/PUBLIC HEALTH

The impact of a communicable disease outbreak within the Metro area may include the loss of life, short-term or long-term debilitation for victims and/or loss or delay of business and service deliverability. Economic hardships are often a direct result of a communicable disease outbreak, as lost work time due to individual illnesses affects employees and employers; in addition, healthy citizens tend to stay home and self-isolate, which puts a strain on business profits.

In addition, a serious epidemic would likely cause a strain on current public health and medical resources. Depending on the disease outbreak, response efforts will include education for both medical personnel and citizens, continuing surveillance and data monitoring, public information and, if necessary, mass prophylaxis.

While communicable diseases vary in intensity and possible impact, the risk and vulnerability of a communicable disease epidemic in Metro Nashville-Davidson County is considered low, based on historical data. Because of ongoing mitigation efforts within the Metro Public Health Department for diseases such as West Nile Virus and pandemic flu, and because of constant surveillance among hospital data and infectious disease reporting, the probability that an epidemic would spread among Metro Nashville-Davidson County before response and planning measures were implemented is low.

Table 4-51: Communicable Diseases Impacts

CONSIDERATIONS	IMPACTS
Impact on the Public	Adverse impact expected to be severe for unprotected persons and moderate to light for protected persons.
Impact on Responders	Adverse impact expected to be severe for unprotected personnel and uncertain for trained and protected personnel, depending on the nature of the incident.
Continuity of Operations & Continued Delivery of Services	Impacted personnel may require lines of succession execution. Disruption of lines of communication and temporary destruction of facilities may extensively postpone delivery of services.
Infrastructure, Property & Facilities	Access to facilities and infrastructure in the area of the incident may be denied until decontamination completed.
Environment	Limited impact anticipated.
Economic Conditions of the Jurisdiction	Minor local economy affected, possibly for an extended period of time.
Public Confidence in the Jurisdictions Governance	Ability to respond and recover may be questioned and challenged if planning, response, and recovery not timely and effective.

Man-Made Hazards (Technological/Terrorism)

For the purpose of this plan, 'Man-made hazards' are technological hazards and terrorism. These are distinguished from natural hazards in that they originate from human activity. Technological hazards refer to the origins of incidents that can arise from human. For technological hazards (hazardous materials) analysis, refer to the hazardous materials vulnerability and consequence analysis separately.

Terrorism is intended to provoke fear and uncertainty, and to intimidate or coerce its intended target. With this in mind, one can already determine that the impacts of terrorism would be quite large. The initial and long term impact on the public and responders would be severe, along with potentially major impacts on infrastructure, property, the environment and of course the economy. The physical impact of this type of disaster will likely be localized to the immediate area surrounding the incident, but based on the specific methods, the impacts could be more wide spread. The impact of the community's mental health would be wide spread and potentially severe, and could last an extended amount of time.

One can also determine that one of the best ways a community can mitigate terrorist activities is by having an aware community; a community that knows what to look for in suspicious activity, and one that swiftly reports this activity. Local, state and federal law enforcement agencies continue to improve on combating terrorist activity, and those in the Metro-Nashville Davidson County area are not an exception. Our local law enforcement agencies continuously plan, train and exercise with state and federal entities and intelligence agencies. The national public campaign of "See Something, Say Something" raises public awareness of the different indicators of terrorism and terrorism related crimes, as well as the importance on the public swiftly reporting such activity. This campaign was launched by the US Department of Homeland Security in conjunction with the US Department of Justice's 'Nationwide Suspicious Activity Reporting (SAR) Initiative (NSI)'. The NSI helps to standardize how suspicious activity is reported and analyzed. This reported information is then shared (when determined to be a reasonably indication of terrorist activity) with local, state and federal law enforcement partners across the US.

Table 4-52: Man-Made Hazards Impacts

CONSIDERATIONS	IMPACTS
Impact on the Public	Localized impact expected to be severe for immediate area and moderate to light for other local areas. Mental health can be expected to have a large impact on a large population.
Impact on Responders	Adverse impact expected to be severe for unprotected personnel and moderate to light for protected personnel, dependent on the nature of the event.
Continuity of Operations & Continued Delivery of Services	Damage to facilities/personnel in the area of the incident may require temporary relocation of some operations. Localized disruption of roads and/or utilities may postpone delivery of some services.
Infrastructure, Property & Facilities	Localized impact to facilities and infrastructure in the area of the incident, possibly for extended period, dependent on the event.
Environment	Localized impact expected to be severe for immediate area, dependent on the event. Remediation may be required.
Economic Conditions of the Jurisdiction	Local economy and finances adversely affected, possibly for an extended period of time, depending on type of event, damage and extent of cleanup.
Public Confidence in the Jurisdictions Governance	Adverse impact expected to be severe. Ability to prevent, respond and recover may be questioned and challenged.

Hazardous Materials

HAZMAT incidents vary widely in their effects on exposure. Most of the common chemicals can quickly cause death or permanent injury in high concentrations with relatively little exposure time, but some toxins cause injury only with repeated exposures, or are carcinogenic. Emphysema or other chronic lung diseases can result from toxic gas inhalation. Caustics, acids, and some other compounds cause immediate burns. Clothing, vehicles, and personal effects can be contaminated by most hazardous materials, often regardless of their chemical state (gas or liquid). Even properly-contained limited impact HAZMAT incidents can swiftly harm those in the affected area before first responders arrive, and leave chemical residues that persist for months or years. A few injuries and deaths occurring at a large facility fire can lead to many casualties from smoke exposure or residential area contamination if the incident is inadequately contained. Winds, flooding, ground elevation, and accessible terrain might increase exposure. Fires and explosions may cause structural damage.

Obviously health and safety of people present at a HAZMAT incident will vary by more than the chemical type: proximity to other volatile or flammable substances, warning time and evacuation protocols, the duration and location of the accident (relative to population centers and to their food and water supplies), and the presence or absence of secondary incidents such as fires and explosions. Transportation-related HAZMAT events can lead to fatalities and injuries caused by the combination of the chemical effects with automobile and road damage, and possible pile-ups.

This hazard could have a significant impact on the public health, the environment, private property and the economy. The impact of this type of disaster will likely be localized to the immediate area surrounding the incident. The initial concern will be for people, then the environment. If contamination occurs, the spiller is responsible for the cleanup actions and will work closely with federal and state agencies and the local jurisdiction to ensure that cleanup is done safely and in accordance with federal and state laws.

Table 4-44: Hazardous Materials Impacts

CONSIDERATIONS	IMPACTS
Impact on the Public	Localized impact expected to be severe for plume area and moderate to light for other adversely affected areas.
Impact on Responders	Adverse impact expected to be severe for unprotected personnel and moderate to light for protected personnel.
Continuity of Operations & Continued Delivery of Services	Damage to facilities/personnel in the area of the incident may require temporary relocation of some operations. Localized disruption of roads and/or utilities may postpone delivery of some services.
Infrastructure, Property & Facilities	Localized impact to facilities and infrastructure in the plume area of the incident, possibly for extended period.
Environment	Localized impact expected to be severe for plume area. Remediation required.
Economic Conditions of the Jurisdiction	Local economy and finances adversely affected, possibly for an extended period of time, depending on damage, extent of cleanup, and length of investigation.
Public Confidence in the Jurisdictions Governance	Localized impact expected to primarily adversely affect HazMat source owner and local entities.

Wildfires

Wildfires can emanate from a myriad of sources, and more often than not they are technological or human caused events, but many are still considered natural hazards. Home wildfires, wildfires, and forest wildfires can impact large populations if intensified. The specific impacts they have can vary, but there are some similarities. Individuals may be exposed to smoke inhalation. In home wildfires, smoke may fill a room quickly, making it difficult for an individual to breathe and find a safe exit. The smoke from wildfires and forest wildfires can affect overall air quality in the area, proving especially dangerous for those with asthma or other lung related health concerns. Food may become exposed to heat, smoke, or soot, putting individuals at risk for food poisoning. In addition, each type of event may impact an individual's general safety, placing them at risk for burns and carbon monoxide poisoning.

Wildfires may cause entire communities to go without power, making it difficult for individuals to stay cool and compromising the food supply. Water can become contaminated, and unable to be used without risking sickness. Wildfires produce an extreme amount of heat, which can severely burn an individual's hands and feet even after the blaze is extinguished, and may also reignite the flames. The wildfire may also have caused chemicals to explode or leak, placing those exposed to the potential health risks of hazardous materials.

Wildfires may result in cascading events, such as future flooding, which may further impact citizens. Rapid response to wildfires is necessary to prevent them from developing into forest wildfires. Although forest wildfires typically occur in heavily forested areas, more people have begun to populate these areas.

Table 4-54: Wildfires Impacts

CONSIDERATIONS	IMPACTS
Impact on the Public	Localized impact expected to be severe for incident areas and moderate to light for other adversely affected areas.
Impact on Responders	Localized impact expected to limit damage to personnel in the incident areas at the time of the incident.
Continuity of Operations & Continued Delivery of Services	Damage to facilities/personnel in the area of the incident may require temporary relocation of some operations. Localized disruption of roads and/or utilities caused by incident may postpone delivery of some services.
Infrastructure, Property & Facilities	Localized impact to facilities and infrastructure in the area of the incident. Some severe damage possible.
Environment	Localized impact expected to be severe for incident areas and moderate to light for other areas affected by smoke or HazMat remediation.
Economic Conditions of the Jurisdiction	Local economy and finances may be adversely affected, depending on damage and length of investigations.
Public Confidence in the Jurisdictions Governance	Ability to respond and recover may be questioned and challenged if planning, response, and recovery not timely and effective.

Multi-Hazard Mitigation Plan
4.3 Capability Assessment

An additional method of evaluating the potential for hazards to adversely impact Metro is to conduct an inventory and analysis of the community's existing mitigation capabilities. Doing so provides an assessment of how well-prepared Metro is presently, and highlights any areas where improvements might be worthwhile. The term "mitigation capabilities" is meant to be inclusive of all existing policies, regulations, procedures, and abilities that already contribute to the protection of the Metro area and the minimization of damages from future disasters.

The Community Planning Team's intent, through this plan, is to identify those policies, regulations, procedures, and abilities that contribute to lessening disaster damages. Second, it is the intent of the CPT to evaluate these mechanisms in terms of whether they could be improved in order to reduce future disaster damages. For example, a community that has adopted building codes has adopted procedures that take a significant step in preventing future damage. However, if that community does not have a Building Inspector, someone whose responsibility it is to inspect pre-construction plans, new construction, and enforce penalties for projects that do not meet the code, then the *usefulness and effectiveness* of the community's building codes has been substantially undermined. Such a circumstance, which is NOT the case in Metro, would lead the CPT towards recommending that the position of Building Inspector be funded and filled.

Tables 4-55a and b present the inventory of existing mitigation capabilities within Metropolitan Nashville-Davidson County and the participating jurisdictions. An evaluation of key capabilities follows.

Table 4-55a: Metropolitan Nashville-Davidson County Mitigation Capability

Capability	Metropolitan Nashville-Davidson County
Comprehensive Plan	Adopted
Land Use Plan	County divided into 14 community plans and updated on a rotating schedule.
Subdivision Ordinance	Subdivision Regulation administered by the Planning Department
Zoning Ordinance	Metro Code – Title 17
NFIP/FPM Ordinance	Ordinance #78-840
Floodway Buffer Ordinance	50' outside Floodway
- Map Date	April 5th, 2017
- Substantial Damage language?	Cumulative Substantial Damage
- Certified Floodplain Manager?	1 – Tom Palko, Roger Lindsey + 12 staff members
- # of Floodprone Buildings?	Approximately 8,871 bldg footprints within floodplain
- # of NFIP policies	Approximately 5,645 policies in force
- Maintain Elevation Certificates?	Yes
- # of Repetitive Losses?	344 Structures
CRS Rating, if applicable	8
Stormwater Program?	Yes
Building Code Version	2006 IRC; 2006 IBC
Full-time Building Official	Yes, Metro Codes Department
- Conduct "as-built" Inspections?	At time of framing an elevation certificate is required
BCEGS Rating	Commercial – 4; Residential – None
Local Emergency Operations Plan	Yes, Comprehensive Emergency Management Plan Adopted 2017
Hazard Mitigation Plan	Yes
Warning System in Place?	Yes
- Storm Ready Certified?	Yes
- Weather Radio reception?	100 % with back-up transmitter
- Outdoor Warning Sirens?	Yes
- Emergency Notification (R-911)?	Yes
- Other? (e.g., cable over-ride)	Yes cable over-ride; EAS message; FCC requirement; IPAWS authorized; Wireless Emergency Alerts; Opt-In emergency alerts
GIS System?	Yes – Metro and NES
- Hazard Data?	Floodplains, parcels, soils
- Building footprints?	Yes
- Tied to Assessor data?	Yes
- Land-Use designations?	Yes, within parcel data – different than zoning code
Structural Protection Projects	Levees – MetroCenter
Property Owner Protection Projects	Buyouts and Elevations; Flood protection/ retrofit not typical
Critical Facilities Protected?	Water Treatment plants – yes; Sewage Treatment plants – in process in capital plan. Program in place to upgrade to submersible pumps
Natural Resources Inventory?	TDEC has database – wetlands, endangered species, tree cover; hyperspectral also available
Cultural Resources Inventory?	Yes – Historic Administration; Information should be parcel based
Erosion Control procedures?	Yes – Regulations
Sediment Control procedures?	Yes – Regulations
Public Information Program/Outlet	Billing Stuffers; Website – Many departments have dedicated Public Information Officers including Metro Water and Office of Emergency Management; Public Information Group for Hazard Mitigation Outreach; meet NPDES public information requirements.
Environmental Education Program?	

Table 4-55b: Jurisdictional Mitigation Capabilities

Capability	Belle Meade	Berry Hill	Forest Hills
Comprehensive Plan	Zoning Ordinance	Community Development Code	Zoning Ordinance
Land Use Plan	MuniCode – Title 14	MuniCode – Title 14	MuniCode – Title 14
Subdivision Ordinance	MuniCode – Title 12; 14	MuniCode – Title 14	MuniCode – Title 14
Zoning Ordinance	MuniCode – Title 14	MuniCode – Title 14	MuniCode – Title 14
NFIP/FPM Ordinance	MuniCode – Title 12, Ch.4	MuniCode – Title 14, Ch.3	MuniCode – Title 14, Ch.3
Floodway Buffer Ordinance	Water Quality Buffer	Water Quality Buffer	Water Quality Buffer
- Map Date	04/05/17	04/05/17	04/05/17
- Substantial Damage language?	Yes	Yes	Yes
- Certified Floodplain Manager?	No	No	No
- # of Floodprone Buildings?	17	15	27
- # of NFIP policies	72	23	88
- Maintain Elevation Certificates?	Yes	Yes	Yes
- # of Repetitive Losses?	0	0	0
CRS Rating, if applicable	N/A	N/A	N/A
Stormwater Program?	Yes	Yes	Yes
Building Code Version	2009 IRC; TN Code	2012 IRC; 2012 IBC	2012 IRC; 2012 IBC
Full-time Building Official	Yes	Yes	Yes
- Conduct "as-built" Inspections?	Yes	Yes	Yes
BCEGS Rating	Not Available	Not Available	Not Available
Local Emergency Operations Plan	Metro Nashville	Metro Nashville	Metro Nashville
Hazard Mitigation Plan	Metro Nashville	Metro Nashville	Metro Nashville
Warning System in Place?	Metro Nashville	Metro Nashville	Metro Nashville
- Storm Ready Certified?	Metro Nashville	Metro Nashville	Metro Nashville
- Weather Radio reception?	Metro Nashville	Metro Nashville	Metro Nashville
- Outdoor Warning Sirens?	Metro Nashville	Metro Nashville	Metro Nashville
- Emergency Notification (R-911)?	Metro Nashville	Metro Nashville	Metro Nashville
- Other? (e.g., cable over-ride)	Metro Nashville	Metro Nashville	Metro Nashville
GIS System?	Metro Nashville	Metro Nashville	Metro Nashville
- Hazard Data?	Metro Nashville	Metro Nashville	Metro Nashville
- Building footprints?	Metro Nashville	Metro Nashville	Metro Nashville
- Tied to Assessor data?	Metro Nashville	Metro Nashville	Metro Nashville
- Land-Use designations?	Metro Nashville	Metro Nashville	Metro Nashville
Structural Protection Projects	N/A	N/A	N/A
Property Owner Protection Projects	N/A	N/A	N/A
Critical Facilities Protected?	N/A	N/A	N/A
Natural Resources Inventory?	TDEC	TDEC	TDEC
Cultural Resources Inventory?	Historic Zoning Comm.	N/A	Cultural and Natural Resources Committee
Erosion Control procedures?	MuniCode – Title 12, Ch.2	MuniCode – Title 18, Ch.2	MuniCode – Title 14, Ch.5
Sediment Control procedures?	MuniCode – Title 12, Ch.2	MuniCode – Title 18, Ch.2	MuniCode – Title 14, Ch.5
Public Information Program/Outlet	Local Website	Local Website	Local Website
Environmental Education Program?	Local Website	Local Website	Local Website

Table 4-55b: Jurisdictional Mitigation Capabilities (cont.)

Capability	Goodlettsville	Oak Hill	Ridgetop
Comprehensive Plan	Comprehensive Land Use Plan	Zoning Ordinance	Zoning Ordinance
Land Use Plan	MuniCode – Title 14	MuniCode – Title 14	MuniCode – Title 14
Subdivision Ordinance	MuniCode – Title 14	MuniCode – Title 14	MuniCode – Title 14
Zoning Ordinance	MuniCode – Title 14	MuniCode – Title 14	MuniCode – Title 14
NFIP/FPM Ordinance	MuniCode – Title 12, Ch.2	MuniCode – Title 14, Ch.6	MuniCode – Title 14, Title 12
Floodway Buffer Ordinance	Buffer Yard	No	Waterway buffer
- Map Date	04/05/17	04/05/17	04/05/17
- Substantial Damage language?	Yes	Yes	Yes
- Certified Floodplain Manager?	No	No	No
- # of Floodprone Buildings?	56	14	0
- # of NFIP policies	138	45	2
- Maintain Elevation Certificates?	Yes	Yes	Yes
- # of Repetitive Losses?	0	0	0
CRS Rating, if applicable	N/A	N/A	N/A
Stormwater Program?	Yes	Yes	Subdivision Regs
Building Code Version	2012 IRC; 2012 IBC	2012 IRC; 2012 IBC	2012 IRC; 2012 IBC
Full-time Building Official	Yes	Yes	Yes
- Conduct "as-built" Inspections?	Yes	Yes	Yes
BCEGS Rating	Not Available	Not Available	Not Available
Local Emergency Operations Plan	Metro Nashville	Metro Nashville	Metro Nashville
Hazard Mitigation Plan	Metro Nashville	Metro Nashville	Metro Nashville
Warning System in Place?	Metro Nashville	Metro Nashville	Metro Nashville
- Storm Ready Certified?	Metro Nashville	Metro Nashville	Metro Nashville
- Weather Radio reception?	Metro Nashville	Metro Nashville	Metro Nashville
- Outdoor Warning Sirens?	Metro Nashville	Metro Nashville	Metro Nashville
- Emergency Notification (R-911)?	Metro Nashville	Metro Nashville	Metro Nashville
- Other? (e.g., cable over-ride)	Metro Nashville	Metro Nashville	Metro Nashville
GIS System?	Yes	Yes	No
- Hazard Data?	Metro Nashville	Metro Nashville	Metro Nashville
- Building footprints?	Metro Nashville	Metro Nashville	Metro Nashville
- Tied to Assessor data?	Metro Nashville	Metro Nashville	Metro Nashville
- Land-Use designations?	Metro Nashville	Metro Nashville	Metro Nashville
Structural Protection Projects	N/A	N/A	N/A
Property Owner Protection Projects	N/A	N/A	N/A
Critical Facilities Protected?	N/A	N/A	N/A
Natural Resources Inventory?	TDEC	TDEC	TDEC
Cultural Resources Inventory?	Parks&Rec Advisory Board	Local Website	Ridgetop Historical Society
Erosion Control procedures?	MuniCode – Title 18, Ch.3	MuniCode – Title 14	MuniCode – Title 14, Ch.2
Sediment Control procedures?	MuniCode – Title 18, Ch.3	MuniCode – Title 14	MuniCode – Title 14, Ch.2
Public Information Program/Outlet	Local Website	Local Website	Local Website
Environmental Education Program?	Local Website	Local Website	Local Website

Table 4-55b: Jurisdictional Mitigation Capabilities (cont.)

Capability	Tennessee State University
Comprehensive Plan	Campus Master Plan
Land Use Plan	Campus Master Plan – Sections 3.1.2 and 6.1
Subdivision Ordinance	N/A
Zoning Ordinance	Metro Nashville
NFIP/FPM Ordinance	Metro Nashville
Floodway Buffer Ordinance	Metro Nashville
- Map Date	04/05/17
- Substantial Damage language?	Metro Nashville
- Certified Floodplain Manager?	Metro Nashville
- # of Floodprone Buildings?	7
- # of NFIP policies	1
- Maintain Elevation Certificates?	Metro Nashville
- # of Repetitive Losses?	0
CRS Rating, if applicable	N/A
Stormwater Program?	Yes; Facilities Management
Building Code Version	TSU Facilities Management follows State Building Code Requirements
Full-time Building Official	Facilities Management
- Conduct "as-built" Inspections?	Yes
BCEGS Rating	Not Available
Local Emergency Operations Plan	TSU Emergency Response Plan; Campus Preparedness Guide
Hazard Mitigation Plan	Metro Nashville
Warning System in Place?	Metro Nashville
- Storm Ready Certified?	Yes
- Weather Radio reception?	Metro Nashville
- Outdoor Warning Sirens?	Yes
- Emergency Notification (R-911)?	University Mass Notification System
- Other? (e.g., cable over-ride)	Mass Email; Tiger Alerts
GIS System?	Yes
- Hazard Data?	Metro Nashville
- Building footprints?	Metro Nashville
- Tied to Assessor data?	Metro Nashville
- Land-Use designations?	Metro Nashville; Campus Master Plan
Structural Protection Projects	N/A
Property Owner Protection Projects	N/A
Critical Facilities Protected?	N/A
Natural Resources Inventory?	TDEC
Cultural Resources Inventory?	Campus Master Plan – Section 1.1
Erosion Control procedures?	Metro Nashville
Sediment Control procedures?	Metro Nashville
Public Information Program/Outlet	University Website; Campus Preparedness Guide
Environmental Education Program?	Facilities Management; Environmental Health and Safety

Explanation of Capability Assessment Matrix

Comp Plan: Comprehensive Long-Term Community Growth Plan

Land Use Plan: Designates type of Land Use desired/required – Comprised of Zoning

Subdivision Ordinance: Regulates platting, recording, infrastructure improvement

Zoning Ordinance: Dictates type of Use and Occupancy, lot sizes, density, set-backs, and construction types, Implements Land Use Plan

NFIP/FPM Ord: Floodplain Management Ordinance: Directs development in identified Flood Hazard Areas. Required for Participation in NFIP and Availability of Flood Insurance

Sub. Damage: Does your FPM Ordinance contain language on Substantial Damage/Improvements? (50% rule)

Administrator: Do you have a Floodplain Management Administrator (someone with the responsibility of enforcing the ordinance and providing ancillary services (map reading, public education on floods, etc.) ?

# of FP Bldgs: How many buildings are in the Floodplain?

# of policies? How many buildings are insured against flood through the NFIP?

# of RL's: # of Repetitive Losses: (Paid more than $1,000, twice in the past 10 years)

CRS Rating: Are you in the Community Rating System of the NFIP, and if so, what's your rating?

BCEGS: Building Code Effectiveness Grading System Rating

LEOP: Do you have a Local Emergency Operations Plan – a disaster RESPONSE plan?

HM Plan: Do you have a Hazard Mitigation Plan?

Warning: Do you have any type of system, such as: "Storm Ready" Certification from the National Weather Service; NOAA Weather Radio reception; Sirens? Cable (TV) Override? "Reverse 911"?

GIS: Geographic Information System

Structural Protection Projects: (levees, drainage facilities, detention/retention basins)

Property Protection Projects: (buy-outs, elevation of structures, flood proofing, small "residential" levees or berms/floodwalls)

Critical Facility Protection: (for example, protection of power substations, sewage lift stations, water-supply sources, the EOC, police/fire stations. medical facilities ... that are at risk ... e.g., in the floodplain)

Natural And Cultural Inventory: Do you have an inventory of resources, maps, or special regulations within the community? (wetlands and historic structures/districts, etc.)

Erosion Or Sediment Control: Do you have any projects or regulations in place?

Public Information And/Or Environmental Education Program: Do you have an ongoing program even if it's primary focus is not hazards? Examples would be "regular" flyers included in city utility billings, a website or an environmental education program for kids in conjunction with Parks & Recreation?)

Evaluation of Existing Capabilities Identified Through the Matrix

Overall, the existing policies and procedures for implementation and accomplishing mitigation are both strong and comprehensive. This analysis has highlighted some issues with the current status of the Community Rating System (CRS) that are discussed below:

- Metro fully participates in the National Flood Insurance Program, however there are approximately 11,740 structures located within the 100-year floodplain, but only 6,347 active flood insurance policies in force. Metro should continue to promote the purchase of flood insurance to all who have the potential for future flood losses.

- Currently Metro has a CRS rating of Class 8 which provides a 10% discount for all flood insurance policy holders within Davidson County. Annually the policy holders receive a cumulative savings of approximately $524,300 in insurance premiums.

- Metro cannot improve its classification in the CRS beyond Class 7 without improving its scores in the Building Code Effectiveness Grading Schedule (BCEGS). Currently Metro does not have a suitable rating for residential plan review. The CPT recommends that Metro research the benefits of implementing the required residential plan review in order to improve the rating within the CRS.

Other Existing Mitigation Capabilities within Metro

Several significant mitigation programs are either underway or already completed in Metropolitan Nashville-Davidson County that further strengthen the existing level of community protection against hazards and reduce future losses from disasters.

- Metro's cumulative Substantial Damage Ordinance is a notable effort to utilize the NFIP to minimize future damages to existing structures.

- Metro's floodplain ordinance requiring construction at the Base Flood Elevation (BFE) plus four feet is a notable effort to use the NFIP to minimize future damages to new and substantially improved structures.

- Community Emergency Response Team (CERT) training. Operated through the Nashville Office of Emergency Management, CERT Training allows citizens to manage utilities, put out small fires, search for and rescue victims safely, triage the victims, and organize themselves and spontaneous volunteers to be effective in aiding victims during times of disasters.

- American Red Cross provides shelter for disaster victims, cooling and heating shelters for victims during extreme temperatures, as well as public information brochures and presentations on multiple natural hazards.

- The Tennessee Valley Authority (TVA) and the Nashville Electric Service (NES) Emergency Load Curtailment Plan is a pre-stated contingency plan for use in the event of emergencies resulting from the shortage of power or other causes.

- NES Vegetation Management Plan. NES developed a Vegetation Management Plan in 2003 to trim trees throughout the entire service area with the goal of improving service reliability within a three year period, through the use of proper tree trimming techniques. NES has completed two complete 3 year trim cycles trimming trees along an estimated 4,500 miles of power lines. In 2009, the plan was changed from a 3 year trim cycle to a 4 year trim cycle. NES has completed two 4 year trim cycles. NES is currently in year three of its current trim cycle which is scheduled to be complete in the Spring of 2020. Upon completion of this trim cycle, we will have completely trimmed the entire system five times since 2003.

- NES has constructed a back up operations center that will allow power system monitoring and power restoration efforts to continue if their main control center is not available either from physical damage or inaccessibility. The back up operations center is constantly in stand-by mode ready to be activated. Its computer and control systems are totally independent of the systems located at the NES main building allowing completely independent operations from the back up facility. The facility can accommodate 4 system operators, 4 service dispatchers and necessary support staff.

- E-Plan, Tier II Chemical Reporting. The State of TN requires the use of the E-Plan program as the primary means for companies operating in TN to comply with Federal chemical inventory reporting requirements, per Section 312 of the Emergency Planning and Community Right-To-Know Act of 1986 (EPCRA). The Davidson County LEPC (OEM), along with the Nashville Fire Department also requires the use of E-Plan instead of submitting paper copies to each agency. The public can request information from a specific facility through the State Emergency Response Commission (SERC) at TEMA, 615-253-3157 or epcra@tnema.org, or mailed to SERC, 3041 Sidco Drive, PO Box 41502, Nashville, TN 37204.

- Critical Lots. According to the Subdivision Regulations, lots are designated critical during the preliminary plat review process based on soil conditions and degree of slope or other lot features, to address concerns related to the feasibility of construction. Reviewers emphasize that a typical house design may not be suitable for a critical lot. A critical lot usually requires a design that is specifically for that lot. Generally, a lot will be designated critical when it is created on an up-slope greater than 15 percent or a down or cross-slope greater than 20 percent grade.

  Prior to submission of an application for a building permit on a lot designated as critical, a plan shall be submitted to the Planning Commission staff for approval. The plan shall provide a survey of existing conditions and details of the proposed development on the lot. No clearing or grading may take place prior to approval of the critical lot plan and issuance of a building permit.

- Flood Hazard Barricades. There are several areas in Metro that are barricaded during heavy rainfall or flooding events to prevent residents from driving through standing flood waters. These areas include:

  Mill Creek
  - Bluff Road – from Nolensville Pike to Davidson County Line;
  - Culbertson Road – from Nolensville Pike to Old Hickory Boulevard;
  - Blue Hole Road – from Una-Antioch Pike to Tusculum Road; and
  - Una-Antioch Pike – from Reeves Road to Hickory Hollow Parkway.

    The U.S. Army Corps of Engineers, Nashville District, is currently performing a detailed hydrologic and hydraulic study of the Mill Creek watershed.

  Dry Fork Creek
  - Stewarts Ferry Pike – from South New Hope Road to Earhart Road.

  Harpeth River
  - Newsom Station Road at Highway 70 – flooding at bridge crossing;
  - Old Harding Pike – from Harpeth River Bridge to Poplar Creek Road; and
  - Coley-Davis Road – barricading only required occasionally.

  McCrory Creek
  - Elm Hill Pike - near Interstate 40 bridge. This is also adjacent to an identified repetitive loss area along McCrory Creek.

- Homeowner Direct Mailings. MWS distributes a notice to all properties located within the 100-year floodplain, which affects approximately 10,000 residents. The annual notice clearly explains that the recipient's property is subject to flooding and includes a phrase such as "your property is in or near the floodplain."

  The pamphlet presents a map of the specific residence and floodplain. The pamphlet also includes information on elevation certificates and narrative information concerning covering such topics as flood safety, flood insurance, property protection measures, floodplain development permit requirements, cumulative substantial improvement policy, drainage system maintenance, natural and beneficial functions of the floodplain, and illicit discharges.

- Metro has created an on-line program for the community called NERVE (Nashville Emergency Response Viewing Engine). This is an interactive mapping site designed to provide timely information relating to natural or man-made emergencies in Davidson County. As an emergency arises, the site will provide information about road closures, evacuation areas and/or routes, shelters and relief centers (i.e. food, water & clothing distribution centers, disaster information centers, disaster recovery centers and more). This site also includes a media tab that includes a Twitter feed from the OEM/EOC, press releases and links to other important information and agencies.

- Metro hubNashville. The hubNashville Call Center is an initiative of the Mayor's Office in collaboration with Public Works Department and Metro ITS. hubNashville is located in the Public Works Department and provides a single point of contact for all non-emergency services that can be reported by phone, in-person, electronically or by any other means of communication. During an emergency, hubNashville has the capability of taking non-emergency calls 24 hours/day, entering requests and providing information to Nashville residents and visitors. hubNashville is a comprehensive customer service system, that makes it easier for people to connect with Metro representatives in order to make service requests, ask questions, and share feedback. hubNashville is a one-stop shop currently available by phone and online, that is easy to use, and doesn't require a user to know which department they need to contact.

- Metro Nashville Public Health employs an Integrated Mosquito Management (IMM) approach in Davidson County. The components are surveillance for adult mosquitoes and West Nile Virus, inspections and management of breeding sites, public education, control of immature stages with larvicides, and control of adult populations, if and when necessary. For other pests, Metro Public Health uses similar approaches and would inspect and make informed decisions based on the results of such inspections. During emergencies, such as the May 2010 Flood, similar approaches were used, albeit on a wider scale. Good working relationships with State and Federal agencies would allow for scaling up if necessary. Metro Public Health has a written Mosquito Control/West Nile Virus plan in place.

- There is also a program called 'SAFE' (Situational Awareness for Flooding Events) that Nashville utilizes. It is a partnership between Metro Water Services, Nashville OEM, Metro Planning, US Army Corps of Engineers, the USGS and the National Weather Service. The expertise and data from each of these agencies is collectively used to monitor and predict watershed conditions. This program allows Metro to monitor actual and forecasted river stages and acquire information that can be used to dispatch resources and respond more efficiently to flood related emergencies. This information will be used to alert emergency personnel to the threat or actual danger of flooding, and not as a warning system for the general public. There are currently 25 gauges installed. This information gets mapped to a program developed by Metro Planning and displays resulting inundation areas and impacts associated with current and predicted flooding. The Nashville SAFE program is focused on the six major watersheds within Metro Nashville: Cumberland River, Harpeth River, Mill Creek, Richland Creek, Whites Creek, and Browns Creek.

- Metro Water Services Stormwater completed a Metro Stormwater Management Plan that generally provides a framework by which stormwater resources within Metro are protected.

- Metro Water Services leads the TNWARN program, which is a type of mutual aid agreement among participating water and sewer utilities across the state. Program info is available at http://www.tnwarn.org/.

- After the Flood of May 2010, there was a combined effort from the US Geological Survey (USGS), National Weather Service (NWS), Metro Water Services and Nashville OEM to install river gauges at flood prone waterways in Davidson County. Data from these gauges is made available to local authorities for action as needed. The USGS supplied the gauges and is responsible for the maintenance. Along with these gauges, there are 3 fixed post cameras, and 2 mobile cameras to monitor flood levels. The current location of the river gauges are listed below in Table 4-56 and illustrated in Figure 4-60.

Browns Creek
Glendale Lane
State Fairgrounds
Cumberland River
Old Hickory Dam
Edenwold
Stones River – Hermitage
Pennington Bend
Omohundro
Nashville
Bordeaux
Cockrill Bend
Dry Creek
Edenwold
Harpeth River
Bellevue
Mansker Creek
Millersville
Mill Creek
Nolensville
Sevenmile Creek
Antioch
Woodbine
Richland Creek
Harding Place/Belle Meade
Charlotte Ave
Stones River
Donelson
Whites Creek
Whites Creek
Bordeaux

Table 4-56: River Gauges

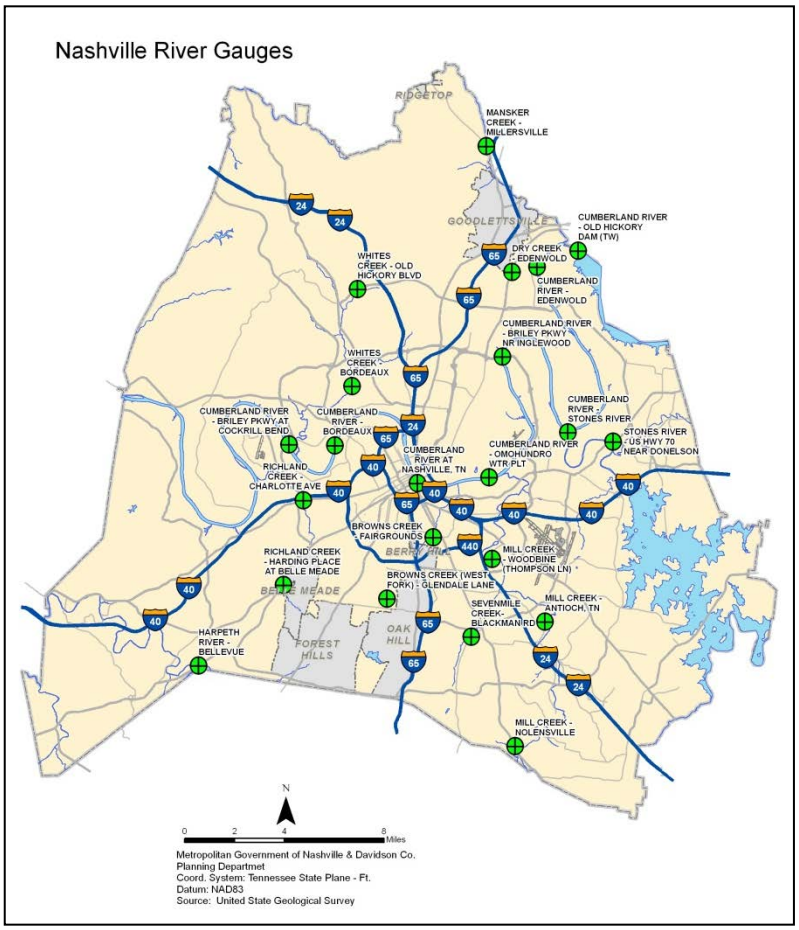

Figure 4-60: River Gauge Locations

- There are many factors during a winter storm that can dictate methods and strategy for mitigation and clearing of roadways. The temperature, wind speed, amount of precipitation, and traffic all play a vital role in establishing a successful cleanup practice. Metro Nashville Public Works uses several techniques to help mitigate the effects of winter storms on its twenty-eight primary and secondary routes.

  First is the direct application of brine onto the roads from the back of their eighteen distribution trucks, approximately twenty-four hours before the snow event takes place. This treatment applies brine directly to the roadway and assists in the prevention of ice formation and bonding to the pavement surface. The next technique used is the actual spreading of salt once accumulation has begun. To perform this application Metro Public Works uses twenty-eight route trucks and seven standby units to accommodate all mitigating factors that occur during a winter storm. This process requires traffic assistance to help activate the salt and the melting process.

  Metro Public Works has five trucks equipped with onboard wetting systems that apply brine or other liquid materials such as calcium chloride to dry rock salt as it exits the truck. The addition of this pre-wetting capability activates the salt & initiates the melting process. These units also contribute to the cleanup, with less material bouncing off of the roadways and going to our ground water supply via storm drains and inlets. These resources will assist in mitigating the effects of a winter storm on local infrastructure and the motoring public. They will also provide the department a faster and more efficient method of clearing roadways, while providing a more environmentally friendly approach to snow and ice removal.

- The Omohundro Water Treatment Plant's Electrical & Emergency Generation Project gives Metro Water Services a new level of redundancy and resiliency. This project started in May 2017, and was mostly completed in May 2019. This project included a totally new 69,000 volt to 23,900 volt electrical system for the plant that is mostly all located underground for resiliency. The backup generation system includes four Caterpillar Generators able to produce 10 megawatts of energy. This is enough power to allow Metro Water Services to produce full production of water at the treatment plant which is rated at 90 million gallons of water per day. The new generators also generate enough power to operate all of our buildings at the Omohundro South Campus which includes our State Certified Laboratory and our System Services Division and it also powers our vicinity sewer overflow system. The system is sized large enough to power our future Clean Water Nashville Omohundro South Project and our future water treatment plant as well. This project, along with the electrical project at our K.R. Harrington Water Treatment Plant, gives Metro Water Services the ability to produce and send clean treated water out to our customers totally separated from the electrical grid if needed. All major water and sewer pumping stations are backed up by generators as well.

- Emergency Watershed Protection Program (EWP). The Emergency Watershed Protection Program, a federal emergency recovery program, helps local communities recover after a natural disaster strikes. This program is administered by the US Department of Agriculture's Natural resources Conservation Service (NRCS). The program offers

technical and financial assistance to help local communities relieve imminent threats to life and property caused by floods, fires, windstorms and other natural disasters that impair a watershed. The EWP Program allows communities to quickly address serious and long-lasting damages to infrastructure and to the land. The EWP does not require a disaster declaration by federal or state officials for program assistance, but partial funding must be provided by the state legislature. Once funding is available, all funded projects must demonstrate they reduce threats to life and property; are economically, environmentally and socially sound; and be designed to acceptable engineering standard if applicable.

There are two distinct options for assistance, the EWP-Recover, and the EWP-Floodplain Easement. All EWP-Recovery projects begin with a local sponsor or legal subdivision of state or tribal government. Eligible sponsors include cities, counties, towns, conservation districts, or any federally-recognized Native American tribe or tribal organization. Interested public and private landowners can apply for EWP-Recovery assistance through one of those sponsors. EWP-Floodplain Easements eligibility is different. Privately owned lands, or lands owned by local and state governments may be eligible. One of the following must be met: lands have been damaged by flooding at least once within the previous calendar year or have been subject to flood damage at least twice within the previous 10 years; other lands within the floodplain are eligible (considering the lands would contribute to the restoration of the flood storage and flow, provide erosion control, or improve the practical management of the floodplain easement); lands that would be inundated or adversely impacted as a result of a dam breach. Landowners can apply for assistance through the EWP-Floodplain Easements option directly at a local NRCS office when project funding for floodplain easements become available. The States will have a signup period for the impacted communities and the local NRCS office will publicize the information in the affected communities.

Warning Capabilities

Warning the general population of impending danger is critical to the mission of the Office of Emergency Management, along with many other departments across the board. Metro has the responsibility to ensure everyone in our jurisdiction is properly notified when an emergency is either threatening the area, already happening, or has happened with future effects to the community at large. With this comes the obvious responsibility of ensuring our large transient population is included in our warning capabilities. Below are some of the warning capabilities that are currently in place within the Metro Nashville and Davidson County area:

- IPAWS: The Nashville Office of Emergency Management is approved and capable of sending emergency messages via the Federal IPAWS system (Integrated Public Alert and Warning System). This includes the Emergency Alert System (EAS), and the Wireless Emergency Alerts (WEA).

- MEANS: Metro Nashville and Davidson County Government recently launched its new Metro Emergency Alert and Notification System. This system has different levels. 1. It is the tool Metro would use to send out IPAWS messages. 2. It is a notification tool Metro can utilize to send out emergency messages not IPAWS criteria via different avenues

(landline phones, email, cell phones etc.), including location based notices (evacuations, shelter-in-place etc.). 3. The public can opt-in to receive different messages, including weather notifications that are automatic within the MEANS from the National Weather Service. In the future, this system may be used for other non-emergent notifications.

- NERVE: Within NERVE, the community can monitor activities happening in the area and take proper precautions.

- SAFE: Within SAFE, authorized personnel can monitor and get advanced warnings of flooding via flood gauges and properly alert emergency personnel.

- Outdoor Warning Sirens: There are 93 Outdoor Early Warning Sirens strategically placed across the county in or near public gathering places. These sirens are used primarily to warn those that may be outdoors (some people can hear them inside), that a tornado warning has been issued for parts of the county, and for the public to go indoors and take shelter and monitor the weather broadcasts. These sirens are only activated by the Nashville Office of Emergency when the National Weather Service issues the tornado warning. When a tornado warning is issued for any part of the county, all the sirens are activated, regardless of the potential tornado location. Recently there has been conversation and political push to upgrade the siren system so it can be used with the polygon system the National Weather Service uses with their warnings; and will in turn only sound for the warning area and not the entire county. The current (early 2019) siren system in place cannot produce polygon warnings; therefore, capital funding was allocated for the system to get upgraded and 20 new sirens to be installed throughout the county.

Evacuation Capabilities

There are certain situations that may require evacuations, either large or small, to take place within the county. Policy and procedures surrounding evacuations are written within the Comprehensive Emergency Management Plan (CEMP). Each agency with responsibilities in evacuations, have their own individual policy and procedures to properly carry out their duties as noted in the CEMP. Also within the CEMP, it describes what agencies need to be ready with certain pieces of equipment to help ensure safe and orderly evacuations. This includes various resources such as buses, personnel, traffic control devices etc.

Multi-Hazard Mitigation Plan
5.0 Mitigation Strategy

This Multi-Hazard Mitigation Plan was originally created in 2005. In 2009, 2012, 2014 and 2019, the CPT reviewed and agreed to continue to adopt the original goals and objectives as noted in this section

The Community Planning Team (CPT) reviewed and discussed the process of formulating mitigation goals. Each CPT member was provided with a written explanation of Goals and Objectives, the purposes they serve, and how they are developed and written. Up to this point in the planning process, the CPT has been involved in talking to agencies and organizations and collecting and recording hazard related data. From these discussions and efforts, the CPT completed all three components of the Risk Assessment:

1. Hazard Identification;
2. Vulnerability Assessment; and
3. Capability Assessment.

The first two components have painted a picture of Metro's vulnerability to natural hazards. The CPT learned that:

1. Stream system and neighborhood flooding continues to be a significant threat to the community;
2. Geological hazards including landslides and sinkholes are a moderate threat;
3. Earthquakes pose a potential threat; and
4. Most meteorological and natural biological hazards occur periodically: drought, extreme temperatures, infestations, severe thunderstorms/high wind, tornadoes, and severe winter storms.

The third component, Capability Assessment, described the current ability of Metro to counter the identified threats through existing policies, regulations, programs, and procedures. Here, the CPT learned that:

1. Flood insurance is available for all parts of Davidson County. Currently (5/31/2019), 6,309 policies are in effect, and there are 9,588 building footprints located in the floodplain/floodway, which is 66 percent of buildings covered in the SFHA;
2. Metro's Floodplain Management Plan for Repetitive Loss Areas, has been incorporated into this document.
3. Various other Stormwater regulations have been enacted since 2010 as outlined in previous updates to include Metro Stormwater Manual revisions in 2013, 2014 and 2016 with another revision slated for late 2019. These various revisions advance overall Stormwater Management Program objectives and activities. Additionally, in July of 2018, Ordinance BL2018-1157 was approved/signed into law. It serves to

modify §15.64.175 of the Metro Stormwater Code to no longer allow new residential structures to be built within the 50 foot Cumberland River floodway buffer. Regarding specific Metro Low Impact Development (LID) policy, over 480 development sites have been built utilizing LID Stormwater practices since that design standard was adopted in 2012. These practices have reduced by several hundred million gallons per year the runoff that would have otherwise resulted from these respective development projects.

4. MWS has prioritized Capital Improvement Projects as outlined in the multiple Stormwater Basin Plans;
5. MWS has prioritized watersheds throughout the County for preparing/updating Basin Plans;
6. The IRC Building Codes contain seismic and design wind elements;
7. Residential plan reviews are performed on complex designs;
8. Flood warning capabilities and stream gauging, has been enhanced since the May 2010 flood event;
9. OEM has 93 Outdoor Early Warning sirens throughout the community. This siren program was last updated in 2012 with an upgraded and additional sirens added to the footprint. Starting in 2019, another upgrade will start with an additional 20 sirens;
10. Public information is made available to inform residents about the risks of hazards (earthquakes, floods, and tornadoes, predominantly) and appropriate risk reduction actions that they can undertake. Social media outlets are also utilized along with Metro Government websites; and
11. Metro does not support flood protection and retrofitting as standard solutions for residential flooding problems. Metro's voluntary home buyout program is focused on removing at risk structures from the floodway and floodplain and restoring the property to open space.

GOAL SETTING

The analysis of the three components of the Risk Assessment identified areas where mitigation improvements could be made, providing the framework for the CPT to formulate planning goals. Each CPT member was provided an alphabetized list of possible goal statements. In addition, each CPT member also received a list of goals from other community plans that have had public input and review and have already been formally adopted by Metro. This information was provided to CPT to ensure that the Mitigation Planning Goals would be in concert, not in conflict, with other existing community priorities. CPT members then each received three index cards and were asked to write what they felt would be appropriate goals for this plan using the information provided as a guide.

The CPT members were instructed that they could use, combine or revise the statements provided, or develop new ones. The goal statements were then attached to the meeting-room wall, grouped into similar topics, combined, rewritten, and agreed upon.

Some of the statements were determined to be better suited as objectives or actual mitigation projects, and were set aside for later use. Based upon the planning data review, and the process described above, the CPT developed the final goal statements listed below. None of the final goal statements are the same as those provided on the alphabetized list. The goals and objectives provide the direction for reducing future hazard-related losses in Metropolitan Nashville - Davidson County.

GOAL #1: **Reduce exposure to hazard related losses for existing and future development.**

Objective 1.1: *Strengthen the existing flood hazard mitigation program.*

Objective 1.2: *Protect critical facilities, utilities, and infrastructure.*

Objective 1.3: *Improve the coordination of severe weather mitigation actions.*

Objective1.4: *Develop a coordinated set of mitigation actions that address geological hazards (earthquakes, sinkholes, and landslides).*

GOAL #2: **Promote awareness of hazards and vulnerability among citizens, business, industry and government.**

Objective 2.1: *Develop a seasonal multi-hazard public education campaign to be implemented annually.*

GOAL #3: Maximize use of available funding.

Objective 3.1: Identify multiple objective opportunities that can be used to support mitigation activities.

Objective 3.2: Identify and analyze project cost share options.

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Objective 3.3: Submit mitigation project applications annually at a minimum.

IDENTIFICATION OF MITIGATION MEASURES

This Multi-Hazard Mitigation Plan was originally created in 2005. In 2009, 2012, 2014 & 2019, the CPT reviewed and agreed to continue to adopt the original mitigation measures and recommended actions as noted in this section, with slight edits and updates as noted. During the 2019 revisions, no changes in priorities were made.

Following the goal setting meeting, the CPT conducted a brainstorming session to generate a set of viable alternatives that would support the selected goals. Each CPT member was provided with the following list of categories of mitigation measures:

- Prevention;
- Property Protection;
- Structural Projects;
- Natural Resource Protection;
- Emergency Services;
- Public Information.

Potential mitigation measures within each of the six categories were presented to the CPT. (see Appendix A). A facilitated discussion examined and analyzed the alternatives. Then, with an understanding of the alternatives, the CPT generated a list of preferred mitigation actions to be recommended. Similar to the goal-setting activity, the CPT included all previously recommended mitigation actions from existing Metro mitigation plans in its review. This process reinforced Metro's use of the Multi-Hazard Mitigation Plan as an umbrella document for all exiting mitigation plans mentioned in Section 3. Thus, this plan puts forth existing recommendations that are still to be implemented in addition to the new recommendations that resulted from the CPT's detailed Risk Assessment process. This plan serves as an update to the existing mitigation plans by identifying the recommendations from previous plans that have already been implemented and by reprioritizing those that remain.

Once the old and new mitigation actions were identified, the CPT members were provided with decision-making criteria to prioritize the recommended actions. FEMA's recommended "STAPLE/E" criteria set (social, technical, administrative, political, legal, economic, and environmental criteria) was utilized in order to help decide why one recommended action might be more important, more effective, or more likely to be implemented than another.

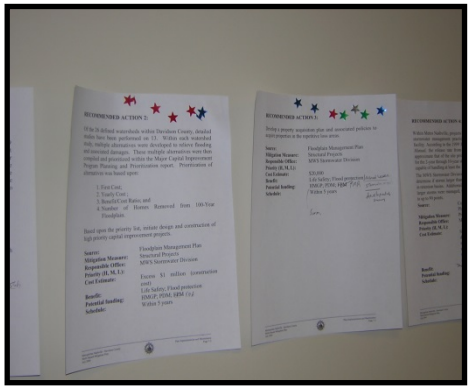

Figure 5.1 Priority "Stars"

With these tools, the CPT then undertook an exercise to prioritize the recommended mitigation measures. CPT members were provided with colored "stars": three red, three blue, and three green. Each color represented either high, medium, or low priority with regard to the importance, and each color was assigned a corresponding value (high = 5 points, medium = 3 points, and low = 1 point).

CPT members then voted for their preferred mitigation measures by placing their "stars" on specific mitigation measures. Team members were allowed to place as many as they wished of any or all colors on any one recommendation or to spread the stars among multiple mitigation actions. They were allowed to trade "stars", or otherwise negotiate with any other Team member, and they did not have to use all of their "stars" if they did not wish to do so. This process provided both consensus and priority for the CPT recommendations.

THE MITIGATION STRATEGY

The results of the planning process, the Risk Assessment, the Goal Setting, the Identification of Mitigation Measures, and the hard work of the CPT led to the Action Plan presented herein. It also helped the CPT clearly comprehend and identify the overall mitigation strategy that will lead to the implementation of the Action Plan.

All of the recommendations set forth fall into four easily identifiable strategies:

1. ENFORCE existing rules, regulations, policies and procedures. Communities can reduce future losses not only by pursuing new programs and projects, but also by paying closer attention to what's already "on the books."

2. EDUCATE the community on the hazard information that Metro has collected and analyzed through this planning process so that the community understands what disasters can happen, where disasters might occur, and what they can do to prepare themselves better. As part of public education, publicize the "success stories" that are achieved through the CPT's ongoing efforts.

3. IMPLEMENT the Action Plan, much of which is comprised of reiterating recommendations that have previously been made as a result of existing community plans.

4. MOM --- ardently monitor "Multi-Objective Management" opportunities, so that funding opportunities may be shared and "packaged" and broader constituent support may be garnered.

ACTION PLAN

The Action Plan presents the prioritized recommendations for Metro to pursue in order to lessen the vulnerability of people, property, infrastructure, and natural and cultural resources to future disaster losses. The recommendations are presented in order of priority to the community both in terms of need and effectiveness. The recommendations are also listed under the corresponding developed goal. Each recommendation includes a cost estimate and community benefit to meet the regulatory requirements of DMA. Action items that have already been completed or that were not recommended are included at the end of this section.

Below is a summary of all the action items and the responsible agencies. Detailed information for each action item is following in this section.

Table 5-1: Mitigation Action Plan Summary

Action #	NASHVILLE/DAVIDSON COUNTY HAZARD MITIGATION ACTION PLANS SUMMARY	Responsible Agency
1-1	Based upon the Storm Water Capital Improvement Plan, the CPT recommends that Metro initiate design and construction of high priority capital improvement projects.	MWS
1-2	The CPT recommends that ordinance language to provide added protection for critical facilities and prohibit hazardous materials and public health hazards from the floodplain is drafted, circulated for review and adopted.	MWS, Planning, Codes
1-3	The Nashville Office of Emergency Management (OEM) should review the costs and benefits of preparing a detailed flood response plan that identifies specific actions to take at different flood level predictions.	OEM
1-4	The studies underway in the approximate A Zones should be completed and adopted into Metro's floodplain regulations. The studies should then be submitted to FEMA with a request to revise the FIRM.	MWS
1-5	Develop a property acquisition plan and associated policies to acquire properties in the repetitive loss areas.	MWS
1-6	Fund, acquire, and install appropriate hardware and software.	OEM
1-7	The MWS Stormwater Division should review the costs and benefits of formalizing Metro's inspection and maintenance program to include detention facilities as well as streams and ditches.	MWS
1-8	It is recommended that the definition of a critical lot be expanded to include specific geological details and defined subjectively during plat review and that the critical lot concept be used in review of other developments.	MWS, Planning, Codes
1-9	MWS Drainage Maintenance staff should make site visits in response to complaints or inquiries from property owners. Staff should be trained in retrofitting techniques and be comfortable providing retrofitting guidance during site visits.	MWS
1-11	It is recommended that Metro personnel participate in training in the use of the RSDE program.	MWS
1-12	The CPT recommends assisting the City of Goodlettsville with the FEMA repetitive loss buyout program and associated flood mitigation initiatives.	MWS, OEM
1-13	The CPT recommends assisting local colleges and universities in obtaining outdoor early warning sirens through grant funding and connecting them to the city's existing early warning siren systems.	OEM
1-14	The satellite city of Oak Hill (located within Davidson County, TN) is aware of	City of Oak Hill

	certain areas in their jurisdiction that have historically experienced flooding during significant rain events. In an effort to address these and any other such issues that may exist, Oak Hill has initiated a 3 Phase Drainage Study/Correction Plan (see below). It is recommended to include this project from The City of Oak Hill in this Multi-Hazard Mitigation Plan as it mirrors actions with Metro Water Services, and applies to the over goal.	
1-15	Based upon Metro Water's critical water asset list, the CPT recommends that Metro initiate design and construction of high priority capital improvement projects.	MWS
1-16	The Clean Water Nashville Overflow Abatement Program (CWNOAP) Design Management Manual (Section 2.6.1) stipulates that all plan projects abide by the following flood elevation considerations.	MWS
1-17	NES has planned the construction of a joint Training and Operation Center in the northern part of the service territory to be located on Myatt Drive.	NES
1-18	In restoring MWS' water and sewer facilities from 2010 Flood impacts, site-specific flood risk mitigation was employed as possible/feasible in bringing facilities back on line. Further, it has been MWS's practice since the May 2010 flood to incorporate flood mitigation into capital projects planned for the facilities that were impacted by the flood. Since the flood, the designs were modified to elevate the facilities above the flood of record to minimize the potential impacts of future floods.	MWS
1-19	Evaluate regulatory standards, infrastructure needs, and/or funding strategies to improve stormwater runoff and local flooding in rapidly redeveloping areas.	Codes, Planning, MWS
1-20	Create a central depository of geological events within Metro, to include landslides and sink holes within the county.	Planning, Codes, MWS, OEM, PW
1-22	The CPT recommends evaluating and creating a process/strategy to advance the Nashville-Davidson County CRS rating to at least a 6, which would give the community a 20% discount on flood insurance.	MWS, Codes
2-1	Develop and conduct a multi-hazard, seasonal Public Awareness Program that provides citizens and businesses with accurate information describing the risk and vulnerability to natural hazards, and is implemented on an annual basis.	OEM, MWS
2-2	Metro Water Services should request the state NFIP Coordinator to conduct Agent and Lender Workshops in support of the community's overall NFIP program efforts.	MWS
2-3	MWS currently sends an annual mailing to the approximate 10,000 properties located within the 100-year floodplain. It is recommended that MWS Stormwater Division continue the mailing and that the mailing be modified to include other natural hazards of concern that have been identified through the hazard mitigation planning process.	MWS
3-4	Develop a financial strategy to design and construct large capital improvement projects. The strategy shall incorporate a cost-sharing plan to leverage local, state, and federal funding for stormwater management activities and projects.	MWS
3-5	The CPT recommends applying annually for potentially available HMGP and FMA grants.	MWS, OEM

GOAL #1:	**Reduce exposure to hazard related losses for existing and future development.**
Objective 1.1:	*Strengthen the existing flood hazard mitigation program.*
Objective 1.2:	*Protect critical facilities, utilities, and infrastructure.*
Objective 1.3:	*Improve the coordination of severe weather mitigation actions.*
Objective 1.4:	*Develop a coordinated set of mitigation actions that address geological hazards (earthquakes, sinkholes, and landslides).*

RECOMMENDED ACTION 1-1:

Of the 26 defined watersheds within Davidson County, detailed basin studies have been performed on 13. Within each basin study, multiple alternatives were developed to relieve flooding and associated damages. These multiple alternatives were then compiled and prioritized within the Major Capital Improvement Program Planning and Prioritization report. Prioritization of alternatives was based upon:

1. First Cost;
2. Yearly Cost;
3. Benefit/Cost Ratio; and
4. Number of Homes Removed from 100-Year Floodplain.

Based upon the Storm Water Capital Improvement Plan, the CPT recommends that Metro initiate design and construction of high priority capital improvement projects.

Source:	Floodplain Management Plan
Mitigation Category:	Structural Projects
Responsible Office:	MWS
Priority (H, M, L):	High
Cost Estimate:	Excess $1 million (construction cost)
Community Benefit:	Life Safety; Flood protection
Potential funding:	HMGP; PDM; FMA
Schedule:	Within 5 years

2009 Update: *Since the creation of this plan in 2005, Metro has initiated a new Stormwater fee where as of July 1, 2009, Stormwater has a dedicated funding source. With this funding, the plan is to continue the home buyout program at $1M/year, plus construct $12M/year in drainage improvements. Stormwater has a master project list that is being constantly updated as new stormwater projects are identified. This list will be ranked and will be used as the plan for making capital improvements to the stormwater system.*

2017 Update: *July 2017 stormwater fees increased, so projects are continuing.*

2018 Update:

For FY18: Total Capital Projects: $10,873,172.51; Class "C" Projects: $3,077,104.84; Metro Water Grate Replacement: $350,000; Tree Surround Grate Replacement: $6,000; USIC Locating Services: $156,360; Metro Center Levee Grass Maintenance: $96,306.88; Total Street Sweeping: $955,460; Grand Total of all Stormwater Projects FY18: 15,514,404.23

For FY17: Total Capital Projects: $1,295,470.55; Class "C" Projects: $1,113,779.54; Metro Water Grate Replacement: $450,000; Metro Center Levee Grass Maintenance: $45,945.50; Total Street Sweeping: $929.762.52; Grand Total of all Stormwater Projects: $3,834,958.11

For FY16: Total Capital Projects: $10,903,784.59; Class "C" Projects: $710,881.16; Metro Water Grate Replacement: $477,260.40; Total Street Sweeping: $707,749.97; Grand Total of all Stormwater Projects: $12,799,676.12

For FY15: Total Capital Projects: 16,560,022.55 + Murfreesboro Pike Stormwater Improvement: $1,000,000; Class "C" Projects: $741.774; Metro Water Grate Replacement: $300,000; Emergency Pipe Cleaning: $29,800; Total Street Sweeping: $786,254.47; Grand Total of all Stormwater Projects: $19,417,851.02

For FY14: Total Capital Projects: $3,857,349.68; Class "C" Projects: $837,869.23; Total Street Sweeping: $818,638.08; Grand Total of all Stormwater Projects: $5,513,856.99 (MWS)

2019 Update: *The Capital Budget has been increased for FY2020. Funding for Class 'C' Projects is $4M, Street Sweeping budget is $1.4M. (MWS)*

RECOMMENDED ACTION 1-2:

Communities often prohibit critical facilities or hazardous uses from the floodway or the entire floodplain. While a building may be considered protected from the 100-year flood, a higher flood or an error on the builder's or operator's part could result in a greater risk than the community is willing to accept. If a critical facility must be located in a floodplain, then it should be designed to stringent protection standards and have flood evacuation plans. Metro does not currently have any special provisions for critical facilities.

The CPT recommends that ordinance language to provide added protection for critical facilities and prohibit hazardous materials and public health hazards from the floodplain is drafted, circulated for review and adopted.

Source:	Community Rating System Action Plan
Mitigation Category:	Prevention
Responsible Office:	MWS; Metro Planning; Metro Codes
Priority (H, M, L):	High
Cost Estimate:	Staff Time; Five to ten days of staff time to get the regulation adopted. Enforcing the new standard would be part of ongoing permit enforcement work.
Community Benefit:	Critical facility protection
Potential funding:	Existing Budget

Schedule: Within 2 years

2009 Update: *A flood response plan was completed in 2009 for Mill creek. OEM will continue to work on more flood response plans in coordination with MWS and NWS.*

2012 Update: *In response to and per situations evidenced during the May 2010 flood event, Metro Water Services is systematically evaluating key infrastructure locations and making certain retrofits to address flooding impact potentials so as to eliminate or minimize operational disruptions during future "flood of record" flood events.*

2014 Update: *Metro Council passed an ordinance that prohibits the construction of new structures within the floodway.*

2018 Update: *Metro Water has begun the process to revise and update the current Stormwater Management Manuals Volume 1 (Regulations) and Volume 5 (LID Manual). Volume 1, Chapter 5 - Floodplain Requirements will be included in this update process and address critical facilities. MWS states that this needs to be more coordinated with Codes. (MWS)*

2019 Update: *The process to update the Stormwater Management Manual is ongoing. Also, Metro Water Services is currently considering "Flood Design Class" provisions outlined in the FEMA ASCE 24-14 Flood Resistant Design and Construction standard, which relates to "critical facility" minimum elevation and/or floodproofing measures for potential inclusion in Metro Stormwater requirements. (MWS)*

The Department of Codes and Building Safety, through the Cityworks permitting system, are now tracking all new construction permits to Metro Water Services for review of Stormwater Grading, and Floodplain issues prior to issuance. Upon review by MWS, they have the option to add any additional reviews felt necessary including a final approval prior to final use and occupancy being approved.(Codes)

RECOMMENDED ACTION 1-3:

A community flood response plan must specify steps to be implemented when a flood warning is issued, such as when and which streets to close, when to order an evacuation, when and what equipment should be moved to high ground, etc.

The Nashville Office of Emergency Management (OEM) should review the costs and benefits of preparing a detailed flood response plan that identifies specific actions to take at different flood level predictions.

Source:	Community Rating System Action Plan
Mitigation Category:	Emergency Services
Responsible Office:	OEM
Priority (H, M, L):	High
Cost Estimate:	$25,000 or less

Community Benefit:	Effective, coordinated response, reducing losses, eliminating gaps and duplications in response activities
Potential funding:	FMA, HMGP, Existing Budget
Schedule:	Within 3 years

2009 Update: *A flood response plan was completed in 2009 for Mill creek. OEM will continue to work on more flood response plans in coordination with MWS and NWS.*

2014 Update: *Wolf Creek Dam failure plans were created in January 2008 for three different levels: Red Level: Lake Level 680 ft. (Minor to Moderate Flooding), Blue Level: Lake Level 715 ft. (Moderate Flooding), and Green Level: Lake Level 751 ft. (Major Flooding). These plans were utilized for the May 2010 flood, even though the flood wasn't from Wolf Creek Dam. Will evaluate the need for a community flood plan apart of these plans, or if they would do the same deeds.*

2018 Update: *With the ongoing development and implementation of Nashville's Situational Awareness of Flood Events (SAFE) and Nashville Emergency Response Viewing Engine (NERVE) programs, the CPT is in the process of reviewing an individual plan including these programs. Once the individual plan is created, the CPT will pursue formal community adoption by Metro Council. (OEM/MWS)*

2019 Update: *Nashville's SAFE program already serves the purpose of identifying action levels and identifying locations that may be in harm's way when flooding conditions may be imminent. MWS's Watershed Advisors are trained in SAFE on a regular basis and are present in the EOC when flooding is the situation at hand. OEM and MWS agree that due to the current SAFE programs capabilities, a separate flood response plan is not necessitated. Instead, OEM and MWS will create a multi-agency Flood Response Standard Operating Procedure which will outline who, what and when with flood responses before or during EOC activations. (OEM)*

RECOMMENDED ACTION 1-4:

Updated Description (2019): In the previously effective (2001) Flood Insurance Rate maps there were 95 miles of approximate "A" zones, or Special Flood Hazard Areas for which there were no designated base flood elevations. All of these areas have now been studied and many of these segments (stream segments, modelled in Phases 2, 3, 4A and 4AA) have been adopted and are included as a part of the FEMA effective maps (2012 – 2016. An additional 91 miles (Phases 4B, 4C and 4D) have been modeled and submitted to FEMA to start public review in the Fall of 2019.

There is an additional group of new streams (Phase 6) that has now been modeled by the US Army Corps of Engineers that have never been identified on FEMA maps, even as approximate SFHA Zones. These streams represent drainage basins of one square mile or greater, that are subject to development pressure. Following Metro reviews, the Phase 6 streams will be submitted to FEMA for inclusion in future FIRM map updates.

It should be noted that all modelled stream segments are accessible to Metro Development Services staff for use in project direction, as "best available data."

Original Action Description:
Metro Nashville's Special Flood Hazard Areas include 107.9 river miles of approximate A Zones, where FEMA did not provide base flood elevations. Most of these areas are slated for studies that will provide flood elevations and floodways.

The studies underway in the approximate A Zones should be completed and adopted into Metro's floodplain regulations. The studies should then be submitted to FEMA with a request to revise the FIRM.

Source:	Community Rating System Action Plan
Mitigation Category:	Prevention
Responsible Office:	MWS
Priority (H, M, L):	Medium
Cost Estimate:	Approximately $1,500 per river mile of each approximate A Zone
Community Benefit:	Life Safety; Regulating development to a defined flood elevation
Potential funding:	CTP; HGMP; PDM; USACE
Schedule:	Within 5 years

2009 Update: *MWS has a meeting scheduled in October 2009 with the State NFIP Coordinator and FEMA's contractor to perform a needs assessment on streams in Davidson County that are in need of a restudy. Converting the un-numbered "A" zones to detailed studies will be on the needs list.*

2014 Update: *The 2001 FIRM includes 95 miles of Zone A streams. A total of 42 miles of these streams have been replaced with detailed studies on the current preliminary FIRM dated November 22, 2013. The remaining 53 miles of Zone A streams are scheduled to be updated with detailed models under a currently funded contract.*

2018 Update: *Working to complete the last few stream studies to eliminate the remaining un-numbered "A" zones in Davidson County. (MWS)*

2019 Update: *The US Army Corps of Engineers has completed the modeling on the last remaining un-numbered "A" zones. An additional group of streams (Phase 6) has been modeled and will be incorporated into effective FIRM maps during the coming year. (MWS)*

RECOMMENDED ACTION 1-5:

Develop a property acquisition plan and associated policies to acquire properties in the repetitive loss areas.

Source:	Floodplain Management Plan

Mitigation Category:	Property Protection
Responsible Office:	MWS
Priority (H, M, L):	Medium
Cost Estimate:	$20,000
Community Benefit:	Life Safety; Flood protection; Reduced losses; Development of greenway; stormwater management
Potential funding:	HMGP; PDM; FMA
Schedule:	Within 5 years

2009 Update: *MWS is in the final stages of developing an acquisition plan for floodplain properties.*

2014 Update: *Immediately following the May 2010 flood, MWS Stormwater finalized an acquisition plan that included 305 structures. The plan was implemented as a voluntary buyout program that resulted in the removal of 225 homes from the floodplain. MWS Stormwater continues to revise and update the acquisition plan.*

2017 Update: *Will always be on-going as repetitive loss is a high priority. Recently submitted applications for 9 properties to TEMA for funding.*

2018 Update: *Metro Water Services recently submitted applications to FEMA for home buyout projects through the federal grant programs. These projects focus on repetitive loss properties as identified by FEMA. MWS has also partnered with the US Army Corps of Engineers (COE) on a home buyout project in Mill Creek. Offers will be made to the first homeowners in this project by the end of this calendar year. Other projects have been identified by the COE in Sevenmile Creek, Richland Creek, Whites Creek, and Browns Creek. MWS is working to complete a $5M home buyout project funded 100% by MWS funds.(MWS)*

2019 Update: *The home buyout program continues. The COE identified 44 homes on Mill Creek and 45 homes on Sevenmile Creek to be purchased and demolished. To date we have purchased 4 homes on Mill Creek. We have conducted 2 public meetings on Mill Creek and one for Sevenmile Creek. Purchase of homes on Sevenmile Creek will begin soon. MWS has made application to FEMA for additional homes through various grants (MWS).*

RECOMMENDED ACTION 1-6:

OEM monitors and updates a software program through TEMA (E-Plan) that companies provide contact information and the geographical location of the following facilities within the Metro area: Title III facilities, critical facilities, and service facilities such as Metro ECC, Metro Fire Stations, NES, MWS facilities, Metro Police precinct stations, hospitals, nursing homes, schools, and daycares.

WebEOC is a software program with required associated hardware, LCD Panels and projectors. WebEOC will provide emergency management checklists during EOC activation. It will also provide real time multi-media with plotted incident sites and damage / impact areas based on Computer Aided Dispatch (CAD) data and field reports.

Fund, acquire, and install appropriate hardware and software.

Source:	OEM Local Hazard Mitigation Plan
Mitigation Category:	Emergency Services
Responsible Office:	OEM
Priority (H, M, L):	Medium
Cost Estimate:	Approximately $25,000
Community Benefit:	Modeling would allow fit-gap analysis to determine optimum solutions; maximize efficiency in response and recovery activities; forecast and prioritize problem areas
Potential funding:	Public-Private partnerships
Schedule:	Within 2 years

2009 Update: *OEM has purchased and is actively utilizing WebEOC within the local Emergency Operations Center.*

2012 Update: *OEM is moving to utilize LEO, a free on-line FBI program, in place of WebEOC. WebEOC will continue to be updated and kept as a back-up to the LEO program. OEM does not utilize E-Stat anymore. P-1 is the newest computed aided dispatch and has common places noted for dispatch information. TEMA has an online E-Plan program that companies submit electronically. Companies can also scan a copy and send it directly to OEM. (OEM)*

2014 Update: *OEM has changed from WebEOC to on-line LEO/LEEP, the free on-line secured FBI sponsored program. (OEM)*

2018 Update: *OEM and all assigned Emergency Service Coordinators (ESC) are still utilizing the free program LEEP within the FBI. (OEM)*
Per a request from OEM, Metro Water recently paid for the cameras to have night vision added to the river cameras. OEM will investigate the current river cameras remaining life span and potentially investigate the need to replace. (MWS/OEM)
OEM suggests revisiting this action to either close due to the current systems in place, and/or revise/add a new action item for more general hardware and software purchases for improving/maintaining situational awareness. (OEM)

2019 Update: *OEM and ESC's are still utilizing the free LEEP program within the FBI. OEM recommended keeping this action item open to continue to improve technology for information sharing and continue to look for programs etc. to improve on the EOC's effectiveness and efficiency. (OEM)*

RECOMMENDED ACTION 1-7:

The MWS Stormwater Division's drainage maintenance section currently removes debris and obstructions in response to complaints and reports of problems. Although staff is increasing,

there are not enough people to inspect the entire drainage system once a year. There is also no written set of procedures.

The MWS Stormwater Division should review the costs and benefits of formalizing Metro's inspection and maintenance program to include detention facilities as well as streams and ditches.

Source:	Community Rating System Action Plan
Mitigation Category:	Structural Projects
Responsible Office:	MWS
Priority (H, M, L):	Medium
Cost Estimate:	The entire drainage system would need to be mapped, streams and basins deserving of annual inspections and maintenance would need to be identified, and procedures would need to be written and approved. The total cost of removing small obstructions found by more frequent inspections before causing a problem would be less than removing large obstructions later. Five (5) days of staff time.
Community Benefit:	Life Safety; Property Protection; Pro-active approach to flood mitigation; FEMA eligibility
Potential funding:	Existing Budget
Schedule:	Within 5 years

2009 Update: *MWS's inspection program does include detention ponds and water quality devices. MWS has initiated an inspection program for these facilities and devices.*

2014 Update: *MWS Stormwater inspection program includes inspecting a representative sample of stormwater control measures annually (approximately 10% of total sites) to gauge private owner-maintenance of these measures. This reflects what is feasible with current staffing. MWS has initiated a proactive education effort to inform new owners of the maintenance required by control measures on their properties. Inspection reports generated by this outreach (submitted by property owners) has broadened MWS' ability to gain information about functionality of stormwater control measures without physically inspecting each site – while promoting overall better maintenance of facilities and devices.*

2015 Update: *Updating and consolidating records.*

2016 Update: *Pilot project has already started in 2016.*

2017 Update: *Since Metro started requiring stormwater management controls to mitigate the impact of development on flooding and water quality, there have been approximately 4,400 structures installed throughout Metro Nashville's jurisdiction. As such, these controls require property owners to perform routine inspection and maintenance activities, so that they will be functioning as they were designed. The Permit Group is responsible for ensuring that the necessary inspection and maintenance is performed by the property owners on all*

SCMs installed per Metro's stormwater management regulations, including public and privately-owned structures. One potential education effort includes requiring future developments to install permanent public education signs at certain SCM structures. As an effort to test installation, durability, and effectiveness of the signs, NPDES recently partnered with General Services to post SCM signs at the Metro Office Building. NPDES also took the opportunity to label storm drains in that area as "Draining to the River" so that visitors and Metro employees know that storm drains are not trash receptacles and certainly not ash trays.

The NPDES Permit Group is currently in the process of developing and administering program to verify public and private properties with Stormwater Control Measures (SCMs) are being inspected and maintained as defined in the Maintenance Agreement filed with the Register of Deeds. Some of the activities that will be performed by the Permit Group include the following:

1. *Coordinate the development and continuous updating of a database used for tracking inspection and follow-up coordination on sites regarding maintenance of SCMs.*
2. *Inspect and coordinate with property owners on inspection and maintenance needs for SCM structures (Inspect at least 20% a year).*
3. *Oversee department compliance with SCM Inspection and Maintenance MOUs.*
4. *File/input into database inspection and maintenance reporting documents.*
5. *Coordinate feedback to the Development Services Division on maintenance compliance on different types of SCMs.*
6. *Perform various educational activities to make owners of the SCM structures much more aware of the inspection and maintenance responsibilities.*

***2018 Update:** M. Hunt stated this has moved into the implementation phase. For FY17, estimated 204 detention pond inspections and in FY18 estimated 841. (It is estimated that 70% of Stormwater Control Measures/SCM inspections were detention ponds) (MWS)*

***2019 Update:** Metro Water Services Stormwater has now fully implemented a Stormwater Control Measures (SCMs) inspection and monitoring program to ensure SCMs – to include detention ponds – are being inspected and maintained by parcel owners. 5,000+ SCMs are currently in place within Metro Nashville with that number currently growing by approximately 400 SCMs per year. Metro Stormwater staff inspected over 2,700 SCMs in fiscal year 2019 and over 8,600 SCMs since fiscal year 2014. This inspection program has led to numerous SCMs in need of maintenance being maintained/made functional again. Additionally, Metro Stormwater Maintenance Staff continue to investigate stormwater drainage concerns (almost 1,700 in fiscal year 2019). Maintenance crews also proactively maintenance between 30 to 40 chronically-problematic drainage locations prior to rain events as these locations are prone to flooding during certain rain events. Stormwater crews also routinely inspect and, if needed, maintenance and clear the Dry Creek Weir flood protection structure to allow it to fully function during significant rain events. (MWS)*

RECOMMENDED ACTION 1-8:

The CPT determined that geological hazards were adequately prevented in subdivision development through the designation of critical lots. Lots are designated critical during the

preliminary plat review process based on soil conditions, degree of slope or other lot features, and to address concerns relating to the feasibility of construction. In order to determine the best method for addressing geological hazards, it is recommended that geological hazard ordinances from communities similar to Metro be identified, collected, and reviewed as part of the process of modifying the critical lot concept. However, outside of subdivision development, the critical lot concept is not utilized.

It is recommended that the definition of a critical lot be expanded to include specific geological details and defined subjectively during plat review and that the critical lot concept be used in review of other developments.

Source:	Community Planning Team
Mitigation Category:	Prevention
Responsible Office:	MWS; Metro Codes, Metro Planning
Priority (H, M, L):	Medium
Cost Estimate:	Staff Time
Community Benefit:	Life Safety
Potential funding:	Existing Budget
Schedule:	Within 3 years

2009 Update: *This will be re-addressed to create procedures for Metro Codes in regards to what gets flagged as critical lots with all parties, and to consolidate with what is flagged with Stormwater Division.*

2016 Update: *Planning states that Subdivision Regulations state that Planning shall look at Slope, Soils and floodplain, and they may look at geological features also.*

2019 Update: *Starting in late 2019, early 2020, a group will convene with personnel from Metro Codes, Metro Planning, Metro Water and OEM to look at the larger picture to determining if this warrants pursuing wider critical lot oversight, and if so, how can this be achieved Metro wide. Currently, Planning does not have the ability to flag critical lots if they are existing, only new plats. Regulations will need to be discussed as well as processes and procedures for all critical lots, not just subdivisions. The team should consist of Latisha Birkeland/Planning, Steve Mishu and/or Eli Anderson from Metro Water, Emily Lamb and John Michael from Metro Codes, and OEM to assist with coordination and to ensure this action item stays on track.*

RECOMMENDED ACTION 1-9:

MWS Drainage Maintenance staff should make site visits in response to complaints or inquiries from property owners. Staff should be trained in retrofitting techniques and be comfortable providing retrofitting guidance during site visits.

Source:	Community Rating System Action Plan
Mitigation Category:	Property Protection
Responsible Office:	MWS

Priority (H, M, L):	Medium
Cost Estimate:	$5,000 for 2-day on-site course for staff
Community Benefit:	Reduce losses, complaints, and staff time in responding to complaints
Potential funding:	Existing Budget; TEMA
Schedule:	Within 2 years

2009 Update: *MWS Stormwater staff responds to inquiries concerning flooding complaints. MWS refers the property owner to available FEMA publications on flood proofing and property protection methods.*

2014 Update: *MWS Stormwater continues to investigate stormwater related requests for service and meets with property owners on site upon request.*

2018 Update: *MWS is investigating more formalized training.*

2019 Update: *MWS drainage maintenance staff still makes site visits in response to concerns from property owners. MWS staff refers property owners to FEMA websites or publications for retrofitting information, if interested.(MWS)*

RECOMMENDED ACTION 1-11:

Communities that participate in the National Flood Insurance Program (NFIP) often have difficulty determining whether structures meet the NFIP definition of being substantially damaged. This is particularly true after a major flood or other disaster in which large numbers of buildings have suffered damage and there is a pressing need to provide damage determinations so that reconstruction can begin. Structures in Special Flood Hazard Areas that are substantially damaged must be brought into compliance with the minimum requirements of local ordinances and the NFIP. To assist communities in making such determinations, FEMA developed the Residential Substantial Damage Estimator (RSDE) software, which provides guidance in estimating building value and damage costs for both single family and manufactured homes. Based on the regulatory requirements of the NFIP, it is intended to be used in conjunction with industry-accepted residential cost estimating guides.
It is recommended that Metro personnel participate in training in the use of the RSDE program.

Source:	CPT
Mitigation Category:	Prevention
Responsible Office:	MWS
Priority (H, M, L):	Low
Cost Estimate:	$5,000 for 2-day on-site course for staff
Community Benefit:	Improved enforcement of substantial damage regulations; mitigated structures; increased eligibility for ICC (increased cost of compliance)
Potential funding:	Existing Budget; TEMA
Schedule:	Within 2 years

2009 Update: *Nothing new to report at this time.*

2014 Update: *MWS Stormwater staff has been trained and they continue to use the program to assess damage to structures following flooding events.*

2017 Update: *Due to personnel turnover, MWS is training new personnel.*

2018 Update: *Due to personnel turnover, MWS is training new personnel. This training will be addressed at an annual conference in 2019.*

2019 Update: *The Residential Substantial Damage Estimator (RSDE) was not addressed at the 2019 conference. MWS will look for a class on the RSDE for the plan review staff at Metro Development Services. (MWS)*

RECOMMENDED ACTION 1-12: (2009)

The City of Goodlettsville continues to have problems with flooding and properties continuing to be damaged by floods. The City of Goodlettsville has requested assistance from Metro Government with flood mitigation efforts.

The CPT recommends assisting the City of Goodlettsville with the FEMA repetitive loss buyout program and associated flood mitigation initiatives.

Source:	CPT
Mitigation Category:	Property Protection, Prevention
Responsible Office:	MWS and OEM
Priority (H, M, L):	High
Cost Estimate:	Staff Time
Community Benefit:	Life safety, Potential funding sources for action items of this Mitigation Plan
Potential funding:	Mitigation Funds
Schedule:	Within 2 years

2014 Update: *The city of Goodlettsville and Metro Nashville Davidson County requested the Army Corp of Engineers to perform a new flood study for Dry Creek. That study is in draft report, with results to soon be released. The city of Goodlettsville has implemented improved procedures to monitor Dry Creek with special attention to the weir structure at Interstate 65. Measures are in place to provide warning to residents when flooding is a threat which includes close monitoring of possible flooding areas, and door to door evacuations if needed. Goodlettsville continues to pursue mitigation projects through FEMA grants.*

2015 & 2016 Update: *Study still not released.*

2017 Update: *Tom P. to obtain report from Corp. of Eng. on Dry Creek. Goodlettsville stated website wasn't working for at least the past year. Michael H. followed up and stated the*

website is working but there have been problems with the software on how it prepares data. Tom P. will follow up on it and will come up with action plan based on results. Tom P. to check lessons learned suggested for Dry Creek gage. (MWS) Lessons learned from Hurricane Harvey in our area suggests that cell service is spotty causing the communication issues.

***2018 Update:** MWS does not currently have the study from the COE on Dry Creek, but will obtain one and review and advise.*

***2019 Update:** MWS has received preliminary data for the dry creek study on July 31st 2019 from USACE. Goodlettsville has requested a camera along the channel to assist with reliable real time monitoring of flood conditions. The area continues to be Goodlettsville's highest threat sector for a flood to suddenly impact residential occupancies in a life threatening way. (MWS/Goodlettsville)*

RECOMMENDED ACTION 1-13: (2009)

Colleges and Universities in the area continue to address the need for supplying quick, accurate emergency information to the student body, faculty and staff.

The CPT recommends assisting local colleges and universities in obtaining outdoor early warning sirens through grant funding and connecting them to the city's existing early warning siren systems.

Source:	CPT
Mitigation Category:	Property Protection
Responsible Office:	OEM
Priority (H, M, L):	Medium
Cost Estimate:	Staff time, equipment, service expenses
Community Benefit:	Life Safety, Potential funding sources for action items of this Mitigation Plan
Potential funding:	Mitigation Funds
Schedule:	Within 5 years

***2014 Update:** OEM has initiated a "Higher Education Preparedness Group" for all major colleges and universities. The purpose of this group is for information sharing, and networking, including sharing concerns. OEM is currently leading this program.*

***2018 Update:** Belmont was looking at possibly putting in outdoor early warning sirens, no update on that discussion. Planning did a study on possible siren locations and they could possibly include some higher education locations.*

***2019 Update:** OEM continues to host the Higher Education Preparedness Group, and also with this revision, all local major colleges and universities were invited to participate in this Hazard Mitigation Plan revision, including the mitigation strategy. It was noted that Belmont and TSU are interested in possibly having a new tornado siren located on their property; this*

information was sent to the OEM Deputy Director to include in discussions on new siren locations with the up-coming siren upgrades and additions. (OEM)

RECOMMENDED ACTION 1-14: (2012)

The satellite city of Oak Hill (located within Davidson County, TN) is aware of certain areas in their jurisdiction that have historically experienced flooding during significant rain events. In an effort to address these and any other such issues that may exist, Oak Hill has initiated a 3 Phase Drainage Study/Correction Plan (see below). Phase 1 was completed in 2011, Phase 2 anticipated to be completed in 2014, and Phase 3 will depend on the results of Phase 2 and funding availability.

1. Planning (started)
    a. Identify drainage basins
    b. Inventory stormwater infrastructure
    c. Prioritize basin drainage work considering need
2. Model stormwater drainage to determine what work is needed to address issues (not started)
3. Construction of flooding resolution projects (not started)

It is recommended to include this project from The City of Oak Hill in this Multi-Hazard Mitigation Plan as it mirrors actions with Metro Water Services, and applies to the over goal.

Source:	City of Oak Hill
Mitigation Category:	Property Protection, Life Safety, Structural Projects
Responsible Office:	City of Oak Hill
Priority (H, M, L):	Medium
Cost Estimate:	Phase 1 ~ 100k, Phase 2 ~150k, Phase 3 unknown at this time
Community Benefit:	Life Safety, Potential funding sources for action items of this Mitigation Plan
Potential funding:	Existing Oak Hill Budget; Grant Funding
Schedule:	Phase 1 – Completed in 2011 Phase 2 **–** Anticipated completion in 2014 Phase 3 **–** Anticipated start date dependent on funding sources

2014 Update: *Phase 1 was completed in 2011 and the drainage study is in the Oak Hill office. Phase II has not been initiated due to lack of funding. Phase III cannot be completed, or even budgeted until Phase II is completed.*

2015 Update: *New City Manager met with MWS and is interested in continuing.*

2016 Update: *Currently on hold due to lack of funding.*

2018 Update: *The potential USACE project for Browns Creek has identified 6 homes within the city limits of Oak Hill. The funding for this project once approved will be 65% COE and 35% Local. MWS will coordinate with the City of Oak Hill to discuss this potential project. No homes have been identified in either Berry Hill or Forest Hills. (MWS)*

2019 Update: *The USACE has not funded the home buyout project. (MWS)*

RECOMMENDED ACTION 1-15: (NEW ITEM 2014)

In 2012, Metro Water Services contracted with a consultant to assist in identifying critical assets and to determine projects to mitigate / minimize risk. The report was completed in early 2013 and projects were added to the 5 year Capital Improvement Budget. In addition to the replacement projects, MWS has an ongoing leak detection program to identify leaks before they cause an emergency and impact service.

Based upon Metro Water's critical water asset list, the CPT recommends that Metro initiate design and construction of high priority capital improvement projects.

Source:	Distribution Optimization Report (DSO)
Mitigation Category:	Structural Projects/Infrastructure Evaluation
Responsible Office:	MWS
Priority (H, M, L):	High
Cost Estimate:	$164M (redundancy projects and improved water quality projects)
Community Benefit:	Continuity of service
Potential funding:	Capital Funding
Schedule:	Long-term plan (5+ years)

2016 Update: *The Metro Water valve exercising program involves staff operating certain water values periodically to make sure they can be closed (are not "stuck" in the open position) in the event they need to be utilized during a water main break incident. MWS also has increased its efforts to monitor excavation work around major infrastructure.*

2017 Update: *SSD is still performing water valve exercising with a consulting firm. We have limited financial resources so the overall scope of this project has been reduced; we still plan to perform future valve exercising on an annual basis as funding is available.*
The Division continues to monitor excavation work near our water and sewer infrastructure. A new policy for horizontal directional drilling was posted to help reduce the potential risk during this method of utility work. (MWS)

2018 Update: *M. Hunt stated the leak protection program has increased. MWS has a multi-year contract in place for water distribution leak detection (WSO) that runs through March 2020. The contractor evaluates all of MWS' water distribution system each year via pipeline "listening technology" to identify subsurface system leaks. (MWS)*

2019 Update: *In 2018, Metro Water Services completed two large-diameter pipe projects to provide added redundancy in the Water Distribution system. Also, 2 water main upgrade projects (not noted previously) were completed that served to improve the Water Distribution system – 1) 2016…installed a parallel 30 inch discharge water main from the Thompson Lane*

water pump station, and 2) in 2015…replaced 10,000 feet of an "at risk" water main to increase fire flows/pressures in the Love Circle area.

Metro Water Services is also currently piloting permanent acoustic leak detectors in the water distribution system in a proactive effort to detect leaks in the system earlier.

Additionally, a major water reservoir tank improvement project design is complete and awaiting funding. A "Power Generation Project" was also completed this fiscal year at the Omohundro (90 MGD) Water Treatment Plant that allows for power source redundancy (i.e. the plant can operate in times of electricity outages).

Finally, MWS is currently conducting a large-scale pilot water plant project in relation to the long term goal of placing a new Water Treatment Plant into service that is to be located outside of the flood risk area. This will increase Metro Nashville's public water supply system resiliency in the event of a major Cumberland River flood in the future.
The CPT recommended closing this action item.

RECOMMENDED ACTION 1-16: (NEW ITEM 2014)

The Clean Water Nashville Overflow Abatement Program (CWNOAP) Design Management Manual (Section 2.6.1) stipulates that all plan projects abide by the following flood elevation considerations.

2.6.1 Flood Elevations
The floor elevation for new electrical/control buildings shall be above the 500-year flood elevation or flood of record, whichever is greater.

All new site electrical equipment such as switchgear, electrical panels, VFDs, and non-submersible motor operators shall be installed 2 feet above the 500-year flood elevation or flood of record, whichever is greater. Existing site additions or modifications shall consider this level of protection in design.

Source:	Clean Water Nashville Overflow Abatement Program (CWNOAP) Design Management Manual
Mitigation Category:	Structural Projects/Infrastructure Evaluation
Responsible Office:	MWS
Priority (H, M, L):	Medium
Cost Estimate:	NA (planned projects will simply be designed to meet criteria)
Community Benefit:	Flood protection, continuity of service
Potential funding:	Capital Funding
Schedule:	20+ years

2017 Update: *All projects have engineering checklists and Clean Water Nashville projects continue to use the constraint on new electrical buildings at facilities. (MWS)*

2018 Update: *There are already specifications on elevating to flood specifications (Hunt/MWS).*

2019 Update: *Metro Water Services now elevates all "new construction" facility structures to the 500 year flood elevation plus 2 feet. The CPT recommended closing this action item.*

RECOMMENDED ACTION 1-17: (2014)

All three of the NES Operating Centers (Central, West and Donelson) are physically located south of the Cumberland River. These Centers house all the fleet facilities and material warehouses used by NES to maintain the transmission and distribution system. Should an event such as a dam breach or earthquake occur and it became necessary to close the bridges over the Cumberland River until inspections could be performed to verify their structural integrity, NES emergency response efforts would be hampered since the river runs through the middle of the NES service territory. Depending on what advance notice was available for a dam breech, much of NES' equipment and material could be on the south side of the river with no easy way to get it on the north side. In the event of an earthquake, there would be no advance notice. Therefore, there would be no opportunity to stage equipment and material north of the river. Because of this situation and load growth in the northern part of the service territory, NES has planned the construction of a joint Training and Operation Center in the northern part of the service territory to be located on Myatt Drive.

Source:	NES Wolf Creek/Center Hill Dam EOP
Mitigation Category:	Property Protection;
Responsible Office:	NES
Priority (H, M, L):	Medium
Cost Estimate:	Approximately $14,000,000 (total cost of the site work, infrastructure improvements and construction of both training facilities and operations center)
Community Benefit:	Continuity of service
Potential funding:	NES
Schedule:	End of 2015

2015 Update: *NES has taken over occupancy of the new service center building and is currently installing equipment. Currently our target date to begin working out of the North Service is January 8, 2016.*

2016 Update: *NES has taken over occupancy of the new service center building and began operations out of it in January 2016. NES has also begun using the 10,000 sq. ft. training center that was also constructed at the site. Recommend closing this action item as completed (close out at next revision)*

2017 Update: *This action item was completed, and the CPT suggests closing it out at the next revision.*

2019 Update: *NES currently has a full Disaster Recovery (DR) site for its Control Center operations. This site is a fully redundant site with full back up communications, Energy/Distribution Management System and System Operator Consoles and can be operated fully independent of any equipment or support from the main NES campus. However, part of*

this facility is underground and water migration has been a problem over years. Also, the current site is located at a power substation. There is no full time security presence at the site. Security is provided remotely through electronic monitoring and monitored security cameras. NES plans to design and construct a new larger DR site above ground at one of its existing Construction Operating Centers. This will eliminate the current water migration issues, provide for on-site 24/7 physical security presence and allow for a more modern work environment. Construction is expected to be complete by June 2021.

RECOMMENDED ACTION 1-18: (2014)

In restoring MWS' water and sewer facilities from 2010 Flood impacts, site-specific flood risk mitigation was employed as possible/feasible in bringing facilities back on line. Further, it has been MWS's practice since the May 2010 flood to incorporate flood mitigation into capital projects planned for the facilities that were impacted by the flood. Two examples of this are the Hot House and Generator Building at the K.R. Harrington WTP and the Effluent Pump Station at the Central WWTP Biosolids Facility. Both of these facilities were damaged in the May 2010 flood. MWS planned to upgrade these facilities prior to the flood. Since the flood, the designs were modified to elevate the facilities above the flood of record to minimize the potential impacts of future floods.

Source:	Metro Water Services Post May 2010 Flood Report
Mitigation Category:	Structural Projects
Responsible Office:	MWS
Priority (H, M, L):	H/M
Cost Estimate:	To be determined for each project and varies with building size, structure type and equipment.
Community Benefit:	Life Safety; Property Protection; Pro-active approach to flood mitigation; FEMA eligibility
Potential funding:	Capital Budget/FEMA
Schedule:	Within 5 years

2014 Update: *MWS continues to pursue these projects as approvals and funds are available.*

2016 Update: *Metro Water is currently near 90% design on remaining flood mitigation projects for the OWTP and KRHWTP. Some projects are complete, and another is in procurement process.*

2017 Update: *The Hot House and Generator Building at the K.R.Harrington WTP and The Effluent Pump station at the Central WWTP Biosolids Facility projects have been completed and were modified to elevate the facilities above the flood of record to minimize the potential impacts of future floods. In addition, The Chemical Feed Upgrades and Miscellaneous Plant Improvements project at both K.R. Harrington and Omohundro WTP's was completed in early 2017. The project raised the chemical feed systems and controls at both plants above the flood of record.*
The Omohundro WTP Site Access Road Mitigation and Guard Shack Equipment Mitigation are currently in construction as part of the Omohundro Substation and Generation Facility project.

The Water Flood Mitigation project at both K.R. Harrington WTP and Omohundro WTP is nearing design completion and will be implemented in phases as funding allows.
MWS continues to pursue additional projects as approvals and funds are available. All capital projects that are designed take into consideration the flood of record as part of the planning/design phases. (MWS)

***2018 Update:** The projects on 8 buildings are almost entirely complete, and should be entirely done by the middle of 2019. (MWS)*

***2019 Update:** There are 8 ongoing Metro Water Services projects. Those 8 projects involve 44 specific project elements of which 7 are now complete. The remainder of these project elements is to be completed as funding becomes available. All Waste Water Treatment Plant floodproofing projects have been completed at this point with the exception of two remaining exterior treatment plant projects (Biosolids Facility and Dry Creek WWTP). These two projects will be completed as funding becomes available. (MWS)*

RECOMMENDED ACTION 1-19: (NEW ITEM 2019)

Nashville has experienced a tremendous level of infill development in recent years. Much of this redevelopment has substantially increased impervious cover. In 2015, Nashville tightened stormwater requirements for new development to address increases in impervious cover as lot by lot development happens. However, many areas are still substantially underserved by stormwater infrastructure as they transition from suburban development patterns with ditches and swales to urban development patterns requiring curbs and gutters.

The CPT recommends evaluating regulatory standards, infrastructure needs, and/or funding strategies to improve stormwater runoff and local flooding in rapidly redeveloping areas

Source:	Community Planning Team
Mitigation Category:	Prevention, Property Protection, Structural Projects, Natural Resource protection
Responsible Office:	Metro Codes, Metro Planning, MWS, PW
Priority (H, M, L):	Medium
Cost Estimate:	Staff Time
Community Benefit:	Life Safety; Property Protection; Pro-active approach to flood mitigation; FEMA eligibility
Potential funding:	Capital Budget/FEMA
Schedule:	Within 5 years

RECOMMENDED ACTION 1-20: (NEW ITEM 2019)

Nashville-Davidson County has experienced numerous sinkholes and landslides throughout time. However, it has been determined through discussions that there is not one single agency

that is tracking these geological events within the county or at the state level. It was determined within the CPT, that having a single depository of this information would be extremely beneficial for hazard mitigation, education etc.

The CPT recommends evaluating and creating a process for a central depository for geological events (such as sink holes and landslides) that happen within the county. One central agency should be the final resting place for this information collection.

Source:	Community Planning Team
Mitigation Category:	Prevention, Property Protection, Structural Projects, Natural Resource protection
Responsible Office:	OEM, Metro Codes, Metro Planning, MWS
Priority (H, M, L):	Medium
Cost Estimate:	Staff Time
Community Benefit:	Life Safety; Property Protection; Pro-active approach to flood mitigation; FEMA eligibility
Potential funding:	Capital Budget/FEMA
Schedule:	Within 5 years

RECOMMENDED ACTION 1-21: (NEW ITEM 2019)

Tennessee State University is aware of hazards that have historically impacted the campus community. In an effort to address these hazards and many other issues that may exist, Tennessee State University will improve resiliency along with its mitigation ability to self-sustain through the following mitigation efforts;

- Conduct annual trainings, drills, exercises and public awareness campaigns to improve campus preparedness.
- Assess and improve campus notification of potential threats. (Weather sirens, IPAWS, etc.)
- Develop and train campus personnel on business continuity planning to ensure resiliency.
- Evaluate and expand emergency generator capacity to ensure continuity of operation for essential functions for the campus community lifeline.
- Participate in municipal, regional and state hazard mitigation planning efforts.

In conjunction with Action #1-13, the CPT acknowledges the importance of working with and assisting our local universities with emergency preparedness and hazard protection. TN State University is an active player in this local Multi-Hazard Mitigation Plan, and this is an important action for them to take. The CPT will assist TN State University to the best of its ability.

Source: TN State University/Community Planning Team

Mitigation Category: Prevention, Property Protection
Responsible Office: Tennessee State University
Priority (H, M, L): Medium
Cost Estimate: Unknown at this time
Community Benefit: Community Preparedness; Critical facility protection; Life Safety; Coordinating Efforts
Potential funding: Existing Budget; Grant Funding
Schedule: Within 5 years

RECOMMENDED ACTION 1-22: (NEW ITEM 2019)

The Community Rating System (CRS) is a voluntary program for National Flood Insurance Program (NFIP) communities, which Nashville-Davidson County is a part of. The goals of the CRS are to reduce flood damages to insurable properties, strengthen and support the insurance aspects of the NFIP, and encourage a comprehensive approach to floodplain management.
The CRS was developed to provide incentives in the form of premium discounts for communities to go beyond the minimum floodplain management requirements to develop extra measures to provide protection from flooding. All communities start out with a Class 10 rating (which offers no discount), and Class 1 which is the best rating a community can get, and gives the greatest premium discount to the community.

Nashville-Davidson County has been a part of the CRS since 1991, and currently (2019), has a Community Rating of 8, which offers up to a 10% discount to the community. It is in the best interest to the community, to continue to improve Nashville-Davidson County's CRS rating, to increase the community's discounts.

The CPT recommends evaluating and creating a process/strategy to advance the Nashville-Davidson County CRS rating to at least a 6, which would give the community a 20% discount on flood insurance.

This would need to involve at least:

1. *Evaluate how Metro Codes operates to determine if BCEGS residential rating is an option.*
2. *Adding Metro Codes staff to be able to inspect and review building plans. This would achieve a BCEGS rating of 5/5, and increase the CRS rating to at least a 6.*

Source:	Metro Water Services/Community Planning Team
Mitigation Category:	Prevention, Property Protection, Structural Projects, Natural Resource protection
Responsible Office:	MWS, Metro Codes
Priority (H, M, L):	Medium
Cost Estimate:	Staff Time
Community Benefit:	Life Safety; Property Protection; Pro-active approach to flood mitigation; FEMA eligibility
Potential funding:	Capital Budget/FEMA
Schedule:	Within 5 years

GOAL #2:	**Promote awareness of hazards and vulnerability among citizens, business, industry and government.**
Objective 2.1:	*Develop a seasonal multi-hazard public education campaign to be implemented annually.*

RECOMMENDED ACTION 2-1:

Develop and conduct a multi-hazard, seasonal Public Awareness Program that provides citizens and businesses with accurate information describing the risk and vulnerability to natural hazards, and is implemented on an annual basis.

Metro is subject to several natural hazards, each of which pose a different degree of risk and associated vulnerability. Some hazards have a combination of attributes, including a high likelihood of occurrence, specific locations that are likely to be affected, and proven approaches that can reduce the impact; therefore the CPT has recommended specific actions be taken in regards to these hazards. For other hazards, where either the likelihood of occurrence is very low, or the area of likely impact cannot be specified, or there is very little that can be done to reduce the impacts of the hazard, the CPT has determined that the best approach would simply be public awareness. An educational program for the community should include information describing historical events and losses, the likelihood of future occurrences, the range of possible impacts, appropriate actions citizens can take to save lives and minimize property damage, and resources for additional information. Any information provided through this effort should be accurate, specific, timely, and consistent with current and accepted local emergency management procedures as promoted by the Tennessee Emergency Management Agency (TEMA), the Nashville Office of Emergency Management (OEM), the CRS Public Outreach (Activity 330), and the American Red Cross.

In order to implement a Public Awareness Program, the following actions are recommended:

- Establish a Public Information Committee with the responsibility for developing a Public Awareness Program highlighting the following topics:
    - Wind mitigation techniques such as safe rooms, securing of roofs and foundations, and strengthening garage doors;
    - Information on geological hazards including landslide and sinkhole risk areas;
    - Information on flood hazards and flood insurance; and
    - Winter storm tips including driving and emergency preparedness kits.
    - The severe weather hazards of drought and wildfire, extreme temperatures, thunderstorms and high winds, tornadoes; and winter storms

- Use a variety of information outlets including local news media, distribution of brochures and leaflets, water bill inserts, websites, and public service announcements. Current brochures and flyers should be put on display in Metro

office buildings, libraries, and other public places. In addition, information should be linked to billing e-payments.

- Develop public-private partnerships and incentives to support public education activities, including displaying hazard models at schools, OEM, NWS, Home Depot, Lowes, Homebuilder shows, Realtor organizations, and other events and locations.

- Investigate opportunities to cooperate with the Greater Nashville Association of Realtors in preparing the public information program strategy. Possibilities include developing a real estate agents' brochure or a process whereby real estate agents disclose hazard information to potential property purchasers, for example through the MLS listing services.

- Continue all public information activities currently taking place. Review effectiveness and revise accordingly.

Source:	CPT and Community Rating System Action Plan
Mitigation Category:	Public Information
Responsible Office:	MWS; OEM; Chamber of Commerce; Realtor Board
Priority (H, M, L):	High
Cost Estimate:	$5,000-20,000, depending upon printing and mailing costs, level of volunteer participation, and scope and frequency of events.
Community Benefit:	Life-Safety, Relatively Low Cost, Multi-Hazard program is efficient, relies upon work already accomplished by CPT and others.
Potential funding:	5% state set aside from HMGP funding and PDM funds
Schedule	Part of a seasonal multi-hazard public awareness campaign

2009 Update: *OEM continues to reach out to the public with all hazard information including the current publication "Ready Nashville". (OEM)*

2012 Update: *Besides the normal face to face outreach, OEM utilizes social media for its outreach efforts before, during and after emergencies. OEM utilizes Metro's website, OEM's Facebook and Twitter accounts.*

Metro has also created a new on-line program for the community called NERVE (Nashville Emergency Response Viewing Engine). This is an interactive mapping site designed to provide timely information relating to natural or man-made emergencies in Davidson County. As an emergency arises, this site will provide information about road closures, evacuation areas and/or routes, shelters and relief centers (i.e. food, water & clothing distribution centers, disaster information centers, disaster recovery centers and more). This site also includes a media tab that includes a Twitter feed from the OEM/EOC, press releases and links to other important information and agencies. (OEM)

2017 Update: *CPT agrees to wait for next full revision to evaluate the HIRA.*
Based on lessons learned from Hurricane Harvey:

- *public awareness program needs. push folks to clean the tops of storm drains/crates etc. and make them free of debris so their area doesn't flood.*
- *make sure that safety message is included…make sure proper authorities are notified if in a major street so authorities can properly flag traffic etc.*

2018 Update: *CPT agrees to wait for next full revision to evaluate the HIRA. It was discussed to get the PIO's together from certain departments to agree on quarterly public outreach to do together. Cindy P. will work with us on making sure the CRS requirements are included in this discussion and outreach plan. Will make sure that this plan includes the satellite cities with templates and plan on when to discuss what for their newsletters etc. (MWS)*

2019 Update: *The CPT recommended combining previous action item 1-10 into this action item since they were very similar. Therefore, this action item was updated to include the more all hazards approach, and the previous action item was closed. A new group, 'Public Campaign Coordination Group was created to accomplish this action item on an on-going basis. This group is multi-agency, and is being led by Nashville OEM. This action item also pushed us to create a new section within this plan, Section 4-4 'Public Outreach'. More information can be found there on this action item. (OEM)*

RECOMMENDED ACTION 2-2:

Metro Water Services should request the state NFIP Coordinator to conduct Agent and Lender Workshops in support of the community's overall NFIP program efforts.

The workshops provide updated program information, responsibilities and requirements for two critical components of the NFIP delivery: insurance agents and lending institutions. Both of these workshops are available through the Technical Assistance provided by the state NFIP Coordinator.

CPT discussions during the development of this plan highlighted two common issues. First, citizens are receiving unclear, mixed, inconsistent or inaccurate information regarding the NFIP and their individual policies. One method of addressing this issue is to ensure that independent insurance agents, the most common source of flood insurance policies and policy information to policy holders, are offered on-going training opportunities to maintain their proficiency regarding the NFIP program and program changes.

Second, since low-interest rates have been available for the past two years, the CPT anticipated, but could not verify, that there would be an increase in the number of flood insurance policies in force as people either refinanced their homes or took out other home-equity loans, which would trigger the mandatory flood insurance purchase requirement on federally backed mortgages. One method of addressing this issue is to ensure that lending institutions, the most common source of federally backed mortgages, are offered on-going training opportunities to maintain their proficiency regarding the NFIP program and their responsibilities within that program.

Source:	CPT
Mitigation Measure:	Prevention
Responsible Office:	Metro Water Services
Priority:	High
Cost Estimate:	Staff time for workshop coordination and delivery
Community Benefit:	Increased policy base and more accurate information regarding policy coverage's by the policy holder.
Potential Funding:	None required. This is a service of the state NFIP Coordinator.
Schedule:	2010

***2014 Update**: Flood Insurance Reform Legislation in 2012 and 2014 implemented some significant changes to the National Flood Insurance Program. Flood insurance subsidies for Pre-FIRM structures will be phased out which will significantly increase the cost of flood insurance for some structures. MWS Stormwater will continue to work with the State NFIP Coordinator and FEMA to provide local training to Agents and Lenders.*

***2015 Update**: MWS is waiting on State NFIP Coordinator*

***2016 Update**: MWS is waiting on State NFIP Coordinator*

***2017 Update**: State NFIP Coordinator to do trainings for lenders/realtors. Tom P. to verify the status from State NFIP Coordinator.*

***2018 Update**: TN Silverjackets developed this training, now it just needs to be implemented by the State NFIP Coordinator. (MWS)*

***2019 Update:** Need to have a discussion with the NFIP state coordinator, Amy Miller, to discuss training for insurance agents and lenders on NFIP topics. (MWS)*

RECOMMENDED ACTION 2-3:

MWS currently sends an annual mailing to the approximate 10,000 properties located within the 100-year floodplain.

It is recommended that MWS Stormwater Division continue the mailing and that the mailing be modified to include other natural hazards of concern that have been identified through the hazard mitigation planning process.

Source:	Community Rating System Action Plan
Mitigation Category:	Public Information
Responsible Office:	MWS
Priority (H, M, L):	Medium
Cost Estimate:	Staff time is required to produce and review approximately 10,000 individual digital pamphlets. The pamphlets must be printed, folded, sealed, and posted in accordance with US Postal

	Service requirements. Assume one week of staff time in addition to approximately $5,000 in printing and postage costs.
Community Benefit:	The annual mailing is distributed to all properties of the SFHA and those additional areas known to have flooding problems. The notice clearly explains that the recipient's property is subject to flooding. The mailing recommends flood insurance coverage and protection measures undertaken by building-owners.
Potential funding:	Existing Budget
Schedule:	Annually

2009 Update: *MWS continues to send these notices to properties in the 100 year floodplain on an annual basis to approximately 10,000 parcels.*

2014 Update: *MWS Stormwater continues to send these notices to properties in the 100-year floodplain on an annual basis. No new sections discussing other hazards have been added to the notice.*

2015 Update*: Ongoing mailings. It was suggested to move the recommendation to the public awareness campaign section, apart from NFIP mailings.*

2016 Update*: MWS revised the mail out. MWS to include a reference to this plan in the mailing and direct the public to view the hazards and plan on OEM website.*

2018 Update*: The annual mailing to the homes in the floodplain was sent to over 12,000 property owners last year. That mailing did not include properties in the satellite cities. MWS will work with the satellite cities with the intent to include their residents in the next mailing. (MWS)*

2109 Update: *MWS will create and evaluate the additional mailer list to satellite cites in Davidson County for the next annual mailer. (MWS)*

GOAL #3: Maximize use of available funding.

Objective 3.1: Identify multiple objective opportunities that can be used to support mitigation activities.
Objective 3.2: Identify and analyze project cost share options.
Objective 3.3: Submit mitigation project applications annually at a minimum.

RECOMMENDED ACTION 3-4:

Develop a financial strategy to design and construct large capital improvement projects.

The strategy shall incorporate a cost-sharing plan to leverage local, state, and federal funding for stormwater management activities and projects.

Source:	Floodplain Management Plan
Mitigation Category:	Structural Projects
Responsible Office:	MWS
Priority (H, M, L):	Low
Cost Estimate:	$40,000
Community Benefit:	Life Safety
Potential funding:	Existing Budget; TEMA
Schedule:	2005

2009 Update: *Beginning July 1, 2009, Metro implemented a Stormwater User fee where all properties in Davidson County that have more than 400 square feet of impervious surface pay a monthly user fee. (The seven incorporated satellite cities within the county are not in the program.) The funds collected through this fee pay the operation expenses of the Stormwater Division and support a $12M/year capital construction program.*

2014 Update: *The City of Lakewood has been abolished. The property owners in the boundaries of the former city limits are now part of Metro and are required to pay the monthly Stormwater User Fee. The remaining satellite cities are not in the program. These funds continue to be collected and are used to support all MWS Stormwater activities.*

2015 Update*: Currently working on revised stormwater business plan; anticipated completion by end of 2015.*

2016 Update*: Revised stormwater business plan completed.*

2017 Update*: New fees increased funding. Murfreesboro Road is an example with TDOT, PW, and MWS.*

2018 Update*: Murfreesboro Rd/Vultee project is about 75% completed.*

***2019 Update**: From Metro Stormwater webpage – "In order to effectively meet existing and anticipated stormwater infrastructure, water quality and flooding needs, a comprehensive review of stormwater fees was conducted. Based on those findings a new fee structure was approved by Metro Council and became effective July 1, 2017. The modernized fee structure will allow Metro Water Services to address both the current and future needs of our stormwater system, including a $200 million backlog of stormwater capital projects."(MWS)*

RECOMMENDED ACTION 3-5:

FEMA offers two programs, the Hazard Mitigation Grant Program (HMGP) and the Flood Mitigation Assistance (FMA) Program, to assist local communities with reducing future losses of lives and properties due to disasters. The HMGP provides grants to local communities to implement long-term hazard mitigation measures such as the elevation, acquisition, or relocation of flood-prone structures after a major disaster declaration. The FMA program provides grants to communities for projects that reduce the risk of flood damage to structures that have flood insurance coverage. FEMA's mitigation grant programs are administered by the TEMA, which prioritizes and selects project applications developed and submitted by local jurisdictions.

The CPT recommends applying annually for potentially available HMGP and FMA grants.

Source:	CPT
Mitigation Category:	Property Protection; Structural Projects
Responsible Office:	MWS and OEM
Priority (H, M, L):	Low
Cost Estimate:	Staff Time to complete grant application
Community Benefit:	Potential funding sources for action items of this Mitigation Plan
Potential funding:	Existing Budget
Schedule:	Annually

***2009 Update:** MWS has a close working relationship with TEMA and MWS has applied for and been awarded funding from both HMGP and FMA on an annual basis. Since 2002, MWS has acquired and removed 52 homes from the 100 year floodplain.*

***2012 Update:** Post May 2010 Flood, the MWS applied for $46.7 million in HMGP funds to acquire 244 properties. Since May 2010, MWS has purchased 197 homes, and 120 homes have been demolished.*

***2014 Update:** Since May 2010, MWS Stormwater has purchased 225 homes all of which have been demolished with the area being converted to open space. MWS Stormwater is currently working through TEMA/FEMA on a project to purchase 33 homes in the Gibson Creek watershed.*

***2015 Update**: Working on 5 more properties SRL applications.*

***2016 Update**: Five more properties SRL applications accepted and 100% federally funded; on-going.*

***2017 Update**: Submitted another application recently.*

***2018 Update**: Submitting applications by the end of this month for other projects. (MWS)*

***2019 Update:** SRL project is complete. To date, 47 homes have been purchased along Gibson Creek and 9 vacant lots with an application to FEMA for another 31 lots. The Mill Creek project with USACE is underway, 4 homes have been purchased out of 44 in the project. The Sevenmile Creek project with USACE is also underway with 45 potential homes identified.*

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COMPLETED ACTION ITEMS

Recommended mitigation action items from several existing community plans have already been implemented by Metro. This demonstrates not only the current capability of Metro to counter identified hazards through existing policies, regulations, programs, and procedures, but also the ongoing commitment of Metro to protect the community and mitigate the damaging effects of hazards. Completed action items since 2005 are presented below.

COMPLETED ACTION 1:

Develop a plan and schedule to modify and enhance the existing floodplain management regulations with the intent of minimizing future flooding within the floodplain.

Source: Floodplain Management Plan
Responsible Office: MWS
Status: A Stormwater Regulation Review Committee was formed to advise Metro Water Services on revisions and enhancements to stormwater management regulations and associated processes.

COMPLETED ACTION 2:

Develop formalized policies (level-of-service and extent-of-service) for maintenance of the stormwater drainage system.

Source: Floodplain Management Plan and Community Rating System Action Plan
Responsible Office: MWS
Status: Draft policies addressing level-of-service and extent-of-service have been prepared in order to define the areas where maintenance work will be performed by MWS Stormwater Division staff.

COMPLETED ACTION 3:

Develop a GIS database of all stormwater detention structures and BMP facilities within Metro Nashville and Davidson County. Upon completion of database, develop a routine maintenance schedule to ensure proper detention and water quality functions of stormwater facilities.

Source: Floodplain Management Plan
Responsible Office: MWS
Status: The GIS database was completed in 2003 based upon the available data through 2002. A maintenance schedule using the GIS database was initiated in June of 2004. The MWS Stormwater Division Maintenance Staff estimate that they inspect 100 stormwater structures each month. The inspection program is performed in conjunction with system maintenance for documentation purposes.

COMPLETED ACTION 4:

Double the number of stormwater infrastructure maintenance crews (four to eight) that handle maintenance problems and dedicate appropriate equipment to perform maintenance.

Source: Floodplain Management Plan
Responsible Office: MWS
Status: The MWS Stormwater Division currently employs eight maintenance crews. The crews are assigned to large ditch maintenance, stormwater inlet construction, stormwater inlet cleanout, and masonry.

COMPLETED ACTION 5:

Metro should begin a practice to place deed restrictions on all flood-prone lands purchased with public funds.

Source: Community Rating System Action Plan
Responsible Office: MWS
Status: Deed restrictions have been revised and/or placed on all flood prone lands purchased with public funds as a part of the CRS annual review and update.

COMPLETED ACTION 6:

Develop GIS database of insurable structures within the designated floodplain, particularly including the repetitive loss areas. The database shall contain detailed structure elevation and floodplain data.

Source: Floodplain Management Plan
Responsible Office: MWS
Status: Developed for the repetitive loss homeowner mailouts, a database of parcels and structures located in the floodplain has been linked to existing elevation certificate information. This information is provided to all homeowners located in the floodplain on an annual basis. Approximately 10,000 homeowners currently receive a residence-specific mailout.

COMPLETED ACTION 7:

Initiate a multi-year comprehensive watershed study for Mill Creek, the largest watershed in Davidson County, Mill Creek. Repetitive loss areas are identified on Mill Creek mainstem and two tributaries, Sevenmile Creek and Whittemore Branch. The watershed study will identify flooding problems and develop capital improvement projects to remedy flooding problems.

Source: Floodplain Management Plan
Responsible Office: MWS
Status: The US Army Corps of Engineers, Nashville District, in conjunction with a contractor, will complete floodplain inundation mapping and floodway analysis for the following streams in the Mill Creek Watershed: Mill Creek, Sevenmile Creek, Sorghum Branch, Whittemore Branch, Sims Branch, Tributary A, Tributary B, Collins Creek, Turkey Creek, Indian Creek, and Holt Creek. The watershed study will be the first study to utilize new HEC software, HEC-HMS version 3.0. The 107 square mile watershed is subdivided into 129 sub-watersheds that are further broken down into 200-meter grids (10 acres). Each grid is defined with unique parameters, such as impervious surface area, loss rates, and land use that have been derived from existing Metro GIS data. Newly developed GIS tools will use watershed management practices for stormwater and planning purposes.

CLOSED ACTION 8: (2009)

Due to the historically perceived threat of nuclear attack, fallout shelters have been designated throughout Davidson County.

The CPT recommends completing an inventory of these existing shelters and utilizing them as "tornado safe" places and shelters. The inventory should be published for community access.

Source: CPT
Responsible Office: OEM
Status:
2009 Update: Due to legality concerns, this recommended action will not be implemented. (CPT)

COMPLETED ACTION 9: (2012)

Metro's emergency management program, in conjunction with Public Works, has installed several flood-warning gauges in some county streams and creeks. The coverage of these gauges is for only three of the county's 14 repetitive flooding creeks and streams.

An additional 11 gauges are recommended for total coverage of the community.

Source: OEM Local Hazard Mitigation Plan
Responsible Office: OEM
Status:
2009 Update: This action item is being amended to include the recommendation of a flood gauge on Mansker Creek in Goodlettsville (automatic notification gauge). MWS has re-installed hardware for the alarm system at the Dry Creek flood control structure and the alarm will alert MWS and OEM; this was conducted using 100% local funding. Manually staff gauges were installed in 2009 at Mill Creek and in the process of being installed at Seven Mile Creek.

2012 Update: After the Flood of May 2010, there was a combined effort from the US Geological Survey (USGS), National Weather Service (NWS), Metro Water and Nashville OEM to install river gauges at flood prone waterways in Davidson County. Data from these gauges is made available to local authorities for action as needed. The USGS supplied the gauges and is responsible for the maintenance. Along with these gauges, there are 2 fixed post cameras, and 2 mobile cameras to monitor flood levels. (This update also goes with Recommended Action #20.)

There is a new program called 'SAFE' (Situational Awareness for Flooding Events) that Nashville utilizes. It is a partnership between Metro Water, Nashville OEM, Metro Planning, US Army Corps of Engineers, the USGS and the National Weather Service. The expertise and data from each of these agencies is collectively used to monitor and predict watershed conditions. This program allows Metro to monitor actual and forecasted river stages and acquire information that can be used to dispatch resources and respond more efficiently to flood related emergencies. This information will be used to alert emergency personnel to the threat or actual danger of flooding, and not as a warning system for the general public. There are currently 28 gauges installed. This information gets mapped to a mapping program developed by Metro Planning and displays resulting inundation areas and impacts associated with current and predicted flooding.

The Nashville SAFE program is focused on the six major watersheds within Metro Nashville: Cumberland River, Harpeth River, Mill Creek, Richland Creek, Whites Creek, and Browns Creek. (MWS)

COMPLETED ACTION 10: (2014)

Channels and detention basins can lose their carrying capacities due to debris accumulation, sedimentation, and the growth of vegetation. This loss may be prevented through the enforcement of regulations that prohibit dumping in streams and other portions of the drainage system. Regulations should:

- Prohibit dumping ANY material in a channel or basin that could cause an obstruction to flows. Ordinances prohibiting pollutants or causing nuisances are not sufficient by themselves;
- Identify of an officer or office responsible for enforcement and monitoring compliance; and
- Include provisions for penalties and abatement of violations.

The Metro Department of Law should draft stream-dumping regulations.

Source: Community Rating System Action Plan
Responsible Office: MWS; Metro Legal
Status:
2009 Update: Nothing new to report at this time**.**

2012 Update: Metro currently addresses the issues identified in Action 7 as outlined below:

1. Metro Codes regulates general refuse dumping within Metro to include such incidents in or near drainage conveyances. This includes mandating the removal of such material by the responsible party.
2. Metro Stormwater works closely with Metro Public Works to educate the public on proper locations (not in ditches, etc.) to stage landscaping debris for pick-up. Public Works also facilitates right-of-way refuse removal assistance in certain situations.
3. Metro Stormwater in certain circumstances will facilitate the removal of accumulated material within the drainage system that represents a localized flooding risk.
4. Metro Stormwater in certain circumstances will facilitate the removal of dumped material within the drainage system that represents a localized flooding risk – if the responsible party cannot be identified/required to remove material.
5. Metro Stormwater enforces certain floodplain provisions in the Metro Stormwater Management Manual that require "cut and fill" material be balanced within designated floodplain areas.
6. Metro Stormwater mandates the performance of certain post development Best Management Practice maintenance activities (per the Metro Stormwater Management manual) by responsible parties. Stormwater works with the parcel owner/manager to facilitate that required maintenance is performed in a timely fashion. Stormwater has the authority to enforce that such maintenance actions are performed.
7. Metro Stormwater provides targeted public education in circumstances of isolated dumping incidents to conveyances or streams in neighborhoods.

COMPLETED ACTION 11: (2014)

Current NFIP riverine regulatory standards require that new residential buildings in the Special Flood Hazard Area (SFHA) have their lowest floor at or above the base flood elevation. Non-residential buildings may be flood proofed to the base flood elevation. Many regulatory standards adopted by communities provide increased protection to new development and redevelopment. Examples of the regulatory standards include:

- **Foundation protection:** Flood and erosion requirements can protect buildings on fill against differential settling as well as scour and erosion.
- **Cumulative substantial improvements:** The NFIP allows improvements valued at up to 50% of the building's pre-improvement value to be permitted without meeting the flood protection requirements. Over the years, a community may issue a succession of permits for different repairs or improvements to the same structures. This can greatly increase the building's overall flood damage potential.
- **Compensatory storage:** Buildings built on fill and elevated above the base flood elevation meet the NFIP rules. However, when fill or buildings are placed in the floodplain, the flood storage areas are lost and flood heights will go up because there is

less room for the floodwaters. This is particularly important in smaller watersheds which respond sooner to changes in the topography.

- **Protecting shorelines:** Regulations that require new floodplain developments to avoid or minimize disruption to shorelines, stream channels, and their banks.
- **Low density zoning:** The fewer structures built in the floodplain, the better. Regulatory standards may zone areas to keep them substantially open. This includes undeveloped land within low density zoning districts, as well as for areas developed in accordance with the density requirements.

Existing permit procedures should be reviewed or revised, as needed, to ensure that the provisions of the ordinances are fully implemented. In addition, permit records should be reviewed to verify that Metro can document enforcement of the ordinances.

Source: Community Rating System Action Plan
Responsible Office: MWS; Metro Codes
Status:
2009 Update: The provisions of the Stormwater Regulations are being fully implemented and enforced.
2014 Update: MWS Stormwater continues to implement and enforce the Stormwater Regulations.

CLOSED/COMBINED ACTION 1-10: (2019)

The CPT determined that severe weather hazard mitigation actions and coordination would be best addressed under the goal of public awareness (Goal #2).

The severe weather hazards of drought and wildfire, extreme temperatures, thunderstorms and high winds, tornadoes; and winter storms are recommended to be included in a multi-hazard, seasonal Public Awareness Program.

CLOSED ACTION 2-4: (2019)

According to insurance agents, one of the greatest impediments to selling flood insurance is the difficulty of obtaining accurate flood insurance rating zone and building elevation data. By providing this data on the community website, the information is readily accessible to any inquirer (e.g., no payment of money is needed). The elevation certificates may be in the form of a searchable database, scanned elevation certificates, or any other format that makes the data available. Additionally, the relatively low setup cost would be more than paid for by the reduced staff time needed to retrieve elevation certificate data and answer questions from inquirers. By referring people to the website, staff would be free to handle technical issues and permit reviews.

Discussions should be held with Metro website staff on the best way to post Elevation Certificate data on the website and procedures to maintain the data.

Source:	CPT and Community Rating System Action Plan
Mitigation Category:	Public Information
Responsible Office:	MWS
Priority (H, M, L):	Low
Cost Estimate:	Staff Time
Community Benefit:	Public Information
Potential funding:	Existing Budget
Schedule:	Within 2 years

2009 Update: *At this time, Elevation Certificates are not available through the web site.(Planning)*

2014 Update: *Elevation Certificates continue to be collected and maintained in files at MWS Stormwater. These certificates are available upon request but have not been made available through the Metro web site. (MWS)*

2015 Update*: CPT recommends closing this action item at the next full revision. Metro will continue to collect and maintain, but no longer recommended for website. (OEM)*

2016 Update: *The Metro Planning has included the elevation certificate to the parcel on their website. Still recommend closing this action item at the next full revision. (Planning)*

2019 Update: *The Nashville planning department parcel viewer includes a stormwater elevation certificate tab available to everyone to view online. The CPT recommended closing this action during this revision. (MWS)*

CLOSED ACTION 3-1: (2019)

A flood threat recognition system tells emergency management officials that a flood is imminent. Examples of systems include river stage predictions from the National Weather Service and using local gauges to predict flood crests and times. Flood crest prediction programs are currently in place on the Cumberland and Harpeth Rivers.

The Nashville Office of Emergency Management (OEM), with help from the MWS Stormwater Division's engineers, should review the costs and benefits of developing flood crest prediction programs for other streams with reporting gauges.

There are more rain and river gauges on smaller streams and additional work would be needed to translate readings into a crest prediction for these areas. These gauges include Mill Creek at Antioch, Browns Creek at the State Fairgrounds, and Whites Creek at Bordeaux.

Source:	Community Rating System Action Plan
Mitigation Category:	Emergency Services
Responsible Office:	MWS in conjunction with OEM
Priority (H, M, L):	Medium

Cost Estimate:	One half (½) day of staff time for documentation of the Cumberland and Harpeth River gauges; $10,000 to develop crest prediction programs for other streams. Additionally there is an existing cost of $165,000 for current monitoring efforts. This cost is shared equally by Metro and the USGS.
Community Benefit:	Public Safety
Potential funding:	NWS; USGS; HMGP, FMA
Schedule:	Within 5 years

2009 Update: *Mill Creek at Bluff and Nolensville Road is complete. Further surveying needs to be completed in the Antioch area and along other creeks.*

2012 Update: *After the Flood of May 2010, there was a combined effort from the US Geological Survey (USGS), National Weather Service (NWS), Metro Water and Nashville OEM to install river gauges at flood prone waterways in Davidson County. Data from these gauges is made available to local authorities for action as needed. The USGS supplied the gauges and is responsible for the maintenance. Along with these gauges, there are 2 fixed post cameras, and 2 mobile cameras to monitor flood levels. (This update also goes with Recommended Action #8) (OEM/MWS)*

2014 Update: *Currently within Davidson County there are 25 river stage gauges, 10 rain gauges, 3 fixed cameras, and 2 mobile cameras. This equipment is being funded and maintained through agreements between Metro and our federal partners. (OEM/MWS)*

2015 Update*: On-going. River gauge levels @ Cumberland River/Woodland suggested previously by the NWS to be lowered for faster action level. (OEM/MWS)*

2016 Update*: On-going. River gauge levels @ Cumberland River/Woodland suggested previously by the NWS to be lowered for faster action level. Update: The National Weather Service coordinated with Metro Nashville to lower the Cumberland River gauge Action Stage from 35 to 30 feet. (OEM/MWS)*

2017 Update*: No change, the NWS officially changed the action levels from 35-30ft. (OEM/MWS)*

2019 Update: *Action completed; MWS continues to partner with the USGS on stream gauge information as listed below. CPT recommended closing this action item. (MWS)*

Davidson County	
03426387	MANSKER CREEK AT HWY 41 NEAR MILLERSVILLE, TN
03430550	MILL CREEK NEAR NOLENSVILLE, TN
03431000	MILL CREEK NEAR ANTIOCH, TN
03431040	SEVENMILE CREEK AT BLACKMAN RD,NR NASHVILLE TN
03431100	W F BROWNS C AT GLENDALE LANE AT NASHVILLE, TN
03431530	WHITES C AT OLD HICKORY BLVD AT WHITES CREEK, TN
03431655	RICHLAND CREEK AT HARDING PLACE AT BELLE MEADE, TN
03433500	HARPETH RIVER AT BELLEVUE, TN

Figure 5-2: Stream Gauge Precipitation Values

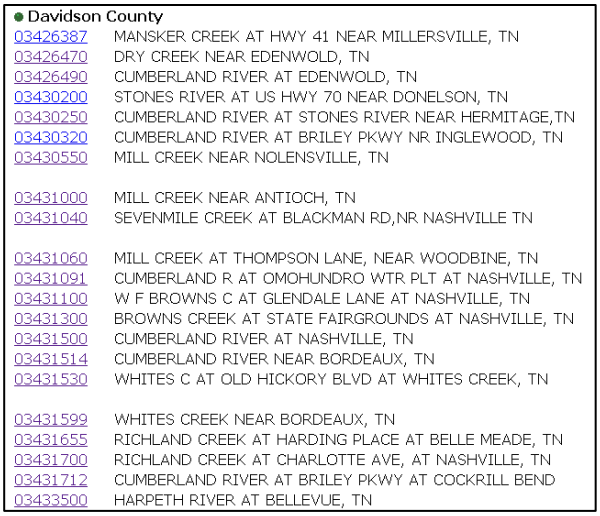

Figure 5-3: Stream River Flow Gauges

CLOSED ACTION 3-2: (2019)

Dams can create a false sense of security for floodplain residents. Unlike levees, they do not need flood conditions to fail. They can be breached with little or no warning and send a wall of water downstream. The combination of high velocity, great depth, and short notice has proven particularly deadly and destructive. One way to minimize this hazard is to enforce construction and maintenance standards. This is usually done through a state dam safety program.

Tennessee state law exempts "farm ponds" from state regulations. The Tennessee Department of Environment and Conservation reports that of the 1,100 dams in the state, over 500 qualify as farm ponds, which are any privately owned dams that are not open to the public.

There are 16 such farm pond dams in Davidson County, eight of which are considered "high hazard" dams. "High hazard" means that their failures would likely kill or injure someone. Since 1973, thirty-seven dams in Tennessee have failed. Thirty-three were unregulated.

Metro officials should talk to their state legislators and Tennessee Department of Environment and Conservation staff about the feasibility of amending the State's dam safety laws.

Source:	Community Rating System Action Plan
Mitigation Category:	Emergency Services
Responsible Office:	MWS and OEM
Priority (H, M, L):	Low
Cost Estimate:	Staff Time; because changing a state law involves political contacts and discussions, a cost for technical staff time or consultant expenses cannot be estimated. It would take one to two days to prepare a background paper on the issues.
Community Benefit:	Public Safety
Potential funding:	Existing Budget

Schedule:	Within 5 years
Status:	

2009 Update: Tennessee's safe dam program does not include farm ponds.

2014 Update: No action has occurred and no actions are currently planned on this issue.

2016 Update: No changes. Review feasibility at next full revision.

2019 Update: Within the last year, improvement work has been performed on the Radnor Lake Ogee Spillway and Downstream Stabilization. The bottom edge of the existing 82' Ogee Spillway was re-informed with a new 12" x 12" concrete edge with two # 4 rebar steel rods through the center. The new edge was doweled into the existing rock 12" on center for additional stabilization. There was approximately 20 cubic yards of concrete infilling on the Northern area of the spillway. There were also areas along the upper and lower slopes that had a geotextile fabric installed with rip rap for erosion control.

Per Davidson County Soil Conservation District staff, there is generally no involvement with farm ponds within the District's agriculture-related activities. The CPT recommended this action be closed.

CLOSED ACTION 3-3:

Cooperating Technical Partners (CTPs) are communities, regional agencies, or states that have the interest and capability to be active partners in FEMA's flood mapping program. CTPs enter into an agreement that formalizes their contribution and commitment to flood mapping. The objective of the program is to maximize limited funding by combining resources and help maintain consistent national standards.

Metro's Stormwater Division should pursue a Cooperating Technical Partner agreement with FEMA in order to get its mapping standards to better fit local conditions or make the community a higher priority for mapping support.

Source:	Community Rating System Action Plan
Mitigation Category:	Prevention
Responsible Office:	MWS
Priority (H, M, L):	Low
Cost Estimate:	Staff Time
Community Benefit:	Formalization of community contribution and commitment to flood mapping. CTP program maximizes limited funding by combining resources and helps to maintain consistent national standards.
Potential funding:	Existing Budget
Schedule:	Within 5 years

2014 Update: *MWS Stormwater has investigated becoming a Cooperating Technical Partner and has decided not to pursue it any further at this time. This should be re-evaluated in 5 years.*

2017 Update*: No changes. Review feasibility at next full revision.*

2019 Update: *No changes. CPT recommended closing action item and re-revaluate at the next 5 year update in 2025.*

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OTHER ACTION ITEMS CONSIDERED

Not all of the mitigation actions presented to and/or discussed by the CPT became recommended action items. Action items may not have been considered to be cost-effective or support the community's goals. Additionally, action items may have lacked political support, constituent support, and funding. Action items not recommended or included in the priority list are presented below for each identified hazard.

GEOLOGICAL HAZARDS

As previously noted, steep slopes, present throughout the Metro area, specifically in south-central Davidson and north-central Williamson Counties, have the potential to be unstable. Landslides have also occurred in this area due to construction-altered colluvium soils on steep slopes adjacent to the Highland Rim escarpment. The CPT discussed the following potential mitigation measures to address these geological hazards:

- Require a stronger, institutionalized methodology of identifying "at risk" soils;
- Require geotechnical studies and engineered solutions for "at risk" soils or "critical sites";
- Identify site specific road-cut issues for county, state, and private roadways; and
- Create standard road-cut designs for specific slopes and/or given soils.

Assessment: The CPT determined geological hazards within the metropolitan area are adequately addressed through notification of the known hazards to grading permit applicants during the plans review process. The CPT did not feel the historical losses from geological hazards were significant enough to warrant additional regulation and expense on the community.

SEVERE WEATHER HAZARDS

Severe weather hazards within the Metro area include drought, extreme temperatures, thunderstorms and high winds, tornadoes, and winter storms. Severe winter storms and tornadoes have been among the causes of significant losses to the community resulting in presidential disaster declarations. The CPT discussed the following potential mitigation measures to address severe weather hazards:

- Improvements to the severe weather warning system.

Assessment: The CPT determined the recently updated warning system of 71 outdoor warning siren locations within the community -- although adequate -- can still be expanded. Additional public education efforts would be better suited to inform the community of the warning system and appropriate emergency response actions. See Recommended Action Item #15.

2012 Update: As of this revision, Metro has 73 sirens. Metro Nashville has issued an RFP in July 2012 for adding approximately 20 new sirens, and upgrading the current outdoor early warning

siren system. This would give almost 100% coverage for the jurisdiction. Expected completion date is 2013, at a capital funding cost of approximately two million dollars.

- Construct tornado saferooms and/or seek vendor donation of one model saferoom.

Assessment: The CPT preferred the use of existing fallout shelters, previously constructed due to the historically perceived threat of nuclear attack, to the new construction of tornado saferooms. See Recommended Action Item #19.

2009 Update: Due to legality concerns, this recommended action will not be implemented.

Assessment: The CPT determined the existing urban forester, currently working within the Metro Codes Department, sufficiently enforces the landscape ordinances at the present time.

- Continue development of tree-trimming program to lessen the risk of power outages by falling limbs.
- Update vegetation ordinances (i.e., urban forester, landscape ordinances, supplement NES program)

Assessment: The CPT determined the tree-trimming program operated by the Nashville Electric Service adequately served the community.

- NES continues development of tree-trimming program to lessen the risk of power outages by falling limbs.

FLOODING HAZARD

Within Metro Nashville, projects that are required to implement stormwater management practices must provide a detention facility. According to the 1999 *Metro Stormwater Management Manual*, the release rate from any detention facility should approximate that of the site prior to the proposed development for the 2-year through 10-year storms, with emergency overflow capable of handling at least the 100-year discharge. The CPT discussed the following potential mitigation measures to address stormwater management practices:

- The MWS Stormwater Division should review its standards to determine if storm events larger than the 10-year event should be managed in retention basins.

Assessment: The CPT did not consider this action item a priority for the Multi-Hazard Mitigation Plan. The action item did not receive any "stars" during the prioritization of preferred measures. The CPT found this action item established an undue regulation on the community, that the probability of storm events larger than the 10-year were not balanced by the life of the structure itself. Upon further discussion, the CPT determined the flooding hazard was sufficiently addressed in the other developed action items.

2014 Update: According to the 2013 Metro Stormwater Management Manual, the design of detention facilities is required to control peak flow at the outlet of a site such that post-developed flows are equal to or less than pre-developed flows for the 2-year, 5-year, 10-year, 25-year, 50-year, and 100-year design storms.

Multi-Hazard Mitigation Plan

6.0 Plan Adoption

44 CFR 201.6(c)(5): "The local hazard mitigation plan shall include} documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council)."

The Metropolitan Mayor adopts the Multi-Hazard Mitigation Plan by signing a promulgation statement, making it policy for the Metropolitan Government of Nashville and Davidson County. Within this section, there is a copy of this promulgation statement along with resolutions of all the Satellite Cities in Davidson County, which have all officially adopted this plan as their official Multi-Hazard Mitigation Plan. This action will complete Step 9 of the Plan Development Process: Formal Plan Adoption.

PROMULGATION STATMENT

METROPOLITAN GOVERNMENT OF NASHVILLE AND DAVIDSON COUNTY

John Cooper
Mayor

OFFICE OF THE MAYOR
METROPOLITAN COURTHOUSE
NASHVILLE, TENNESSEE 37201

May 8, 2020

TO: Metro Departments and the citizens of Nashville-Davidson County,

The Metropolitan Government of Nashville and Davidson County daily works toward safeguarding our community against hazards with the potential to inflict damage and/or loss of life. Local governments –in partnership with the public they serve– must strategically pursue comprehensive resilience priorities across environmental, social, economic, and infrastructural improvement goals. Rising global temperatures endanger human and environmental health and pose serious economic risks for cities. By acting boldly to understand and address risk, we can improve the lives of Nashvillians today – and build a safer, healthier future for generations to come. Reviewed and approved at the local, state, and federal levels of government, the 2020 Metro Nashville-Davidson County Multi-Hazard Mitigation Plan is a central component of Nashville's urban-resilience and climate-adaptation strategy.

2020 is an appropriate moment to reflect on how best to respond in a crisis, as two of the four or five worst disasters in the 238 years of Nashville history have occurred during the first quarter. A category EF-3 tornado touched down on March 3rd, and a pandemic outbreak of a contagious, debilitating coronavirus has dramatically changed how we must conduct business and move through society. And every year, rainfall flooding alone begets enormous costs in property damage and economic disruption. All these events, identified as formidable risks in our Multi-Hazard Mitigation Plan, present significant challenges to public safety and health, prosperity, and environmental sustainability. Our willingness to plan and prepare is what will position Nashville to withstand and bounce back from these threats that are increasingly part of 21st Century urban life, by making smart investments to address our challenges head-on—ultimately building a Nashville that's ready for whatever comes next.

By virtue of the powers and authority vested in me by the Metropolitan Charter and the Constitution of the State of Tennessee, and in accordance with the provisions of the Tennessee Code Annotated and the federal Civil Defense Act of 1950, as amended, as Mayor of the Metropolitan Government of Nashville and Davidson County, I hereby promulgate and issue, effective this date, the Metro Nashville-Davidson County Multi-Hazard Mitigation Plan. Further, I declare this plan to be the official multi-hazard mitigation plan for The Metropolitan Government of Nashville and Davidson County and its municipalities. It shall serve as the central policy and guidance document for such mitigation actions, upon all agencies and political subdivisions within. This plan is effective upon receipt and for execution when so directed. The Nashville-Davidson County Office of Emergency Management is responsible for maintaining and updating this plan, in coordination with the appropriate departments, agencies, and the community at-large.

Sincerely,

John Cooper, Mayor
Metropolitan Government of Nashville & Davidson County

Figure 6-1: Mayor Cooper's 2020 Promulgation Statement

Satellite City Plan Resolutions

RESOLUTION 2020-03

A RESOLUTION ADOPTING THE 2020 METROPOLITAN NASHVILLE DAVIDSON COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the City of Belle Meade 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 save taxpayer dollars; and

WHEREAS, an adopted hazard mitigation plan is required as a condition of future federal and state grant funding for mitigation projects; and

WHEREAS, Metropolitan Nashville Davidson County has prepared the Multi-Hazard Mitigation Plan and has incorporated comments of the other local units of government within the County to prepare the Multi-Hazard Mitigation Plan; and

WHEREAS, the Metropolitan Nashville Davidson County Office of Emergency Management will submit on behalf of the participating municipalities, including the City of Belle Meade, the adopted Multi-Hazard Mitigation Plan dated January 2020 to the Federal Emergency Management Agency officials for final review and approval.

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF COMMISSIONERS OF THE CITY OF BELLE MEADE, TENNESSEE, AS FOLLOWS:

SECTION 1. That the City of Belle Meade hereby adopts the 2020 Metropolitan Nashville Davidson County Multi-Hazard Mitigation Plan as an official plan of the City of Belle Meade.

SECTION 2. This Resolution shall be effective immediately upon its passage and adoption, the public welfare and the welfare of the City requiring it.

Date of Adoption:
May 20, 2020

Mayor James V. Hunt

City Recorder Edie Glaser

Figure 6-2: City of Belle Meade Plan Resolution 2020

RESOLUTION NO. 130-2020

A RESOLUTION ADOPTING THE METROPOLITAN NASHVILLE-DAVIDSON COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the City of Berry Hill 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 save taxpayer dollars; and

WHEREAS, an adopted hazard mitigation plan is required as a condition of future federal and state grant funding for mitigation projects; and

WHEREAS, the City of Berry Hill participated in the process by which the Metropolitan Government of Nashville and Davidson County (Metro) prepared a multi-hazard mitigation plan pursuant to the requirements of the Disaster Mitigation Act of 2000, for the metropolitan area, comprising 533 square miles and encompassing the City of Berry Hill; and

WHEREAS, in addition to a public meeting conducted by Metro Nashville/Davidson County, whereby public comment on the proposed plan was solicited, a public hearing was held by the Berry Hill Board of Commissioners on adoption of the multi-hazard mitigation plan, following public notice being placed in a newspaper of general circulation and on the City's website; and

WHEREAS, the Board of Commissioners of the City of Berry Hill finds that the interest of the city and its citizens will be served by the adoption of the multi-hazard

Figure 6-3.a: City of Berry Hill Plan Resolution 2020

mitigation plan prepared by Metro, as Metro agencies provide emergency services in the City of Berry Hill and coordination between Metro agencies and Berry Hill agencies will contribute to the effective provision of emergency services;

NOW, THEREFORE, BE IT RESOLVED, as follows:

1. That the City of Berry Hill hereby adopts the Metropolitan Nashville-Davidson County Multi-Hazard Mitigation Plan, dated January 2020, as an official plan of the City of Berry Hill.

2. That this Resolution shall be effective immediately upon its passage and adoption, the public welfare requiring it.

APPROVED AND ADOPTED this 8th day of June, 2020.

GREG MABEY, MAYOR

ATTEST:

CITY RECORDER

Approved as to form and legality:

CITY ATTORNEY

2

Figure 6-3.b: City of Berry Hill Plan Resolution 2020

RESOLUTION NO. 20-921

A RESOLUTION OF THE CITY OF GOODLETTSVILLE BOARD OF COMMISSIONERS ADOPTING AND PARTICIPATING IN THE 2020 METROPOLITAN NASHVILLE - DAVIDSON COUNTY, TENNESSEE MULTI-HAZARD MITIGATION PLAN.

WHEREAS, the County Mayor's Office of Emergency Management has completed an update of the Metropolitan Nashville / Davidson County Multi-Hazard Mitigation Plan, and it was submitted to the Federal Emergency Management Agency and the Tennessee Emergency Management Agency for consideration and approval; and,

WHEREAS, the City of Goodlettsville has participated in the 2020 plan update process, and is committed to the Multi-Hazard Mitigation Plan concept by adoption of the earlier plans; and,

WHEREAS, this plan has been distributed to jurisdictions, agencies and county municipalities for local adoption completion, and Federal emergency funding and grants are conditioned upon adoption of updated plan; and,

WHEREAS, upon submittal of adoption documentation by participating jurisdictions, the Federal Emergency Management Agency will issue formal approval of the 2020 Metropolitan Nashville - Davidson County Multi-Hazard Mitigation Plan.

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF COMMISSIONERS OF THE CITY OF GOODLETTSVILLE, TENNESSEE:

SECTION 1: That the City of Goodlettsville, Tennessee hereby adopts and will participate in the principal Multi-Hazard Mitigation plan for Metropolitan Nashville – Davidson County, Tennessee, as one of the municipal governments within Davidson County, Tennessee.

SECTION 2: That this Resolution shall be in full force and effective from and upon its passage approval.

This resolution is read and adopted at public meeting this 14th day of May, 2020.

Adopted: May 14, 2020

MAYOR JEFF G. DUNCAN

CITY RECORDER

APPROVED AS TO FORM AND LEGALITY

CITY ATTORNEY

Figure 6-4: City of Goodlettsville Plan Resolution 2020

RES 21-04-01-70

A RESOLUTION ADOPTING THE METROPOLITAN NASHVILLE-DAVIDSON COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the City of Oak Hill 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 save taxpayer dollars; and

WHEREAS, an adopted hazard mitigation plan is required as a condition of future federal and state grant funding for mitigation projects; and

WHEREAS, the Metropolitan Government of Nashville and Davidson County (Metro) prepared a multi-hazard mitigation plan pursuant to the requirements of the Disaster Mitigation Act of 2000, for the metropolitan area, comprising 533 square miles and encompassing the City of Oak Hill, and invited comment from the City of Oak Hill in preparing said plan; and

WHEREAS, the Board of Commissioners of the City of Oak Hill finds that the interest of the city and its citizens will be served by the adoption of the multi-hazard mitigation plan prepared by Metro, as Metro agencies provide emergency services in the City of Oak Hill and coordination between Metro agencies and Oak Hill agencies will contribute to the effective provision of emergency services;

NOW, THEREFORE, *BE IT RESOLVED,* as follows:

1. That the City of Oak Hill hereby adopts the Metropolitan Nashville-Davidson County Multi-Hazard Mitigation Plan, revised January 2020.

2. That this Resolution shall be effective immediately upon its passage and adoption, the public welfare requiring it.

APPROVED AND ADOPTED THIS 21st day of April, 2021.

Dale Grimes, Mayor

Victoria Talbott, City Recorder

Comp tsm

Figure 6-5: City of Oak Hill Plan Resolution 2021

RESOLUTION NO. 2020-04

A RESOLUTION ADOPTING THE METROPOLITAN NASHVILLE-DAVIDSON COUNTY MULTI-HAZARD MITIGATION PLAN

WHEREAS, the City of Forest Hills 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 save taxpayer dollars; and

WHEREAS, an adopted hazard mitigation plan is required as a condition of future federal and state grant funding for mitigation projects; and

WHEREAS, the Metropolitan Government of Nashville and Davidson County (Metro) prepared a multi-hazard mitigation plan pursuant to the requirements of the Disaster Mitigation Act of 2000, for the metropolitan area, comprising 533 square miles and encompassing the City of Forest Hills, and invited comment from the City of Forest Hills in preparing said plan; and

WHEREAS, the Board of Commissioners of the City of Forest Hills finds that the interest of the city and its citizens will be served by the adoption of the multi-hazard mitigation plan prepared by Metro, as Metro agencies provide emergency services in the City of Forest Hills and coordination between Metro agencies and Forest Hills agencies will contribute to the effective provision of emergency services;

NOW, THEREFORE, BE IT RESOLVED, as follows:

1. That the City of Forest Hills hereby adopts the Metropolitan Nashville-Davidson County Multi-Hazard Mitigation Plan, revised January 2020.
2. That this Resolution shall be effective immediately upon its passage and adoption, the public welfare requiring it.

APPROVED AND ADOPTED THIS 21st day of May, 2020

Mayor Lanson J. Hyde, III, Mayor

Aspen Collins, City Recorder

Figure 6-6: City of Forest Hills Plan Resolution 2020

Other Adoptions

TENNESSEE STATE UNIVERSITY
3500 JOHN A. MERRITT BOULEVARD
NASHVILLE, TENNESSEE 37209-1561

OFFICE OF
THE PRESIDENT

Date: August 7, 2020

To: The Metropolitan Government of Nashville and Davidson County

Re: The Metropolitan Government of Nashville and Davidson County
Multi-Hazard Mitigation Plan

Tennessee State University is committed to ensuring the safety and well-being of citizens and property against hazards that have the potential for causing damage and/or loss of life. Accordingly, it is prudent to take appropriate steps to lessen the potential effects of such events or to eventually prevent their occurrence altogether.

TSU recognizes that undertaking mitigation efforts before hazards occur will reduce the potential for harm to people and property, as well as save costs. TSU further understands that the adoption of the 2020 Multi-Hazard Mitigation Plan is required as a condition of future federal and state grant funding for mitigation projects.

By virtue of the powers and authority vested in me as President of Tennessee State University through the Tennessee State University Board of Trustees' delegation of authority to me to conduct the University's operational affairs, Tennessee State University hereby adopts the 2020 Metro Nashville-Davidson County Multi-Hazard Mitigation Plan.

Sincerely,

Dr. Glenda Glover
President

Figure 6-7: TSU Adoption 2020

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Multi-Hazard Mitigation Plan
7.0 Plan Implementation and Maintenance

IMPLEMENTATION

44 CFR 201.6(c)(4): "{The plan maintenance process shall include a} section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle."

Step 10 of the Plan Development Process: Implementation and Maintenance of the Plan is critical to the overall success of Hazard Mitigation Planning. Upon adoption, the plan faces the truest test of its worth: implementation. Implementation implies two closely related concepts: action and priority.

While this plan recommends many worthwhile and "High" priority actions, the decision about which action to undertake first will be the first issue the CPT faces. Fortunately, there are two factors that will help the CPT make that decision, items that have been prioritized during planning and funding. Thus, pursuing low or no-cost high-priority recommendations will have the greatest likelihood of being the first steps.

Another important implementation mechanism that is highly effective but low-cost, is to take steps to incorporate both the recommendations and the underlying principles of this Hazard Mitigation Plan into other community plans and mechanisms, such as Comprehensive Planning, Capital Improvement budgeting, Economic Development goals and incentives, or regional plans such as those put forth by the State Department of Transportation. Mitigation is most successful when it is incorporated into the day-to-day functions and priorities of government and development. The best chance for the plan's success is if CPT staff and elected officials maintain a vigilance to incorporate the plan into operations. This integration is accomplished by a constant, prevailing, and energetic effort to network among programs and to identify and highlight the multi-objective, "win-win" benefits for each affected program, as well as the communities and constituents. This effort is achieved through the routine actions of monitoring agendas, attending meetings, sending memos, and promoting safe, sustainable communities.

In concert with these efforts, it is important to maintain constant monitoring of funding opportunities that can be leveraged to implement some of the more costly recommended actions. This will include creating and maintaining a bank of ideas on how any required local match or participation requirement can be met. Then, when funding does become available, the CPT will be in a position to capitalize upon the opportunity. Funding opportunities that can be monitored include special pre- and post-disaster funds, special district budgeted funds, state or federal ear-marked funds, and grant programs, including those that can serve or support multi-objective applications.

The standing CPT has previously met annually to review and update any part of this plan; but starting in 2020, the CPT has agreed to meet on a quarterly basis. This Committee, led by OEM, agrees to commit to:

- Act as a forum for hazard mitigation issues;
- Disseminate hazard mitigation ideas and activities to all participants;
- Pursue the implementation of the high priority, low/no-cost Recommended Actions;
- Keep the concept of mitigation in the forefront of community decision-making by identifying recommendations of this plan when other community goals, plans and activities overlap, influence, or directly affect community vulnerability to disasters;
- Maintain vigilant monitoring of multi-objective cost-share opportunities to assist the community in implementing the Recommended Actions of this plan for which no current funding or support exists;
- Monitor implementation of this Plan;
- Report on progress and recommended changes to the Metro Council; and
- Inform and solicit input from the public.

The Committee does not have any powers over Metro staff; it will be an advisory body only. Its primary duty is to see that the Plan is carried out successfully and to report to the Metro Council and the public on the status of Plan implementation and mitigation opportunities in Nashville and Davidson County. Other duties include reviewing and promoting mitigation proposals, hearing stakeholder concerns about hazard mitigation, passing concerns on to the appropriate entities, and posting relevant information on the Metro website.

MAINTENANCE

Plan maintenance implies an ongoing effort to monitor and evaluate the implementation of the plan, and to update the plan as progress, roadblocks, or changing circumstances are recognized.

Previously, informal ad hoc reviews have been held to cover a multitude of planning areas (including this plan); however, moving forward, formal quarterly reviews (including any additional reviews needed) will be held and documented within this plan.

This monitoring and updating will take place through a quarterly review, with an annual report by OEM and the standing CPT, and a 5-year written update to be submitted to the state and FEMA Region IV, unless disaster or other circumstances (e.g., changing regulations) lead to a different time frame. CRS requires an annual re-certification report.

When the Committee reconvenes for the reviews they will coordinate with all of the stakeholders that participated in the planning process, or that have joined the Committee since the inception of the planning process, to update and revise the plan. Public notice will be given and public participation will be invited, at a minimum, through available web postings and press releases to the local media outlets, when a large written revision is anticipated.

The evaluation of the progress can be achieved by monitoring changes in the degree of vulnerability identified in the plan. Changes in vulnerability status can be identified by noting:

- Lessened vulnerability as a result of implementing Recommended Actions;
- Increased vulnerability as a result of failed or ineffective mitigation actions;
- Increased vulnerability due to hazard events; and/or
- Increased vulnerability as a result of new development (and/or annexation).

Updates to this plan will:

- Consider changes in vulnerability due to action implementation,
- Document success stories where mitigation efforts have proven effective,
- Document areas where mitigation actions were not effective,
- Document any new hazards that may arise or were previously overlooked,
- Incorporate new data or studies on hazards and risks,
- Incorporate new capabilities or changes in capabilities,
- Incorporate growth and development-related changes to inventories, and
- Incorporate new action recommendations or changes in action prioritization.

The plan will be updated via written changes and submissions, as the Committee deems appropriate and necessary, and as approved by the Metro Council.

The Committee will have Action Review meetings quarterly to ensure the action items contained in this plan are maintained and updated.

Nature of Change	Date of Change	Page (s) affected	Changes made by
Plan Creation	April 2005	All	OEM/KP
Plan Revision	September 2009	All	OEM/HJJ
Plan Adoptions	October 2010	6-3 to 6-10	OEM/HJJ
Plan Revision	September 2012	All	OEM/HJM
Plan Revision	January 2015	All	OEM/HJM
Plan Adoptions	June 2015	Sections 3, 6, 7	OEM/HJM
Plan Revision	September 2019	All	OEM/HJM

Table 7-1: Plan Record of Changes

Incorporation into Existing Planning Mechanisms

Where possible, plan participants will use existing plans and/or programs to implement hazard mitigation actions. Based on the capability assessment, Metropolitan Nashville & Davidson County will continue to plan and implement programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through the following plans:

- General or master plans of participating jurisdictions;
- Ordinances of participating jurisdictions;
- Emergency Operations Plan;
- Capital improvement plans and budgets;
- Other community plans, such as, stormwater master plans, and parks and recreation plans;
- Other plans and policies outlined in Section 4.3, Capability Assessment.

CPT members involved in updating these existing planning mechanisms will be responsible for integrating the findings and actions of the mitigation plan, as appropriate. This includes incorporation of mitigation actions into any updates to this Multi-Hazard Mitigation Plan, Metro Nashville & Davidson County Emergency Operations Plan; Metro Nashville & Davidson County THIRA and any comprehensive County planning efforts.

The CPT is also responsible for monitoring this integration and incorporating the appropriate information into the five-year update of the multi-hazard mitigation plan.

Continued Public Involvement

The update process provides an opportunity to publicize success stories from the plan's implementation and seek additional public comment. Information will be posted in local newspapers, such as the *Tennessean*, and on the OEM website following the annual

review/report of the mitigation plan. A public hearing(s) to receive public comment on plan maintenance and updating will be held during the update period. When the CPT reconvenes for the update, they will coordinate with all stakeholders participating in the planning process, including those who joined the CPT after the initial effort, to update and revise the plan. Public notice will be posted and public participation will be invited, at a minimum, through available website postings and press releases to the local media outlets, primarily newspapers. The CPT will also coordinate this public outreach process with the public information program established pursuant to the most current guidelines from the CRS.

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Multi-Hazard Mitigation Plan
Appendix A – Planning Process

The Nashville Office of Emergency Management (OEM) facilitated the revision of this 2020 Multi-Hazard Mitigation Plan.

Specific tasks included:

- Establishing a planning organization for Nashville and Davidson County and all of the participants;
- Meeting all of the DMA requirements as established by federal regulations, following FEMA's planning guidance;
- Facilitating the entire planning process;
- Coordinating the DMA planning process with the Community Rating System planning process; and
- Developing and facilitating the Public Input process.
- Identifying the data requirements that the participating counties, communities, and other FEMA "eligible applicants" could provide, and conduct the research and documentation necessary to augment that data;
- Producing the Draft and Final Plan documents.

Community Planning Team (CPT)

The DMA planning regulations and guidance ardently stress that each local government seeking the required FEMA approval of its mitigation plan must participate in the process. The Community Planning Team (CPT) is composed of Metro staff and outside agencies. The following members participated on the Community Planning Team, or were participating as Stakeholders or Subject Matter Experts:

Table A-1: CPT Members

Name	Agency / Title	Phone	E-mail
Heidi Mariscal	OEM/ Planning, Training, Exercise	615-862-8530	Heidi.Mariscal@nashville.gov
Amanda Rhinehart	Forest Hills/ City Mgr	615-372-8677	Amanda.rhinehart@cityofforesthills.com
Byron Hall	Metro Codes/ Asst. Director	615-862-6521	Byron.hall@nashville.gov
Chris Runyon	Metro Public Works/ Technical Specialist	615-862-8712	Chris.runyon@nashville.gov
David Kitchens	TEMA/ District Coordinator	615-741-2476	David.kitchens@tn.gov
Gary Goodwin	Goodlettsville/ Police Chief	615-851-2223	ggoodwin@cityofgoodlettsville.gov
Greg Claxton	Metro Planning/ Community Plans	615-862-7162	Gregory.claxton@nashville.gov
Jack Baxter	NES/ Operations Manager – System Operations	615-747-3683	jbaxter@nespower.com
James LaRosa	National Weather Service/ Hydrologist	615-754-8502	james.larosa@noaa.gov
Anna Kuoppamaki	MWS/Planner I-GIS Analyst	615-862-4792	Anna.kuoppamaki@nashville.gov
Jeff Clawson	Oak Hill/ City Mgr	615-371-8291	Jeff.clawson@oakhilltn.us
Jeff Duncan	MWS/ Lead Engineer-Capital Projects Inspector	615-862-4959	Jeff.duncan@nashville.gov
Jennifer Higgs	Metro Planning-ITS/ GIS Director	615-880-3416	Jennifer.higgs@nashville.gov
Joe Baker	Berry Hill/ City Mgr	615-292-5531	jbaker@berryhilltn.net
Joshua Wickham	TEMA/ Regional Planner	615-741-0001	Joshua.Wickham@tn.gov
Kenneth Reeves	Goodlettsville/ Fire Chief	615-851-2245	kreeves@goodlettsville.gov
Michael Hunt	MWS/ System Services Manager	615-880-2420	Michael.Hunt@nashville.gov
Rachel Franklin	Metro Public Health/ Communicable Disease & Emergency Preparedness Bureau Director	615-340-5691	Rachel.franklin@nashville.gov
Renee Jackson	MWS/ Lead Engineer-Stormwater Maintenance	615-862-4724	Renee.jaskcon@nashville.gov
Beth Reardon	Belle Meade/ City Mgr	615-297-6041	breardon@cityofbellemeade.org
Ricky Swift	MWS/Manager-Stormwater Maintenance	615-862-4784	Ricky.swift@nashville.gov
Roger Lindsey	MWS/ Program Manager	615-862-4706	Roger.Lindsey@nashville.gov
Ron Zurawski	TGS/ State Geologist	615-532-1502	Ronald.zurawski@tn.gov
Shannon Williams	USGS/ Associate Director, Hydrologic Data Program	615-837-4755	swilliam@usgs.gov
Steve Lewis	Metro Police/ Lieutenant	615-862-7740	Stephen.lewis@nashville.gov
Tim Coleman	Berry Hill/ Police Chief	615-297-4701	tcoleman@berryhilltn.net
Tim Eads	Belle Meade/ Chief of Police	615-297-0241	teads@cityofbellemeade.org
Tim Henderson	Nashville Fire/ Deputy Director Chief	615-862-5421	Timothy.henderson@nashville.gov
Tim Young	Metro Public Works/ Technical Specialist I	615-862-8752	Tim.young@nashville.gov
Tom Palko	MWS/ Assistant Director	615-862-4510	Tom.Palko@nashville.gov

Tommy Campsey	Oak Hill/ Safety Coordinator	615-557-7329	safetycoordinator@oakhilltn.us
Tyler Wortham	MWS/ Engineer in Training-Stormwater Maintenance	615-862-4724	Tyler.Wortham@nashville.gov
William Robinson	Metro Public Works/ Technical Specialist	615-880-1680	William.robinson@nashville.gov

Table A-2: Plan Stakeholders or Subject Matter Experts

Name	Agency / Title	Phone	E-mail
Cindy Popplewell	AMEC-MWS/ Senior Project Manager	615-333-0630	Cindy.popplewell@amec.com
Mark Becknal	Goodlettsville Fire/ Deputy Chief	615-851-2245	mbecknal@cityofgoodlettsville.org
Tim Ellis	Goodlettsville/ City Mgr	615-851-2200	tellis@cityofgoodlettsville.org
April Khoury	Belmont University/ Director of Risk Mgmt.	615-460-6766	april.khoury@belmont.edu
Curtis Johnson	TN State University/ Assoc. VP Adm.	615-963-1489	johnsonc@Tnstate.edu
Ellery Cunningham	Metro Nashville Schools/ Safety Director	615-259-8747	Ellery.Cunningham@mnps.org
Greg Dawson	Trevecca University/ Director of Security	615-248-1507	GDawson@trevecca.edu
Hugues Siffrard	Fisk University/ Captain	615-485-8583	hsiffrard@fisk.edu
James Tabor	Metro Public Health/	615-340-0405	james.tabor@nashville.gov
John Cochran	NES/ System Operations Supervisor	615-747-3906	jcochran@nespower.com
Johnny Vanderpool	Vanderbilt/ Director of Public Safety	615-322-2745	johnny.vanderpool@vanderbilt.edu
Kareem Bonugli	Metro Water Services/ CRS	615-862-2317	Kareem.Bonugli@nashville.gov
Mickey West	Fisk University/ Safety Chief	615-329-8680	mwest@fisk.edu
Mike Armistead	Nashville Fire/ Special Operations	615-862-5486	Michael.Armistead@nashville.gov
Steve Lopez	Fisk University/ Captain	615-329-8777	slopez@fisk.edu
Thomas Graham	TN State University/ Director EM	615-963-1246	tgraham5@Tnstate.edu

Additional Agencies and Organizations

Additional agencies and organizations interested in Metro Nashville and/or natural hazards were contacted to see if they were doing anything that might affect the community's program and to see how they could support the community's efforts (see Figure A-1). The following key agencies were contacted:

- American Red Cross;
- CSX Intermodal Terminals;
- Davidson County Soil Conservation District;
- FEMA Region 4, Hazard Mitigation Office;
- Home Builders Association of Middle TN;
- Nashville Chamber of Commerce;
- Nashville Downtown Partnership;
- Nashville Humane Association
- Nashville Zoo;
- National Flood Insurance Program (NFIP) State Coordinator;
- Nissan Stadium;
- Rivive Nashville/Nashville Waterways Consortium;
- Small Business Administration;

- TN Association of Independent Schools;
- TN Department of Economic and Community Development;
- TN Department of Transportation;
- TN Emergency Management Agency;
- TN Environmental Council;
- TN Valley Authority;
- TN Wildlife Resources Agency;
- U.S. Army Corps of Engineers, Nashville District;
- U.S. Coast Guard, Marine Safety Detachment Nashville;
- U.S. Department of Agriculture;
- U.S. Fish and Wildlife Service;
- UT/TSU Extension, Institute of Agricultural;
- Waste Management Solutions;
- WeGo Public Transport/Regional Transportation Authority;

In addition, technical data, reports, and studies were obtained from these agencies and others, either through web-based resources or directly from the agencies. Some additional agencies contacted throughout the planning process include:

- TN Division of Forestry, Highland Rim District
- TN State Parks, Radnor Lake Park
- TN Department of Environment and Conservation

Since Nashville Davidson County has so many higher educational facilities within its jurisdiction, some of the larger local Universities and others were invited to participate in the revision of this multi-hazard mitigation plan. The following universities were contacted:

- Belmont University
- Fisk University
- Lipscomb University
- Metro Nashville Public Schools
- TN State University
- Trevecca University
- Vanderbilt University

Neighboring communities were also contacted and provided an opportunity to take part in the community planning team meetings, and were added to the email group to ensure constant communication with the planning (see figure A-2). These communities have previously officially adopted this plan in 2015 as their Multi-Hazard Mitigation plan, and will be asked to officially adopt or opt out again this revision. These communities included:

- Belle Meade;
- Berry Hill;
- Forest Hills;
- Goodlettsville;
- Oak Hill

The following jurisdictions have participated in the planning process and are seeking approval with this plan: Metro Nashville Davidson County, the cities of Belle Meade, Berry Hill, Forest Hills, Goodlettsville, Oak Hill; and the TN State University.

NASHVILLE OFFICE OF EMERGENCY MANAGEMENT

EMERGENCY OPERATIONS CENTER
Director William Swann

David Briley, Mayor

March 18th, 2019

<Name>
<Title>
<Organization>

Re: Multi-Hazard Mitigation Plan Update

Dear <name>:

As required in 44 CFR §201.6, Local Hazard Mitigation Plans must be reviewed, revised and resubmitted to the Federal Emergency Management Agency (FEMA) for approval every 5 years, and we are starting the planning process for this year's plan revision now. This review and revision may include changes such as hazard identifications/priorities, demographic changes, etc. that have occurred since the last revision in 2015. This regulation further states that local plans must be submitted in order to maintain continued eligibility for any of the following mitigation grant programs administered by FEMA:

Hazard Mitigation Grant Program (HMGP) (post disaster funding)
Pre-Disaster Mitigation Competitive Program (PDM-C)
Flood Mitigation Assistance Program (FMA)
Severe Repetitive Loss Program (SRL)

Metro Nashville and Davidson County and the Community Planning Team are working on revising and submitting this plan by the end of October 2019.

Because of your interest in Metro Nashville Davidson County and/or natural and manmade hazards, we are sending you this notice to ask that you please advise us if you have any studies, plans, programs, activities or ideas that could help us in our efforts to identify the best ways to reduce the dangers and damage from natural and manmade hazards.

In addition, if you are interested in participating or commenting in this review and revision process, please do not hesitate to let us know and we will inform you of future meetings and opportunities. We also have more information and the current plan on our website: www.oem.nashville.gov, and a public input survey available as well: https://www.surveymonkey.com/r/2019_Davidson_Hazmit_Plan_Input.

Thank you for your assistance,

Heidi J. Mariscal, MEP
Planning, Training & Exercise Coordinator

Cc: William Swann, OEM Director/Nashville Fire Chief
Jay Servais, OEM Deputy/Nashville Fire District Chief
Hazard Mitigation Plan Community Planning Team

2060 15th Avenue South • Nashville, TN 37212 • Phone: (615) 862-8530 • Fax: (615) 862-8534 • oem@nashville.gov

Figure A-1: Initial Coordination Mail Merge Letter

Mariscal, Heidi (OEM)

From: Servais, Jay (NFD)
Sent: Friday, March 1, 2019 2:06 PM
To: Reardon, Beth (Belle Meade)
Cc: Mariscal, Heidi (OEM)
Subject: Fwd: Important Hazard Mitigation Plan
Attachments: Belle Meade fillable MOA 2019.pdf; revision timeline 2019.pdf

Get Outlook for iOS

---------- Forwarded message ----------
From: **"Mariscal, Heidi (OEM)"** <Heidi.Mariscal@nashville.gov>
Date: Fri, Mar 1, 2019 at 12:47 PM -0600
Subject: Important Hazard Mitigation Plan
To: "Servais, Jay (NFD)" <Jay.Servais@nashville.gov>

Beth Reardon breardon@citybellemeade.org

Good Afternoon!

As you probably already know, Metropolitan Nashville and Davidson County government has a Multi-Hazard Mitigation Plan led by our Office of Emergency Management (OEM). Every five (5) years a multi-agency planning team convenes and revises this local mitigation plan, including associated mitigating activities, and submits it to the Tennessee Emergency Management Agency (TEMA) and in turn to the Federal Emergency Management Agency (FEMA). This process meets the requirements of the Stafford Act and Title 44 Code of Federal Regulations (CFR) §201.6, which continues our eligibility for FEMA hazard mitigation project grant funding. Specially, §201.6(d)(3) reads:

> *A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within five (5) years in order to continue to be eligible for mitigation project grant funding.*

The purpose of hazard mitigation is to reduce potential losses from future disasters. Therefore, our plan focuses on sustained actions we can take to reduce or eliminate the long-term risk to human life and property from hazards in our area. Our mitigation activities may be implemented prior to, during, or after an event, however, we prefer to concentrate on the long-term plan that is developed before a disaster occurs.

Since we have multiple satellite cities (jurisdictions) within Davidson county, it is important to keep this plan a multi-jurisdictional plan so all jurisdictions are covered by this plan and in turn are eligible for hazard mitigation grant funding. Due to this plan being multi-jurisdictional, it is necessary that each jurisdiction has participated and met the requirements spelled out:

- The plan must list the jurisdiction(s) participating in the plan.
- The plan must identify who represented each jurisdiction, including at a minimum: the persons position/title and agency within the jurisdiction.
- For each jurisdiction seeking plan approval, the plan must document how they were involved in the planning process. This may include documented meetings attended, data provided, and/or stakeholder and public involvement activities offered. Sections where involvement requirements are checked: Planning process, Hazard Identification & Risk Assessment, Mitigation Strategy, Plan review, evaluation & implementation.
- Each jurisdiction must have its governing body adopt the final plan.

This year we are starting new Memorandums of Agreement (MOA) with all of our satellite cities to ensure complete jurisdictional compliance. Please read over and fill out the attached (fillable) MOA and submit it back to OEM, specially our planner Heidi Mariscal. The initial kick off meeting will be held on March 14th @ 10am.

If you have any questions regarding this email or the attached MOA, please do not hesitate to reach out to our planner Heidi Mariscal (615-880-2950 or Heidi.mariscal@nashville.gov), who has successfully led the planning team to numerous accepted plans over the years.

Thank you for your continued coordination,

1

Figure A-2: Initial email to Satellite Cities

MEETING MINUTES

The CPT met numerous times during the planning process. Meeting minutes are attached for each of these meetings. Meeting dates were scheduled for the following:

- May 14th, 2019 – Kick off meeting
- April 9th, 2019 – HIRA & Consequence Analysis Meeting
- April 17th, 2019 – Public Input Session-1
- May 1st, 2019 – PIO Public Campaign Coordination Meeting
- May 2nd, 2019 – Public Input Session-2
- May 16th, 2019 – Plan Review Updates Meeting
- June 20th, 2019 – Mid-Term Review Meeting
- July 18th, 2019 – PIO Public Campaign Coordination Meeting
- July 30th, 2019 – Draft Plan Review Meeting
- August 7th, 2019 – Public Input Session-3
- August 22nd, 2019 – Draft Plan Review Meeting
- September 25th, 2019 – Final Plan Review Meeting

METRO NASHVILLE-DAVIDSON COUNTY
MULTI-HAZARD MITIGATION
PLANNING COMMITTEE

Full Revision Kick-Off Meeting
Thursday, March 14th, 2019
10 A.M.-11:30 A.M.
Nashville Emergency Operations Center,
2060 15th Ave South, Nashville, TN

Agenda

10:00 am	Welcome/Introductions	OEM/Heidi Mariscal
	Plan Revision Background	
	Community Rating System (CRS)	
	Expectations	
	Timeline	
	Public Input Survey	
	Public Information Officers	
	Initial 'homework'	
	Open Floor	
11:30 am	Adjourn	Next Meeting: 3/21 @ 9am

A conference line is made available for anyone needing to teleconference.

External access: 615-862-7300, Call ID: 63003#
Metro access/Metro desk phone: dial 63003

Please keep in mind; conference calls are not ideal for some of these meetings.

Meeting Dates (subject to change)		
March 14	10a - 11:30am	Initial Kick off Mtg.
March 21	9a - 11:30am	HIRA & Consequence Mtg.
April 30	9:30a - 11am	PIO Public Campaign Mtg.
May 16	9a - 11am	Plan Review Updates Mtg.
June 20	9a - 11am	Mid-term Review Mtg.
July 18	9a - 11am	Draft Plan Review Mtg.
August 7	4p - 5pm	Public Input Mtg.
August 15	9a - 11am	Public Review Mtg.
September 12	9a - 11am	Final Plan Review

POC: Heidi Mariscal, Nashville Office of Emergency Management
615-880-2950, Heidi.Mariscal@nashville.gov

CPT Meeting Minutes, March 14th, 2019

CPT Members in Attendance:

Heidi Mariscal/ OEM
Anna Kuoppamaki/ MWS
Marty Sewell/ Metro Planning (designee for Greg Claxton)
Ronnie Hall/ Berry Hill (designee for Joe Baker)
Kenneth Reeves/ Goodlettsville Fire Chief
Michael Hunt/ MWS
James Tabor/ Metro Public Health (designee for Rachel Franklin)
Ricky Swift/ MWS Stormwater
Ron Zurawski/ TN Geological Survey
Tim Coleman/ Berry Hill Police Chief
Tim Eads/ Belle Meade Police Chief
Tim Young/ Metro Public Works
Tom Palko/ MWS
William Robinson/ Metro Public Works

Stakeholders/SME in Attendance:

Steve Keel/ Metro Schools (designee for Ellery Cunningham)
Greg Dawson/ Trevecca University
Johnny Vanderpool/ Vanderbilt University
Kareen Bonugli/ Metro Water-CRS
Cindy Popplewell/ Metro Water - Wood

- Heidi started the meeting at around 10:00am. She explained that this was the initial kick off meeting for the 5 year Multi Hazard Mitigation Plan revision.

- Heidi gave some background for the Multi-Hazard Mitigation Plan (MHMP)
  - An avenue for multiple federal assistance programs including Hazard Mitigation Funding and the NFIP Community Rating System (CRS).
  - Meets the requirements for 44 Codes of Federal Regulations (CFR), Stafford Act
  - Need to review the plan annually and do a total revision every 5 years
  - FEMA approves the final plan
  - Multi-Hazard Mitigation Planning is not just about flooding but all potential hazards in the area
  - This year we invited the university's in the area to be more involved as stakeholders because they cover a large portion of the community
  - This year we also created Memorandums of Agreement (MOA's) with all our Satellite cities to assist them with the planning process and their integration.

- NFIP CRS (Community Rating System) was briefly discussed.
  - In place to help save the community money on flood insurance premiums

- Currently we have a CRS rating 8, which gives the community a 10% discount on flood insurance premiums.

- OEM District Chief Servais said a few words about upcoming events and meetings, and his appreciation for everyone's involvement in this very important plan.

- MHMP overview and who should be looking at each section. (PowerPoint presentation)
  - 1.0 Introduction, Purpose and Need
  - 2.0 Community Profile
    - Metro Planning is a major player
    - Universities can add more information here on their profile
  - 3.0 Planning Process
    - Steps of the planning process including how the CRS requirements mirror
  - 4.0 Risk Assessment
    - All CPT (Community Planning Team) heavily involved
    - This section develops our risk scores
    - Topic of next meeting 4/21/19
  - 4.1 Hazard Identification
    - SME agencies heavily involved
  - 4.2 Vulnerability & Consequence Assessment
    - Metro Planning heavily involved
    - Consequence Analysis consideration and impacts
    - All CPT involved
  - 4.3 Capability Assessment
    - All CPT involved
  - 5.0 Mitigation Strategy
    - All CPT involved
    - Three main goals and many objectives
    - Action Plan
      - List and details of action items
  - 6.0 Plan Adoption
    - Metropolitan Government of Nashville & Davidson County
    - Satellite Cities
    - FEMA will review, approve, then send it back for everyone's final adoption
  - Appendices
    - Makes up about half of the entire plan with support/back-up data
    - Planning meeting minutes
    - Public involvement information
    - Maps
    - Etc.

- Expectations
  - Everyone needs to participate

- We must meet deadlines.
  - Stick to the Hazard Mitigation Plan Revision Timeline sheet
  - There is some flexibility included in the timeline due to the nature of our jobs, but we need to be able to meet the State and Federal timeline at the end.
- Provide valuable and accurate information
  - Cite accurate sources
- Offer suggestions

- Public Involvement
  - Initial public input survey is drafted and will soon be available to the public for plan input
    - Will be sent to everyone to make comments/adjustments
      - Metro planning (GIS/IT) offered to fix map on survey
      - Suggested to involve pets in MHMP to get public engaged
    - Encouraged to put survey on social media to get more of the public involved
      - Make sure to document all ways of public engagement and send to Heidi
        - Such as a screen shot of a social media post etc.
  - Public Information Officers:
    - Will have meeting on 4/30/19 to discuss joint public campaigns and come up with a solid public awareness plan
    - Asked to notify all agencies public information officers to attend upcoming meeting 4/30/2019
    - Make sure to inform them why they are needed to attend and what your agencies role is in the plan and the planning process
    - Give them a brief description of the MHMP
  - It was mentioned to have a public meeting at the beginning of the planning process for the CRS program. Heidi will schedule as soon as possible.

- Homework
  - Read the MHMP
    - Understand it and where everything is located
    - Mark areas where you can contribute
  - Start gathering information and working on what you can revise
  - Bring revised sections to the meeting on 5/16/2019
  - Bring suggestions on who to add/invite for future meetings ("stakeholders")
    - Suggested TDOT, CSX, MTA/RTA, Coastguard, Army Corps of Engineers, TVA, TWRA, Chamber of Commerce, Small Business Administration, Large businesses, Nashville Zoo, Private schools and the Nashville Humane Assoc. etc.
  - Think of any additional public awareness ideas
  - Start looking at section 4 for next meeting on 3/21/2019.
  - Notify Heidi of any conflicts with meeting dates
- Meeting ended around 11:00am

METRO NASHVILLE-DAVIDSON COUNTY
MULTI-HAZARD MITIGATION
PLANNING COMMITTEE

THIRA & Consequence Analysis Meeting
Tuesday, April 9th, 2019
9 A.M.-11:30 A.M.
Nashville Emergency Operations Center,
2060 15th Ave South, Nashville, TN

Agenda

9:00 am	Welcome/Introductions	OEM/Heidi Mariscal
	THIRA Results & Approval	
	Consequence Analysis Review	
	Open Floor	
11:30 am	Adjourn	Public Input Session: 4/17, 4pm Next Meeting: 5/1 @ 9:30am

Conference line for this meeting

External access: 615-862-7300, Call ID: 63003#
Metro access/Metro desk phone: dial 63003

Meeting Dates (subject to change)		
~~March 14~~	~~10a - 11:30am~~	~~Initial Kick off Mtg.~~
~~April 9~~	~~9a - 11:30am~~	~~HIRA & Consequence Mtg.~~
April 17	4p-5pm	Public Input Session
May 1	9:30a - 11am	PIO Public Campaign Mtg.
May 2	5p - 6pm	Public Input Session
May 16	9a - 11am	Plan Review Updates Mtg.
June 20	9a - 11am	Mid-term Review Mtg.
July 18	9a - 11am	Draft Plan Review Mtg.
August 7	4p - 5pm	Public Input Session

POC: Heidi Mariscal, Nashville Office of Emergency Management
615-880-2950, Heidi.Mariscal@nashville.gov

CPT Meeting Minutes, April 9th, 2019

CPT Members in Attendance:

Anna Kuoppamaki/ MWS
Byron Hall/ Metro Codes
Heidi Mariscal/ OEM
James LaRosa/ National Weather Service (via conference call)
Jennifer Higgs/ Planning-ITS
Joe Baker/ Berry Hill
John Cochran/ NES (designee for Jack Baxter)
Kenneth Reeves/ Goodlettsville Fire Chief
Larry Clymer/ Nashville Fire (designee for Tim Henderson)
Michael Hunt/ MWS
Roger Lindsey/ MWS
Ron Zurawski/ TN Geological Survey
Terry Richards/ Metro Police (designee for Steve Lewis)
Tim Eads/ Belle Meade
Tom Palko/ MWS
Tommy Campsey/ Oak Hill
William Robinson/ Metro Public Works

Stakeholders/SME/Guests in Attendance:

April Khoury/ Belmont University (via conference call)
Cindy Popplewell/ Metro Water - Wood
Emily Hudson/ community member
Kareem Bonugli/ Metro Water-CRS
Mac Berklacich/ TN Office of Homeland Security
Mike Armistead/ Nashville fire
Thomas Graham/ TSU

- Heidi started the meeting at around 9:10am. She explained that this was the THIRA and Consequence Analysis meeting for the 5 year Multi Hazard Mitigation Plan revision.

- Heidi brought up how there is a new Share Point site that we will be using to submit edits, be able to see documents (agenda, meeting minutes, original documents, timelines etc.). An email will go out today inviting everyone to the site. If you have someone that needs access, please let Heidi know.

- Heidi brought up the suggestion (from TEMA) to have TSU incorporated into this Multi Hazard Mitigation Plan, but to add an annex specifically for TSU so they can personalize it to fit their needs. This will not only help them in the future potentially create their own plan, but will assist them in their mitigation activities in the future as being included in this plan.

- Heidi went over the numbers that were submitted for the overall THIRA. Some discussions on the THIRA included:

- There was discussion on how the Earthquake hazard was so low on the THIRA. This could be mainly in part because the likelihood is lower than other hazards. Ron Z. shared that there have been changes in the earthquake risks/maps etc. Ron Z. agreed to type up this explanation for the plan in section 4.1.

- Due to the possibility of large power outages (grids), the CPT discussed and agreed to have NES have a weighted score for earthquakes since they know more on how earthquakes can damage the power grid etc. This is reflected in the new THIRA.

- Some of the public survey responses mentioned the following:

    - Criminal activity was mentioned as a hazard. This was discussed in detail and the CPT decided that this was best to leave out of this particular plan but to share the information with Metro Police to take into consideration for any of their public outreach etc., as part of collaborating with other agencies and plans.

    - Traffic was also mentioned as a hazard. This was brought up and the CPT decided this was best to leave out of this particular plan.

    - Concern about damage from blasting at the quarry. This was discussed in detail with the CPT and in particular TN Geological Survey member Ron Z. There is not a straight forward response, but the State Fire Marshalls office is over the blasting. The team decided it was best to mention this in the plan in section 4.1 briefly (Ron Z. to type something up), but then to share information from the public with the State Fire Marshalls office for further discussion within their areas.

- The THIRA was approved by the CPT and all members present. (after the meeting, the THIRA had edits and additions from other agencies so updated THIRA's were emailed out for approval from all those that participated.) This approval sheet is available upon request.

- The Consequence Analysis was discussed. Not much needs to be changed in this section, Heidi will review more. Some discussions from this section included:

    - It was discussed on how secondary effects of disasters elsewhere could impact our area like Hurricane Katrina and others. This was noted but no decision was made as to putting anything in this particular plan.

    - It was suggested and agreed upon to add the coordination efforts of the February 2019 flooding and potential massive flooding that was derailed due to the great coordination of the USACE and their dam program. NWS will get details on the historic dam and lake levels so it can be added to 4.1.

- It was suggested to add climate change wording/discussion in the plan, possibly in 4.2. James LaRosa with National Weather Service agreed to type something up to add.

- It was suggested to add something to the plan on how our rapid development may impact the floodways/floodplains in the future. Tom Palko agreed to type something up.

- HOMEWORK. Items discussed that follow up will be needed:

Section / action	Assigned to
4.0 Risk Assessment ▪ Add finalized THIRA to this section.	• Heidi
4.1 Hazard Identification ▪ Ron Z. shared that there have been changes in the earthquake risks/maps etc. Ron Z. agreed to type up this explanation for the plan in section 4.1.	• Ron Z.
▪ Concern about damage from blasting at the quarry. This was discussed in detail with the CPT and in particular TN Geological Survey member Ron Z. There is not a straight forward response, but the State Fire Marshalls office is over the blasting. The team decided it was best to mention this in the plan in section 4.1 briefly	• Ron Z.
▪ It was suggested and agreed upon to add the coordination efforts of the February 2019 flooding and potential massive flooding that was derailed due to the great coordination of the USACE and their dam program. NWS will get details on the historic dam and lake levels so it can be added to 4.1.	• James LaRosa • Heidi • Tom Palko
4.2 Vulnerability & Consequence Assessment ▪ It was suggested to add climate change wording/discussion in the plan, possibly in 4.2. James LaRosa with National Weather Service agreed to type something up to add.	• James LaRosa
Appendices ▪ Add a TSU Annex	• Heidi • Thomas Graham
Other ▪ It was discussed on how secondary effects of disasters elsewhere could impact our area like Hurricane Katrina and others. This was noted but no decision was made as to putting anything in this particular plan. Heidi to review.	• Heidi
▪ It was suggested to add something to the plan on how our rapid development may impact the floodways/ floodplains in the future. Tom Palko agreed to type something up. Heidi to review and find best place in plan for this.	• Tom Palko • Heidi
▪ Start making edits to the entire plan that your agency is or may be involved in and submit via Share Point site.	• EVERYONE

- Meeting ended around 11:15am

Metro Nashville-Davidson County
Multi-Hazard Mitigation Plan
Public Input Session Notes 4/17/2019

CPT Members in Attendance:

Heidi Mariscal/ OEM
Michael Hunt/ MWS
Roger Lindsey/ MWS
Ron Zurawski/ TN Geological Survey
Tom Palko/ MWS

Stakeholders/SME in Attendance:

Curtis Johnson/ TSU
Vincent Higgins/ Belle Meade
Chuck Williams/ Belle Meade PD
Eben Cathey/ Mayor's Office

Guests in Attendance:

Jenny Barnes/ AT&T Public Safety
WM Steffenhagen/ Fire Protection Associations, Inc.
Terry Jo Bichell/ Metro Council Candidate
Cynthia Tieck/ Community – Nashville Percy Priest Cleanup Project

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- First public input session on the Multi-Hazard Mitigation Plan Revision.
  - Nashville Midtown Police Precinct Community Room
  - April 17th, 4pm-5pm
- 5 Community Planning Team members were present; 4 Stakeholders/SME's present; and 4 guests signed in. There were others in attendance that did no sign in, including a few from the Davidson County Assessor's Office.
- Ms. Tieck brought up several good topics of general discussion to the group and some individually. These topics included but were not limited to:
  - Community Planning: She thinks there needs to be more of a push for families to get more products/supplies put together ahead of time, before a disaster strikes.
  - Traffic/roadways: Concern on Couchville Pike, too narrow for evacuations. Concern for evacuation of Woodland Point with one way in and one way out. Reynolds and Bell Rd have no shoulders and is dangerous, especially with all the trucks on it. Concerned about trucks carrying hazardous materials on Bell Rd (used as a cut through due to traffic congestion).
  - Suggested putting a 2nd Fire boat placed on lake near Woodland Point for quicker response.
- Ms. Vivian Wilhoite, Property Assessor, shared information related to TCA §67-5-603 (a)(1), on if your property received substantial damage, you can contact the Assessor's office for a Property Valuation Informal Review, which was extended to April 29, 2019.
- It was suggested to add the Multi-Hazard Mitigation Plan to the digital library catalog for easy access (CRS Requirement)
- The Public Input Session concluded at 5pm with no other community members present.

Metro Nashville-Davidson County
Multi-Hazard Mitigation
Planning Committee

Public Campaign Coordination Meeting
Wednesday, May 1st, 2019
9:30 A.M.-11 A.M.
Nashville Emergency Operations Center,
2060 15th Ave South, Nashville, TN

Agenda

9:30 am	Welcome/Introductions	OEM/Heidi Mariscal
	Multi-Hazard Mitigation Plan Overview	
	THIRA Overview	
	Develop Public Awareness Program	
	- Public Information Committee	
	- Identify hazard areas that a public awareness campaign can be successful	
	- Create a game plan on how to collectively accomplish this public awareness	
	Next Steps	
	Open Floor	
11:00 am	Adjourn	

Conference line for this meeting

External access: 615-862-7300, Call ID: 63018#, Pin: 1212#
Metro access/Metro desk phone: dial 63018, Pin: 1212#

Meeting Dates (subject to change)		
~~March 14~~	~~10a - 11:30am~~	~~Initial Kick off Mtg.~~
~~April 9~~	~~9a - 11:30am~~	~~HIRA & Consequence Mtg.~~
~~April 17~~	~~4p-5pm~~	~~Public Input Session~~
May 1	9:30a - 11am	PIO Public Campaign Mtg.
May 2	5p - 6pm	Public Input Session
May 16	9a - 11am	Plan Review Updates Mtg.
June 20	9a - 11am	Mid-term Review Mtg.
July 18	9a - 11am	Draft Plan Review Mtg.
August 7	4p - 5pm	Public Input Session

POC: Heidi Mariscal, Nashville Office of Emergency Management
615-880-2950, Heidi.Mariscal@nashville.gov

Hazard Mitigation Plan Meeting Minutes, May 1st, 2019

CPT Members in Attendance:

Anna Kuoppamaki/ MWS
Amanda Rhinehart/ Forest Hills (on conference call)
Kenneth Reeves/ Goodlettsville Fire (on conference call w/ Alison Baker)
Heidi Mariscal/ OEM
James LaRosa/ National Weather Service
Joe Baker/ Berry Hill
Michael Hunt/ MWS
James Tabor/ Metro Public Health (designee for Rachel Franklin)
Ron Zurawski/ TN Geological Survey
Terry Richards/ Metro Police (designee for Steve Lewis)
Tim Eads/ Belle Meade
Tommy Campsey/ Oak Hill

Stakeholders/SME/Guests in Attendance:

April Khoury/ Belmont University
Kareem Bonugli/ Metro Water-CRS
Joseph Pleasant/ NFD-OEM (PIO)
Princine Lewis/ Vanderbilt (PIO)
Sonia Allman/ Metro Water (PIO)
Jenn Harrman/ Metro Water (PIO)
Sissy Muro Juarez/ Metro Public Works (PIO)
Jerry Tomlinson/ NFD
Mandy Crow/ Trevecca University (PIO)
Brian Todd/ Metro Public Health (PIO)
Sean Braisted/ Metro Codes (PIO) (on conference call)
Greg Pillon/ Belmont University (PIO)
Holden Sheriff/ NES (PIO)
Leah Taylor/ NES (PIO)
Paula Geruntino/ NES (PIO)

- Heidi started the meeting at around 9:40am. She explained that this was the Public Campaign Coordination Meeting for the Multi Hazard Mitigation Plan revision.

- Heidi explained the purpose and main objective of this meeting, which is to bring all of the different agency PIO's together to create a joint public awareness campaign in relation to the Multi-Hazard Mitigation Plan.

    - Specifically, this is addressed in our Multi-Hazard Mitigation Plan, Goal #2: Promote awareness of hazards and vulnerability among citizens, business, industry and government; Objective 2.1: Develop a seasonal multi-hazard public education campaign to be implemented annually. Recommended actions are listed within the

Goal/objective. A copy of Goal #2 with objective 2.1 is attached to the meeting minutes (handed out at the meeting)

- Heidi did an overview of the Multi-Hazard Mitigation Plan, and highlighted the main areas the PIO's should become familiar with moving forward.

- Heidi did an overview of the THIRA/Threat, Hazard Identification Risk Assessment. This was just recently re-done by the planning committee. The main hazards to our area are shown on the THIRA, which can be found on OEM's website (oem.nashville.gov), or are attached to the meeting minutes (handed out at the meeting). The hazards identified should be the main focus for the public outreach campaign.

- Heidi explained the Public Input Survey that was rolled out in April. The purpose of this public survey was to have open public involvement for the public to comment on the plan during the drafting stage of the plan revision. This survey has received 847 responses as of April 30th. PIO's should take a look at the responses and utilize this information in the public awareness campaign. There are almost 400 comments in the question that asks about suggestions for mitigating actions/activities. (Public survey summary and word clouds attached, and handed out at the meeting.)

- Heidi explained that a Public Awareness Program is being asked of this group of PIO's. This includes the following:
    - Create a Public Information Committee that includes a majority of the agencies represented on the Community Planning Team. This committee will be responsible for creating and maintaining the public awareness program association with the Multi-Hazard Mitigation Plan.
    - From the list of hazards identified in the THIRA, identify what hazard areas a public awareness campaign can be successful.
    - Create a game plan on how to collectively accomplish this public awareness campaign.
    - Execute the plan for the Public Awareness Program.
    - Ensure the Community Planning Team (or lead agency-Heidi Mariscal w/ OEM) for the Multi-Hazard Mitigation plan is aware of all activities associated with this Public Awareness Program.

- Next Steps
    - A sign in sheet went around the room that anyone could sign up to be on the Public Information Committee. Those that signed up but have an asterisk next to their name, only wants to be communicated with (kept in the loop), but not active members.
    - Joseph Pleasant with OEM & Nashville Fire will be reaching out to everyone to move forward with this program.

- Meeting ended around 11am

Metro Nashville-Davidson County
Multi-Hazard Mitigation Plan
Public Input Session Notes 5/2/2019

CPT Members in Attendance:

Heidi Mariscal/ OEM
Michael Hunt/ MWS
Ron Zurawski/ TN Geological Survey
Tim Eads/ Belle Meade

Stakeholders/SME in Attendance:

Shelby Hughes/ Metro PD

Guests in Attendance:

No guests in attendance

- Second public input session on the Multi-Hazard Mitigation Plan Revision.
  - Nashville South Police Precinct Community Room
  - May 2nd, 5pm-6pm

- 4 Community Planning Team members were present; 1 Stakeholders/SME's present; and no guests signed in.

- The Public Input Session concluded at 6pm with no community members present.

METRO NASHVILLE-DAVIDSON COUNTY
MULTI-HAZARD MITIGATION
PLANNING COMMITTEE

Hazard Mitigation Plan Review Meeting
Thursday, May 16th, 2019
9 A.M.-11 A.M.
Nashville Emergency Operations Center,
2060 15th Ave South, Nashville, TN

Agenda

9:00 am	Welcome/Introductions	OEM/Heidi Mariscal
	Revision Reviews	
	Next Steps/Homework	
	Open Floor	
11:00 am	Adjourn	Next Meeting: 6/20 @ 9am

Conference line for this meeting

External access: 615-862-7300, Call ID: 63009#, Pin: 1212#
Metro access/Metro desk phone: dial 63009, Pin: 1212#

Meeting Dates (subject to change)		
~~March 14~~	~~10a - 11:30am~~	~~Initial Kick off Mtg.~~
~~April 9~~	~~9a - 11:30am~~	~~HIRA & Consequence Mtg.~~
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May 16	9a - 11am	Plan Review Updates Mtg.
June 20	9a - 11am	Mid-term Review Mtg.
July 18	9a - 11am	Draft Plan Review Mtg.
August 7	4p - 5pm	Public Input Session

POC: Heidi Mariscal, Nashville Office of Emergency Management
615-880-2950, Heidi.Mariscal@nashville.gov

Hazard Mitigation Plan Meeting Minutes, May 16th, 2019

CPT Members in Attendance:

Anna Kuoppamaki/ MWS
Byron Hall/ Metro Codes
Heidi Mariscal/ OEM
Jack Baxter/ NES
Jennifer Higgs/ GIS
Michael Hunt/ MWS
Roger Lindsey/ MWS
Ron Zurawski/ TN Geological Survey
Terry Richards/ Metro Police (designee for Steve Lewis)
Tim Coleman/ Berry Hill PD
Tim Eads/ Belle Meade PD
Tom Palko/ MWS
William Robinson/ Public Works

Stakeholders/SME/Guests in Attendance:

April Khoury/ Belmont University
David Hickman/ US Army & Graduate Student
John Carroll/ NY Fire-retired
Kareem Bonugli/ Metro Water-CRS
Thomas Graham/ TN State University

- Heidi, OEM, started the meeting at 9:03 am.

- Heidi briefly went over the meeting agenda items.
  - Revision reviews
    - Heidi mentioned receiving a few 4.1 and 4.2 section revisions but not all of the sections.
    - Heidi mentioned today we will go over each section and identify who needs to do what and have discussions necessary.
  - Next steps/homework
    - Heidi wants everyone to identify which parts of the plan they are responsible for updating so they can make their updates.
    - Heidi mentioned the next meeting will be June 20th and is looking for everyone to make revisions by then to be able to discuss them in the next meeting.

- Other Discussion:
  - Kareem mentioned that any coordination outside the CPT group should be uploaded to the SharePoint site such as emails, letters, etc.

  - Heidi updated the group about the PIO meeting that took place May 1st. She informed everyone they are welcome to be a part of the PIO committee just let her know. The committee is being run by Joseph Pleasant, the OEM PIO.

- Revision Reviews:
  - Heidi brought up the Louisville plan and the CRS, Community Rating System from Kareem's suggestion. She asked Kareem, CRS, about a section on warning and evacuation he brought up. Heidi asked the team if this new section should be included with section 4.3 Capabilities or should there be a new section added to the plan.
    - **Action Item:** *The team decided to create a new section suggested by Heidi as 4.4 Public Outreach.* ***(Heidi)***

  - Heidi said the Louisville Hazard Mitigation Plan had some interesting parts but she prefers the easy layout of our Nashville plan. Roger, MWS mentioned Louisville has a 3 CRS rating and Nashville has an 8 rating, but the layout of the plan is just a small piece of it. Kareem mentioned the Louisville plan is a good reference for CRS items.
    - **Action Item:** *Heidi asked Kareem to go through and make sure the plan includes all parts recommended by the CRS.* ***(Kareem)***

  - Section 2.0 Community Profile
    - Majority of this section was previously done by the planning department.
    - **Action Item:** *Jennifer of Metro GIS along with the Metro Planning Department will be updating the majority of this chapter including the population graph and economic development.* ***(Jennifer Higgs and Metro Planning)***
    - **Action Item:** *Michael, MWS, volunteered to update the MWS major utility reach section.* ***(Michael Hunt)***
    - **Action Item:** *Heidi suggested adding the universities to this section. Thomas of Tennessee State University said he is willing to write something for his university in this section and April Khoury agreed. All Universities in the county are asked to type something about their respective Universities to be added to this section.* ***(Thomas Graham, April Khoury, Ellery Cunningham, Greg Dawson, Hugues Siffrard, Johnny Vanderpool, Mickey West)***
    - **Action Item:** *Heidi mentioned satellite city development information. She asked each satellite city to write about the development in their cities and add construction permit numbers over time to display the development trend.* ***(All Satellite Cities)***

  - Heidi moved on to section 3, Planning Process.
    - **Action Item:** *She asked Kareem to make sure everything needed for CRS was in this section respectively.* ***(Kareem)***

  - Heidi moved to Chapter 4.0, Risk Assessment.
    - **Action Item:** *She said she would update the THIRA information.* ***(Heidi)***

  - Heidi moved to Section 4.1, Hazard Identification.
    - **Action Item:** *The first section is Dam and Levee Failure to be updated by MWS, GIS, and help from the USACE. Tom, MWS, presented a scaled photo depicting all the dams in the area to be added to this section. There was a discussion on which Dams to list and how to map them in this section. If possible the CRS mentioned mapping affected areas in the event of a dam/levee failure. Michael, MWS, found a map and list of dams on the USACE website.* ***(Tom P, Jennifer Higgs, Anna Kuoppamaki, Heidi)***

- Heidi moved to the 4.1 flooding section. Heidi mentioned the updates uploaded to the SharePoint site by Kareem and went through the previous plan sections making sure everything was included.
    - **Action Item:** *Heidi to update* ***(Heidi)***

- Heidi moved to the geological hazards section of 4.1.
    - **Action Item:** *TGS geologist, Ron mentioned updating the figure 4-19 map.* ***(Ron)***
    - **Action Item:** *For the earthquake section Heidi mentioned updating the likelihood of occurrence.* ***(Ron)***
    - **Action Item:** *Landslides were discussed. The team found that there is no real regulating agency for landslides. Heidi mentioned updating past occurrences and likelihood of future occurrences to Ron. Jennifer with GIS volunteered to update the figure 4-26 map.* ***(Jennifer)***
    - **Action Item:** *Heidi brought up adding an action item to section 5.0 about who should collect information on landslide occurrences since this currently wasn't officially being tracked by any one agency.* ***(Heidi)***
    - **Action Item:** *Heidi moved on to sinkholes. Anna volunteered to update the figure 4-29 map.* ***(Anna K)***

- Heidi moved on to the manmade section of 4.1.
    - **Action Item:** *She asked the Metro Police Department to look at updating this section.* ***(Steve L/Terry R)***
    - **Action Item:** *For wildfire, Heidi will ask the Metro Fire Department to update this section.* ***(Tim H/Mike A)***
    - **Action Item:** *For all the weather related sections, Heidi will ask the National Weather Service to review and update these sections.* ***(James L)***

- Heidi moved to the 4.2 section.
    - **Action Item:** *Jennifer volunteered to update tables 4-20 and 4-21.* ***(Jennifer H)***
    - **Action Item:** *The table 4-22 natural resource was mentioned to probably be on the TDEC website.* ***(Heidi)***
    - **Action Item:** *Jennifer said the planning department would be able to update the development trends section written page.* ***(Planning Dept.)***
    - **Action Item:** *Michael of MWS mentioned being able to come up with graphs of grading permit over time to show development trends.* ***(Michael H)***
    - **Action Item:** *Heidi said the rest of section 4.2 is similar to 4.1 and should be updated by the same team members in the corresponding 4.1 section.* ***(Everyone)***

- Heidi moved on to section 4.3, Capability Assessment.
    - **Action Item:** *She asked everyone to look at table 4-38 and update each item if it pertains to any team member.* ***(Everyone)***

- Heidi told everyone that section 5.0 Mitigation Strategy will be looked at in the next meeting.

- Heidi moved to the appendices. Starting with Appendix A, planning process.

    - **Action Item:** *She asked Kareem to make sure everything looks okay for the CRS.* ***(Kareem)***

- Heidi moved on to Appendix B.
  - **Action Item:** *She asked the Metro Police Department for historical information updates to possibly add in this section on Man Made Hazards.* ***(Steve L/Terry R)***

- Heidi moved to Appendix C, map section.
  - **Action Item:** *MWS is working on updating the repetitive loss maps.* ***(Kareem/Tom P)***
  - **Action Item:** *She mentioned that this section is for any additional maps not just repetitive loss maps, she asked everyone to review and if you have additional maps etc. to add, this is the place to put it – i.e. university maps, satellite city maps etc.* ***(Everyone)***

- Heidi moved to Appendix D, reference section.
  - **Action Item:** *She asked everyone to keep track of references used to add to this section.* ***(Everyone)***

❖ Next Steps/Homework
- Please make sure EVERYONE is keeping track of items they need to do with these revisions, and are reading the minutes. ***(Everyone)***
- Heidi wants everyone to identify which parts of the plan they are responsible for updating so they can make their updates. ***(Everyone)***
- Heidi said next meeting will be on June 20th. In this meeting Section 5.0, Mitigation Strategies will be reviewed. She said this is the "wish list" section. Anything that the team would like to do can be voted on by the committee, but may not be immediately funded. Please come prepared to the meeting to bring up any and all mitigation actions you would like to put into the plan. ***(Everyone)***
- Heidi will create a new section: 4.4 Public Outreach, which will include information about warnings and evacuations, and other preparedness items and everything the new Public Campaign Coordination committee creates. ***(Heidi)***

➢ Heidi ended the meeting at about 10:40 am

METRO NASHVILLE-DAVIDSON COUNTY
MULTI-HAZARD MITIGATION
PLANNING COMMITTEE

Hazard Mitigation Plan Review Meeting
Thursday, June 20th, 2019
9 A.M.-11 A.M.
Nashville Emergency Operations Center,
2060 15th Ave South, Nashville, TN

Agenda

9:00 am	Welcome/Introductions	OEM/Heidi Mariscal
	Mitigation Strategy/Section 5.0	
	Revision Reviews	
	Next Steps/Homework	
	Open Floor	
11:00 am	Adjourn	Next Meeting: 7/18 @ 9am

Conference Line for this meeting:

External access: 615-862-7300, Call ID: 63009#, Pin: 1212#
Metro access/Metro desk phone: dial 63009, Pin 1212#

Meeting Dates (subject to change)		
~~March 14~~	~~10a - 11:30am~~	~~Initial Kick off Mtg.~~
~~April 9~~	~~9a - 11:30am~~	~~HIRA & Consequence Mtg.~~
~~April 17~~	~~4p-5pm~~	~~Public Input Session~~
~~May 1~~	~~9:30a - 11am~~	~~PIO Public Campaign Mtg.~~
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~~May 16~~	~~9a - 11am~~	~~Plan Review Updates Mtg.~~
June 20	9a - 11am	Mid-term Review Mtg.
July 18	9a - 11am	Draft Plan Review Mtg.
August 7	4p - 5pm	Public Input Session
August 15	9a - 11am	Public Review Mtg.
September 12	9a - 11am	Final Plan Review

POC: Heidi Mariscal, Nashville Office of Emergency Management
615-880-2950, Heidi.Mariscal@nashville.gov

Hazard Mitigation Plan Meeting Minutes, June 20th, 2019

CPT Members in Attendance:

Amanda Rhinehart/ Forest Hills
Anna Kuoppamaki/ MWS
Byron Hall/ Metro Codes
Greg Claxton/ Planning
Heidi Mariscal/ OEM
Jack Baxter/ NES
Kenneth Reeves/ Goodlettsville Fire
Michael Hunt/ MWS
Ron Zurawski/ TN Geological Survey
Tim Eads/ Belle Meade PD
Tommy Campsey/ Oak Hill
William Robinson/ Public Works

Stakeholders/SME/Guests in Attendance:

April Khoury/ Belmont University
Curtis Johnson/ TN State University
Hendrell Remus/ TN State University
Kareem Bonugli/ Metro Water-CRS
Murphy Strickland/ MWS Intern
Thomas Graham/ TN State University

- Heidi, OEM, started the meeting at 9:10 am with introductions.

- Heidi briefly went over the meeting agenda items.
  - Mitigation Strategy/ Section 5.0
    - Heidi mentioned today we will go over Section 5.0/Mitigation Strategy and update existing action items, identify any action items completed (to close), and add any action items the group has identified, along with going over any lessons learned to add, (Harvey 2017, Dry Creek 2017/2018) Heidi will add anything relevant based on these lessons learned, and the EOC exercise in 2018
  - Revision reviews
    - Heidi mentioned receiving many section revisions but not all of the sections.
  - Other
    - Section 3, pages 4-5, 'Relationship to Other Community Planning Efforts and Hazard Mitigation Activities'.
      - **Action item:** Need everyone to review and *update and add or remove* any plans referenced throughout the planning and revision process, along with any other activities or pieces of work. ***(everyone)***
    - Tom P. was not able to attend the meeting, so additional conference calls may need to happen for the action items. Heidi will advise.
  - Next steps/homework
    - Heidi needs everyone to make sure they know and complete all of their action items, and identified areas to revise. We are over half way to our completion date and need to complete all of these items.

- Heidi mentioned the next meeting is scheduled for July 18th as a draft plan review. However, due to the current status of revisions, we may need to push the next meeting, and all subsequent meetings back a little bit to be able to successfully complete everything. Heidi will make a determination within the next two weeks and will advise as necessary.

❖ Other Discussion:

- Heidi discussed the new PIO committee for this plan and how they have already had their intro meeting, but haven't met anymore yet to get into details. This PIO committee ties into Goal #2 of the Mitigation Strategy, and Heidi highly suggests that everyone, including all Satellite Cities and Universities take advantage of this group and be a part of it so public education and outreach is done at all levels, but especially at their respective locations. If you were not at the initial meeting, that's ok, just email Heidi if you are interested in becoming a part of this group and you will be added to the list. The committee is being run by Joseph Pleasant, the OEM PIO.

❖ Section 5.0 Mitigation Strategy Revisions and/or Discussions

- Heidi asked if everyone agreed with the plans goals and objectives that are summarized on page 7-8 and everyone agreed with no objections.

Section 5.0 Mitigation Strategy Revisions		
Location	**Action Needed**	**Responsible**
Pg. 1, under third component ¶, #1	Update #'s	Kareem
Pg. 1, under third component ¶, #3	Update	Michael H.
Pg. 2, last item #11	Update first sentence	Tom P.
Pg. 10, Action 1-1	2019 Update	Michael H. Tom P.
Pg. 11, Action 1-2	2019 Update with Cityworks description and process of coordination between MWS and Codes	Michael H. Byron Steve Mishu
Pg. 11, Action 1-3	Set up conference call to discuss 2019 Update re: flood response plan	Heidi Tom P. Michael H. Kareem
Pg. 12, Action 1-4	2019 Update	Anna
Pg. 13, Action 1-5	2019 Update	Tom P.
Pg. 14, Action 1-6	2019 Update	Heidi
Pg. 16, Action 1-7	2019 Update (CRS suggests inspection of the entire drainage system 1x year and documentation of the inspections)	Michael H.
Pg. 16, Action 1-8	Set up conference call to discuss 2019 Update re: critical lots	Heidi Tom P. Michael H. Byron Amanda R.
Pg. 17, Action 1-9	2019 Update	Tom P.

		Ricky S.
Pg. 17, Action 1-10	Remove and consolidate into Goal #2	Heidi
Pg. 18, Action 1-11	2019 Update	Tom P.
Pg. 18, Action 1-12	2019 Update (website has been working, potentially/ideally put camera up at location per Goodlettsville request)	Tom P. Anna (studies)
Pg. 19, Action 1-13	2019 Update	Heidi
Pg. 20, Action 1-14	2019 Update (incl. USACE home buyout)	Tom P. Tommy C.
Pg. 21, Action 1-15	2019 Update (possibly close)	Michael H.
Pg. 22, Action 1-16	2019 Update (possibly close)	Michael H.
Pg. 23, Action 1-17	2019 Update (or close and add new action) with info on new back up control ctr.	Jack
Pg. 24, Action 1-18	2019 Update (incl. plans for new water treatment plant)	Michael H.
Pg. 27, Action 2-1	2019 Update (integrate Action 1-10 into this action)	Heidi
Pg. 28, Action 2-2	2019 Update	Tom P. Roger L.
Pg. 29, Action 2-3	2019 Update (possibly add satellite cities to mailings)	Anna
Pg. 30, Action 2-4	Close out *or* add 2019 Update	Tom P.
Pg. 32, Action 3-1	2019 Update	Tom P. Michael H.
Pg. 33, Action 3-2	2019 Update	Michael H.
Pg. 33, Action 3-3	Close out *or* add 2019 Update	Tom P.
Pg. 34, Action 3-4	2019 Update (including program funding fees)	Michael H. Ricky S.
Pg. 35, Action 3-5	2019 Update (add new projects w/ the USACE)	Tom P.
Add Action	Impervious Surface Ratio study (requested by Planning, agreed by the CPT) Schedule Conference call to discuss more details	Heidi Greg C. Byron H. Jennifer H. Michael H. Satellite Cities

Previously Requested Action Items		
Location	**Action Needed**	**Responsible**
New, after 4.3	Create new section, 4.4 Public Outreach	Heidi/Joseph
Throughout plan	Ensure the plan includes all items recommended by the CRS	Kareem
?	Add something in the plan on how our rapid development may impact floodways/floodplains in the future.	Tom P.
Section 2.0	Update the majority of this section including the population graph and economic development.	Jennifer H. Greg C.

Section 2.0	Update the MWS major utility reach section	Michael H.
Section 2.0 (new part)	*Create something about your respective Universities to be added to this section.*	April K./ Belmont Thomas G./ TSU Ellery C./ MNPS Johnny V./ Vandy Kathy H./Lipscomb Greg D/ Trevecca Frank P./ NSCC
Section 2.0 (new part)	*Create something for each satellite city about the development in their cities and add construction permit numbers over time to display the development trend*	**All Satellite Cities**
Section 3.0, pg. 4-5	Need everyone to review and *update and add or remove* any plans referenced throughout the planning and revision process, along with any other activities or pieces of work.	**EVERYONE**
Section 3.0	Ensure everything needed for CRS was in this section	Kareem
Section 4.0	Update HIRA information	Heidi
Section 4.1	Update your area of expertise accordingly	**EVERYONE**
Section 4.1, Dam and Levee Failure	To be updated by MWS, GIS, and help from the USACE. Tom, MWS, presented a scaled photo depicting all the dams in the area to be added to this section. There was a discussion on which Dams to list and how to map them in this section. If possible the CRS mentioned mapping affected areas in the event of a dam/levee failure. Michael, MWS, found a map and list of dams on the USACE website.	Tom P. Jennifer H. Anna K. Heidi
Section 4.1, Geological Section	Update the figure 4-19 map	Ron Z.
Section 4.1, Geological Section	Update the earthquake likelihood of occurrence	Ron Z.
Section 4.1, Geological Section	Update the landslide map, figure 4-26	Jennifer H.
Section 4.1, Geological Section	Add something in here re: blasting at the quarrys and the community's concerns on damage.	Ron Z.
Section 4.1, Geological Section	Update sinkhole map, figure 4-29	Anna K.
Section 4.1, Man-Made Hazards, pg. 52	Update section as needed	Steve L. Terry R., PD
Section 4.1, Wildfire, pg. 56-58	Update section and tables/figures as needed	Tim H./Mike A.
Section 4.1, Severe Weather	Update all weather sections within	James L.
Section 4.1, Severe Weather	Add details on the historic dam and lake levels from the Feb 2019 flooding (to reflect on the coordination efforts with NWS/USACE etc.)	
Section 4.2	Add climate change wording/discussion in this section or recommend other section.	James L.
Section 4.2	Update tables 4-20 & 4-21	Jennifer H.
Section 4.2	Update table 4-22	Heidi
Section 4.2	Update development trends section	Jennifer H.

		Greg C.
Section 4.2	Add grading permit graph showing development trends	Michael H.
Section 4.2	Update your area of expertise accordingly	**EVERYONE**
Section 4.3	Update your area of expertise accordingly	**EVERYONE**
Section 5.0	Add action item for someone to collect information on landslide occurrences	Heidi
Section 5.0	Add any action items based off of lessoned learned from Harvey in 2018, Dry Creek in 2017/2018, and the EOC exercise in 2018.	Heidi
Appendix A	Any outside contact that you made should be shared so credit can be given	**EVERYONE**
Appendix B	Gather historical information to add Man Made Hazards sheet like the others	Steve L. Terry R./PD
Appendix C	Update the repetitive loss maps	Kareem Tom P.
Appendix C	Add any maps you feel relevant to this plan for your respective agencies (campus maps, satellite city maps, coverage maps etc.) These can be uploaded into the Sharepoint site with description.	**EVERYONE**
Appendix D	Keep a log of all references used to be added to this section	**EVERYONE**
Appendix D	All references need to be captured for this appendix	**EVERYONE**
NEW Appendix	TSU – if wanting your own Appendix/Annex, please get the content to Heidi to add.	Curtis J/TSU Thomas G/TSU

- Next Steps/Homework
  - Please make sure EVERYONE is keeping track of items they need to do with these revisions, and are reading the minutes. ***(Everyone)***
  - ***Submit all revisions to Heidi as soon as you complete them. (via SharePoint or email)***

- Heidi ended the meeting at 11:00 am

METRO NASHVILLE-DAVIDSON COUNTY
MULTI-HAZARD MITIGATION PLAN
PUBLIC CAMPAIGN COORDINATION GROUP

Hazard Mitigation Plan Meeting
Thursday, July 18th, 2019
1:30 P.M. - 2:30 P.M.
Nashville Emergency Operations Center,
2060 15th Ave South, Nashville, TN

Agenda

1:30 pm	Welcome/Introductions	OEM/Joseph Pleasant
	Current Modes of Information Sharing	
	Calendar Year Topics	
	Compiling various plans	
	Open Floor	
	Next Steps/Homework	
2:30 pm	Adjourn	Next Meeting: TBD for September

Important Dates (subject to change)		
July 26th, 2019		Draft Multi-Hazard Mitigation Plan due
September 26th, 2019	1:30pm	Follow up PIO Committee Meeting

POC: Joseph Pleasant, Nashville Office of Emergency Management/Nashville Fire
615-880-2011, Joseph.Pleasant@nashville.gov

Special Group Hazard Mitigation Plan Meeting Minutes, July 18th, 2019

Public Campaign Coordination Group Members in Attendance:

Joseph Pleasant/ Nashville OEM
Charlotte Weatherington/ Metro Public Health
Leah Taylor/ Nashville Electric Service
Sonia Allman/ Metro Water
Thomas Mulgrew/ Mayor's Office
Laura Braam/ Mayor's Office

CPT/Stakeholders/SME/Guests in Attendance:

Heidi Mariscal/ Nashville OEM
Rachel Franklin/ Metro Public Health
Roger Lindsey/ Metro Water
Tim Eads/ Belle Meade PD
Tommy Campsey/ Oak Hill
Kareem Bonugli/ Metro Water-CRS
Thomas Graham/ TN State University

- Joseph, OEM PIO, opened the meeting with a welcome and introduction
- Public Campaign Coordination Group Members introduced themselves and identified which agency they represent.
- Joseph went over the top 5 hazards in our county, which was recently updated earlier this year.
    1. Flooding
    2. Tornado
    3. Winter Storm
    4. Extreme Temperatures (Heat/Cold)
    5. Thunderstorms
- Joseph went over topics the committee should include based on the plan's action items and recommendations from the Community Planning Team/CPT.
    - Severe Weather Hazards
        - Flooding *(hazards, steps they can take to help, and flood insurance)*
        - High winds/tornadoes *(besides regular safety, include wind mitigation techniques including Safe rooms, securing roofs/foundations, strengthening garage doors etc.)*
        - Thunderstorms
        - Extreme temperatures *(heat/cold)*
        - Droughts
        - Wild fires
        - Winter storm tips *(staying safe while heating, driving, emergency kits, other tips etc.)*
    - Info on geological hazards
        - Landslides, sinkholes *(risk areas etc.)*

- Communicable diseases

❖ Joseph opened up a discussion on how the various members currently share information with the public.
  - Departments/Agencies used social media (Facebook, Twitter, Instagram, and Nextdoor)
  - Others utilized mass notification methods in addition to social media to communicate with the public. TSU, Metro Health, Entergy and Vanderbilt have the ability to send messages to their customers and community partners.
  - Metro Water Services also suggested the group reach out to the Silver Jackets. The Silver Jackets is a group of teams across the country at the state, federal and sometime tribal level who work together to reduce the risk of flooding and other natural disasters. They also work to enhance response and recovery efforts when those kind of events occur. Working with the Silver Jackets could help with the sharing of information nationwide to enhance the information available for this committee to share in Davidson County.
  - Metro Nashville also has the NERVE system for the public during EOC activations, MEANS (Metro Emergency Alert Notification System) for major incidents of various natures. (HazMat, Active Shooter, Severe Weather and other public safety incidents)
  - Mayor's Office also has the Office of Neighborhoods to help connect with communities on a specific level.
    - Mayor's Office also has the Office of New Americans in the Diversity and Inclusion division.
      - This office specifically can help reach immigrant communities in Nashville/Davidson County.

❖ Joseph opened up a discussion about other groups and means the Public Campaign Coordination Committee should work with to accomplish the goal of public awareness.
  - From the Metro Nashville Multi-Hazard Mitigation Plan, Mitigation Strategy, and the Community Planning Team, it is suggested to work with at least:
    - Great Nashville Association of Realtors *(creating pamphlets for them to hand out, maybe create a brochure for them on disclosing hazard info to potential buyers)*
    - Nashville Convention and Visitors Bureau *(on safety tips/precautions for visitors)*
    - Music City Center *(on safety tips/precautions for visitors)*
    - Utility companies on mail out flyers, e-bills etc. (*get safety information out)*

❖ Joseph opened up a discussion with the group about the best ways to share messaging and cross promote awareness activities.
  - The group decided on creating a SharePoint site to house messaging, a calendar of upcoming events and ever-green social media content to share.
  - The group also agreed to continue to update the SharePoint site so that all organizations are able to inform the other organizations of real-time events and messaging opportunities.
  - The group also discussed creating packets to give to stakeholders like the GNAR, Nashville CVC and others to provide to new homebuyers and visitors to Davidson County.

- The group also decided sharing information with Channel 3 would be a good idea at the suggestion of District Chief Jay Servais/OEM, who said the Metro Nashville Network is looking for good content this group could provide.
- The group decided identifying mass messaging that will go out at the same time from all the organization would be good. However the group also wants other content and information that can be shared independently.
    - This information would be available in a SharePoint folder with the understanding that it can be shared at any time by any agency.
    - Other content in SharePoint would specifically be flagged for cross posting at certain points of the year.

❖ Joseph opened a discussion about how to keep the SharePoint folder (and thereby content) fresh.

- The group agreed to provide content for at least through the end of 2019 to provide a starting point for the committee's public awareness campaign.
- The group will then submit more information and content in January to provide content and information through the end of Summer 2020.
- The group will continue to meet on at least a quarterly basis to assess the sharing of information, the effectiveness of the sharing of the information, and share upcoming events members of the group can promote.

❖ Joseph thanked the group for their input and let them know he would send notes from the meeting at a later date.

- Joseph also checked with the group about a follow up meeting in September possibly 9/19 or 9/26 at 1:30p.
- Members of the committee also stated sharing each other's social media handles and following each other will be an immediate benefit we can take advantage of for the committee.

❖ Joseph adjourned the meeting.

Action Items		
Due Dates	***Action Needed***	***Responsible***
	Schedule follow up meeting for Committee in September, and quarterly thereafter, or more if necessary; including meeting when the annual report of the Multi-Hazard Mitigation Plan is due in the fall of 2020.	Joseph/OEM-NFD
09/01/19	SharePoint Creation on OEM's Existing Hazard Mitigation Site	Heidi/OEM
	Meeting Minutes	Joseph/OEM-NFD
09/01/19	Combine all Social Media Handles into one sharable document	Everyone, Joseph/OEM-NFD
09/01/19	Share all of your existing special dates/events (i.e. Disaster Preparedness Month in Sept, Fire Awareness month, Severe Weather Awareness week, etc.) before the next meeting.	Everyone, Joseph/OEM-NFD

METRO NASHVILLE-DAVIDSON COUNTY
MULTI-HAZARD MITIGATION
PLANNING COMMITTEE

Hazard Mitigation Plan Review Meeting
Tuesday, July 30th, 2019
9 A.M.-11 A.M.
Nashville Emergency Operations Center,
2060 15th Ave South, Nashville, TN

Agenda

9:00 am	Welcome/Introductions	OEM/Heidi Mariscal
	Revision Reviews	
	Update To-Do Lists	
	Next Steps/Homework	
	Public Input Session	8/7 @ 4pm, East Police Precinct
	Open Flood	
11:00 am	Adjourn	Next Meeting: 8/15 @ 9am

Meeting Dates (subject to change)		
~~March 14~~	~~10a - 11:30am~~	~~Initial Kick off Mtg.~~
~~April 9~~	~~9a - 11:30am~~	~~HIRA & Consequence Mtg.~~
~~April 17~~	~~4p-5pm~~	~~Public Input Session~~
~~May 1~~	~~9:30a - 11am~~	~~PIO Public Campaign Mtg.~~
~~May 2~~	~~5p - 6pm~~	~~Public Input Session~~
~~May 16~~	~~9a - 11am~~	~~Plan Review Updates Mtg.~~
~~June 20~~	~~9a - 11am~~	~~Mid-term Review Mtg.~~
July 30	9a - 11am	Draft Plan Review Mtg.
August 7	4p - 5pm	Public Input Session
August 15	9a - 11am	Public Review Mtg.
September 12	9a - 11am	Final Plan Review

POC: Heidi Mariscal, Nashville Office of Emergency Management
615-880-2950, Heidi.Mariscal@nashville.gov

Hazard Mitigation Plan Meeting Minutes, July 30th, 2019

CPT Members in Attendance:

Anna Kuoppamaki/ MWS
Heidi Mariscal/ OEM
James LaRosa/ National Weather Service
Jennifer Higgs/ Planning
Michael Hunt/ MWS
Roger Lindsey/ MWS
Ron Zurawski/ TN Geological Survey
Tim Coleman/ Berry Hill PD
Tim Eads/ Belle Meade PD
Tom Palko/ MWS
Tommy Campsey/ Oak Hill
William Robinson/ Public Works

Stakeholders/SME/Guests in Attendance:

Cindy Popplewell/ MWS-Wood
Kareem Bonugli/ MWS-CRS
Mike Armistead/ NFD
Thomas Graham/ TN State University
Hendrell Ramus/ TN State University
Ronnie Hill/ Berry Hill PD

- Heidi, OEM, started the meeting at 9:10 am
- Heidi went around and spoke individually with everyone to confirm and check contributions and updates to the plan, before addressing the Community Planning Team/CPT as a whole.
- Heidi informed the CPT updates need to be ready ASAP before the August 7th public meeting.
- Heidi went down the to-do list from the last meeting minutes and updated on the team on the conference calls regarding critical lots, impervious ratio study and the flood response plan.
- Heidi asked Michael, MWS, if he recommends closing the mitigation strategy action items 15 & 16.
    - Michael does recommend closing both action items.
- Heidi asked if the plan should leave action items numbered the same to be able to reference in the plan without changing action item numbers.
    - The CPT were in agreement to not change the action item numbers
- The Public Information Campaign Coordination group has met recently and had great discussions and things are moving forward nicely.
    - They discussed how they currently share information and what other options they should look at for this group. The group decided to utilize SharePoint to share all the information to the group.
    - They discussed how they want to push the same messages out at the same time to have a large social media presence etc.

- Heidi reminded everyone that the CPT and stakeholders are invited to attend this group when they meet, and if you have someone that you want to get added to this group, please let Heidi know.

- The next Public Input meeting is August 7th, from 4-5pm at East Police Precinct. Please make plans to attend to be able to answer the public's questions. This public input meeting is for them to comment on the draft plan.
- The next CPT meeting will be on August 15th to review the public input and to review the draft plan.
- The September 12th meeting will be to review the FINA L plan.
- Heidi proceeded to go over the entire plan updates on the projector for everyone to comment
  - Started with the introduction
  - Then section 2.0, with mostly updates from the planning department and help from Metro Water
    - Reviewed each individual highlighted part that needed a revision
  - Heidi reminded everyone that the draft revision will be able to be reviewed on the SharePoint site and anyone can make suggestions on revisions.
  - Section 3.0
    - Metro Water CRS edits need re-wording
  - Section 4.0 had no highlighted items to review
  - Section 4.1
    - Went over dams and hazard classifications
    - Levees, picture needs updating, chew crew/goat levee maintenance
    - Geological hazards map updates needed
    - Communicable diseases/public health section will be updated
    - Hazmat in the THIRA but not in 4.1, NFD will be adding this
    - NWS will look at past occurrences of droughts and extreme temperatures as well as tornado maps
  - Section 4.2
    - Number of critical facilities needs to be updated
    - Natural resource table update from TDEC website sent to Heidi from Cindy/WOOD.
    - Ron, TGS, look at 4.2, page 8
    - Flooding section needs updated maps and tables from MWS and GIS
      - CPT discussed where to put the updated development, suggested to put in section 2.0
  - Section 4.3 had minimal highlighted material to review
  - Section 4.4 is a new section added to the plan and Heidi will be tweaking it and is for the public participation in the plan. (This section will be changed to 3.1 due to better placement)
  - Section 5.0
    - Went through action items
      - Added critical lots and infill action items

- Some updates still needed from Metro Water

❖ Heidi went over the next meetings dates
  - o August 7th – Public Input Meeting, 4-5pm at East Police Precinct
  - o August 15th – CPT Public input review and draft plan review
  - o September 12th – Final plan review

❖ Heidi ended the meeting at 11:04am

Section 5.0 Mitigation Strategy Revisions		
Location	**Action Needed**	**Responsible**
~~Pg. 1, under third component ¶, #1~~	~~Update #'s~~	~~Kareem~~
~~Pg. 1, under third component ¶, #3~~	~~Update~~	~~Michael H.~~
Pg. 2, last item #11	Update	Tom P.
~~Pg. 10, Action 1-1~~	~~2019 Update~~	~~Michael H.~~ ~~Tom P.~~
Pg. 11, Action 1-2	2019 Update with Cityworks description and process of coordination between MWS and Codes	~~Michael H.~~ Byron Steve Mishu
~~Pg. 11, Action 1-3~~	~~Set up conference call to discuss 2019 Update re: flood response plan~~	~~Heidi~~ ~~Tom P.~~ ~~Michael H.~~ ~~Kareem~~
Pg. 12, Action 1-4	2019 Update	Anna
Pg. 13, Action 1-5	2019 Update	Tom P.
~~Pg. 14, Action 1-6~~	~~2019 Update~~	~~Heidi~~
~~Pg. 16, Action 1-7~~	~~2019 Update~~ ~~(CRS suggests inspection of the entire drainage system 1x year and documentation of the inspections)~~	~~Michael H.~~
~~Pg. 16, Action 1-8~~	~~Set up conference call to discuss 2019 Update re: critical lots~~	~~Heidi~~ ~~Tom P.~~ ~~Michael H.~~ ~~Byron~~ ~~Amanda R.~~
Pg. 17, Action 1-9	2019 Update	Tom P. Ricky S.
~~Pg. 17, Action 1-10~~	~~Remove and consolidate into Goal #2~~	~~Heidi~~
Pg. 18, Action 1-11	2019 Update	Tom P.
Pg. 18, Action 1-12	2019 Update (website has been working, potentially/ideally put camera up at location per Goodlettsville request)	Tom P. Anna (studies)
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Pg. 20, Action 1-14	2019 Update (incl. USACE home buyout)	Tom P. Tommy C.
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~~Pg. 22, Action 1-16~~	~~2019 Update~~	~~Michael H.~~
~~Pg. 23, Action 1-17~~	~~2019 Update~~	~~Jack~~

	~~(or close and add new action) with info on new back up control ctr.~~	
~~Pg. 24, Action 1-18~~	~~2019 Update~~ ~~(incl. plans for new water treatment plant)~~	~~Michael H.~~
~~Pg. 27, Action 2-1~~	~~2019 Update~~ ~~(integrate Action 1-10 into this action)~~	~~Heidi~~
Pg. 28, Action 2-2	2019 Update	Tom P. Roger L.
Pg. 29, Action 2-3	2019 Update (possibly add satellite cities to mailings)	Anna
Pg. 30, Action 2-4	Close out *or* add 2019 Update	Tom P.
Pg. 32, Action 3-1	2019 Update	Tom P. Michael H.
~~Pg. 33, Action 3-2~~	~~2019 Update (closed)~~	~~Michael H.~~
Pg. 33, Action 3-3	Close out *or* add 2019 Update	Tom P.
~~Pg. 34, Action 3-4~~	~~2019 Update~~ ~~(including program funding fees)~~	~~Michael H.~~ ~~Ricky S.~~
Pg. 35, Action 3-5	2019 Update (add new projects w/ the USACE)	Tom P.
~~Add Action~~	~~Impervious Surface Ratio study (requested by Planning, agreed by the CPT)~~ ~~Schedule Conference call to discuss more details~~	~~Heidi~~ ~~Greg C.~~ ~~Byron H.~~ ~~Jennifer H.~~ ~~Michael H.~~ ~~Satellite Cities~~

CPT Action Items		
Location	**Action Needed**	**Responsible**
~~New, after 4.3~~	~~Create new section, 4.4 Public Outreach~~	~~Heidi/Joseph~~
Throughout plan	Ensure the plan includes all items recommended by the CRS	Kareem
?	Add something in the plan on how our rapid development may impact floodways/floodplains in the future.	Tom P.
~~Section 2.0~~	~~Update the majority of this section including the population graph and economic development.~~	~~Jennifer H.~~ ~~Greg C.~~
~~Section 2.0~~	~~Update the MWS major utility reach section~~	~~Michael H.~~
Section 2.0 (new part)	*Create something about your respective Universities to be added to this section.*	~~April K./ Belmont~~ Thomas G./ TSU ~~Ellery C./ MNPS~~ Johnny V./ Vandy Kathy H./Lipscomb Greg D/ Trevecca Frank P./ NSCC
Section 2.0 (new part)	*Create something for each satellite city about the development in their cities and add construction permit numbers over time to display the development trend*	**All Satellite Cities** ~~Oak Hill~~ Belle Meade Forest Hills ~~Berry Hill~~

		Goodlettsville
Section 2.0	Update climate verbiage and stats table	James L.
Section 2.0, pg. 3	1st paragraph, research and determine the # of acres of conserved open space.	Jennifer H.
Section 2.0, pg. 3	3rd paragraph, research and determine the # of acres of land in the floodplain.	Anna
Section 3.0, pg. 6	Need everyone to review and *update and add or remove* any plans referenced throughout the planning and revision process, along with any other activities or pieces of work.	**EVERYONE**
Section 3.0	Ensure everything needed for CRS was in this section	Kareem
Section 3.0, step 1	Metro Water CRS edits need re-wording	Kareem
~~Section 4.0~~	~~Update HIRA information~~	~~Heidi~~
Section 4.1	Verify declarations	Heidi
Section 4.1	Update your area of expertise accordingly	**EVERYONE**
Section 4.1, Dam **and** Levee Failure & Section 4.2	To be updated by MWS, GIS, and help from the USACE. There was a discussion on which Dams to list and how to map them in this section. If possible the CRS mentioned mapping affected areas in the event of a dam/levee failure. Section 4.2 has the list from Safe Dams, need same list to put into 4.1 but with map?	Tom P. Jennifer H. Anna K. Heidi
~~Section 4.1, Geological Section~~	~~Update the figure 4-19 map~~	~~Ron Z.~~
~~Section 4.1, Geological Section~~	~~Update the earthquake likelihood of occurrence~~	~~Ron Z.~~
Section 4.1, Geological Section	Update the landslide/slope maps, figure 4-26	Jennifer H.
~~Section 4.1, Geological Section~~	~~Add something in here re: blasting at the quarrys and the community's concerns on damage.~~	~~Ron Z.~~
~~Section 4.1, Geological Section~~	~~Update sinkhole map, figure 4-29~~	~~Anna K.~~
Section 4.1 landslides	Add pictures from recent landslide north of town	Heidi Rocky (TDOT/PW?)
Section 4.1, Man-Made Hazards, pg. 52	Update section as needed	Steve L. Terry R., PD
Section 4.1, Wildfire, pg. 56-58	Update section and tables/figures as needed	Tim H./Mike A.
~~Section 4.1, Severe Weather~~	~~Update all weather sections within~~	~~James L.~~
~~Section 4.1, Severe Weather~~	~~Add details on the historic dam and lake levels from the Feb 2019 flooding (to reflect on the coordination efforts with NWS/USACE etc.)~~	~~James L.~~
Section 4.1 Severe Weather	NWS will look at past occurrences of droughts and extreme temperatures as well as tornado maps	James L.
Section 4.2	Add climate change wording/discussion in this section or recommend other section.	James L.
Section 4.1, severe weather/winter	Update Table 4-19 (snowfall)	James L.

~~Section 4.2~~	~~Update tables 4-20 & 4-21~~	~~Jennifer H.~~
Section 4.2	Look for better figure 4-22	Ron Z.
~~Section 4.2~~	~~Update development trends section~~	~~Jennifer H.~~ ~~Greg C.~~
~~Section 4.2~~	~~Add grading permit graph showing development trends~~	~~Michael H.~~
Section 4.2	Update your area of expertise accordingly	**EVERYONE**
Section 4.2	Number of critical facilities needs to be updated	Jennifer H.
~~Section 4.2~~	~~Update Natural Resources table~~	~~Heidi~~
Section 4.2	Flooding section needs updated maps and tables	MWS (Anna?) Jennifer H.
Section 4.3	Update your area of expertise accordingly	**EVERYONE**
Section 4.3	Add description of HUB capabilities	Heidi Rocky
~~Section 5.0~~	~~Add action item for someone to collect information on landslide occurrences~~	~~Heidi~~
~~Section 5.0~~	~~Add any action items based off of lessoned learned from Harvey in 2018, Dry Creek in 2017/2018, and the EOC exercise in 2018.~~	~~Heidi~~
Appendix A	Any outside contact that you made should be shared so credit can be given	**EVERYONE**
Appendix B	Gather historical information to add Man Made Hazards sheet like the others	Steve L. Terry R./PD
Appendix B	Add historical information for recent landslides	Heidi
~~Appendix C~~	~~Update the repetitive loss maps~~	~~Kareem~~ ~~Tom P.~~
Appendix C	Add any maps you feel relevant to this plan for your respective agencies (campus maps, satellite city maps, coverage maps etc.) These can be uploaded into the Sharepoint site with description.	**EVERYONE**
Appendix D	All references need to be captured for this appendix. Keep a log of all references used to be added to this section	**EVERYONE**
NEW Appendix	TSU – if wanting your own Appendix/Annex, please get the content to Heidi to add.	Curtis J/TSU Thomas G/TSU
Throughout	Update any and all illustrations/tables/figures etc.	Heidi
Table of Contents	Update	Heidi

Metro Nashville-Davidson County
Multi-Hazard Mitigation Plan
Public Input Session Notes 8/7/2019

CPT Members in Attendance:
Heidi Mariscal/ OEM
Gregory Claxton/ Metro Planning
Roger Lindsey/ MWS
Ron Zurawski/ TN Geological Survey
Tim Eads/ Belle Meade
Tom Palko/ MWS
Tommy Campsey/ Oak Hill

Stakeholders/SME in Attendance:

Kareem Bonugli/ MWS
Thomas Graham/ TN State University

Guests in Attendance:

No guests in attendance

- Third/Final public input session on the Multi-Hazard Mitigation Plan Revision.
  - Nashville East Police Precinct Community Room
  - August 7th, 4pm-5pm

- 7 Community Planning Team members were present; 2 Stakeholders/SME's present; and no guests signed in.

- The Public Input Session concluded at 5pm with no guests/community members present.

METRO NASHVILLE-DAVIDSON COUNTY
MULTI-HAZARD MITIGATION
PLANNING COMMITTEE

Hazard Mitigation Plan Review Meeting
Thursday, August 22nd, 2019
9 A.M.-11 A.M.
Nashville Emergency Operations Center,
2060 15th Ave South, Nashville, TN

Agenda

9:00 am	Welcome/Introductions	OEM/Heidi Mariscal
	Revision Reviews / View Draft	
	Update To-Do Lists	
	Next Steps/Homework	
	Open Flood	
11:00 am	Adjourn	FINAL PLAN REVIEW Meeting 9/12 @ 9am

Meeting Dates (subject to change)		
~~March 14~~	~~10a - 11:30am~~	~~Initial Kick off Mtg.~~
~~April 9~~	~~9a - 11:30am~~	~~HIRA & Consequence Mtg.~~
~~April 17~~	~~4p-5pm~~	~~Public Input Session~~
~~May 1~~	~~9:30a - 11am~~	~~PIO Public Campaign Mtg.~~
~~May 2~~	~~5p - 6pm~~	~~Public Input Session~~
~~May 16~~	~~9a - 11am~~	~~Plan Review Updates Mtg.~~
~~June 20~~	~~9a - 11am~~	~~Mid-term Review Mtg.~~
~~July 30~~	~~9a - 11am~~	~~Draft Plan Review Mtg.~~
~~August 7~~	~~4p - 5pm~~	~~Public Input Session~~
August ~~15~~ 22	9a - 11am	Draft Plan Review Mtg.
September 12	9a - 11am	Final Plan Review

POC: Heidi Mariscal, Nashville Office of Emergency Management
615-880-2950, Heidi.Mariscal@nashville.gov

Hazard Mitigation Plan Meeting Minutes, August 22nd, 2019

CPT Members in Attendance:

Anna Kuoppamaki/ MWS
Heidi Mariscal/ OEM
Joe Baker/ Berry Hill
Michael Hunt/ MWS
Roger Lindsey/ MWS
Ron Zurawski/ TN Geological Survey
Brad Burns (for Steve Lewis)/ Metro Police
Tommy Campsey/ Oak Hill
William Robinson/ Public Works

Stakeholders/SME/Guests in Attendance:

Kareem Bonugli/ MWS-CRS
Thomas Graham/ TN State University

- Heidi, OEM, started the meeting at 9:07 am

- Heidi passed out a spreadsheet to document everyone's phone numbers for the CPT table in the plan

- Heidi passed out the most recent To-Do List
  - Some discussion was done one on one with Heidi and CPT members for updates

- Heidi asked the CPT about meeting quarterly for annual updates, after this 5 year revision. If we met quarterly, we could increase our CRS points from 6 to 24.
  - Everyone in attendance agreed to meet quarterly with no objections.

- Heidi started to go down the To-Do List for updates and reminders
  - Tasks for everyone:
    - Heidi again asked everyone to send her a list of references and any plans referenced from the plan revision
    - Heidi asked if anyone has any additional maps
    - Heidi again asked everyone for records of any non-CPT agency contacts made during the process of the revision. This would include meetings, phone calls, emails etc.
  - Asked Tommy about action item 1-14; Tommy will get back with Heidi on any update.
  - Asked MWS about development impacts to floodplains in the future; Roger will get with Tom P. and get back with Heidi.

- Noted that some Satellite cities are still missing items
- A few items involved people that were not present at the meeting, but Heidi has already had discussions with most of them.

❖ Heidi went through all updates to plan sections
- Starting with section 2.0, all highlighted items still need editing
  - Spoke about what kind of floodplain information to include in this section
- Section 3.0 was updated based on CRS needs and THIRA
  - 3.1 is a new public information section
- Section 4.1, reviewed all updates and highlighted information that still needs to be updated by individual CPT members
  - Hazardous materials is a new section created for this update
- Section 4.2, reviewed all updates and highlighted sections that still need updates from individual CPT members
- Section 4.3 capabilities, reviewed all updates and highlighted sections that still need updates from individual CPT members
- Section 5.0 mitigation strategy, reviewed all update and highlighted sections that still need updates from individual CPT members
- Appendix A
  - Still need documentation of contact with other agencies used to help with plan information sent to Heidi
- Appendix B contains other maps

❖ HAZUS revisions still needed from Cindy @ Wood. Kareem agreed to follow up with Cindy.

❖ Heidi says that the updated plan is on the SharePoint site if anyone wants to review it and/or make updates to the highlighted sections

❖ Heidi asked if anyone had questions or comments
- TSU asked about plan adoption procedure so they can adopt the plan for their university

❖ The last and final meeting is on September 12th

❖ Heidi ended the meeting at 10:10 am

METRO NASHVILLE-DAVIDSON COUNTY
MULTI-HAZARD MITIGATION
PLANNING COMMITTEE

Hazard Mitigation Plan Meeting
Wednesday, September 25th, 2019
10 A.M.-11 A.M.
Nashville Emergency Operations Center,
2060 15th Ave South, Nashville, TN

Agenda

10:00 am	Welcome/Introductions	OEM/Heidi Mariscal
	Final Plan Agreement	
	Next Steps	
	Open Floor	
11:00 am	Adjourn	

Future Meeting Dates (subject to change)		
September 26th, 2019	1:30pm – 2:30pm	PIO Public Campaign Coordination Committee Meeting
March 4th, 2020	12:30pm – 1:30pm	PIO Public Campaign Coordination Committee Quarterly Meeting
	1:30pm – 2:30pm	CPT Quarterly Meeting
June 3rd, 2020	12:30pm – 1:30pm	PIO Public Campaign Coordination Committee Quarterly Meeting
	1:30pm – 2:30pm	CPT Quarterly Meeting
September 2nd, 2020	12:30pm – 1:30pm	PIO Public Campaign Coordination Committee Quarterly Meeting/Annual Report
	1:30pm – 2:30pm	CPT Quarterly Mtg./Annual Report
December 2nd, 2020	12:30pm – 1:30pm	PIO Public Campaign Coordination Committee Quarterly Meeting
	1:30pm – 2:30pm	CPT Quarterly Meeting

POC: Heidi Mariscal, Nashville Office of Emergency Management
615-880-2950, Heidi.Mariscal@nashville.gov

Hazard Mitigation Plan Meeting Minutes, Sept. 25th, 2019

CPT Members in Attendance:

Heidi Mariscal/ OEM
Anna Kuoppamaki/ MWS
Byron Hall/ Metro Codes
Joe Baker/ Berry Hill
Michael Hunt/ MWS
Rachel Franklin/ Public Health
Roger Lindsey/ MWS
Ron Zurawski/ TGS
Tim Coleman/ Berry Hill
Tim Eads/ Belle Meade
Tom Palko/ MWS
William Robinson/ PW

Stakeholders/SME/Guests in Attendance:

Cindy Popplewell/ MWS-Wood
Mike Armistead/ NFD
Thomas Graham/ TSU
Kim Kassander/ TEMA
Trip Voss/ TEMA
Paul Harbin/ MNPD
Cedric Connolly/ MNPD

- Heidi, OEM, started the meeting at 10am
- Heidi explained that the hazard mitigation plan is 99.99% completed and will be finalized tomorrow and sent to TEMA.
    - TEMA advised they have a quick turn-around now, and should be reviewed within 30 days.
    - TEMA also advised that FEMA may take a few months, but since our current plan doesn't expire until June 2020, we should be good.
    - TEMA will keep Heidi advised on the status of the approvals
- Heidi asked all CPT members and Stakeholders to please sign the approval sheet, just showing that you agree with what we are submitting (knowing minor edits may take place prior to submittal)
- Heidi will put the final submitted plan on the SharePoint site for everyone. It will then be updated once all adoptions are completed, and FEMA gives final approval.
- Once we get FEMA Approval Pending Adoption, Heidi will be in touch with everyone, and the Satellite Cities and TSU will be advised on them needing to move forward for their official adoptions.
- Heidi went over the quarterly CPT and PIO Public Campaign Coordination Meetings.
- All CPT and Stakeholders are invited to participate in the PIO meetings since they are a part of the hazard mitigation plan. Please also feel free to invite your PIO or Public Affairs personnel if they aren't already involved.
- After no further discussions, Heidi ended the meeting at 10:20am.

Multi-Hazard Mitigation Plan
Appendix B – Historical Hazard Information

This appendix contains the past occurrences of the following natural hazards identified and investigated in the Metropolitan Nashville-Davidson County area:

- Dam and Levee Failures;
- Flooding;
- Geological Hazards, which includes:
  - Earthquakes, and
  - Landslides and Sinkholes;
- Communicable Diseases/Public Health;
- Manmade Hazards; and
- Severe Weather, which includes:
  - Droughts / Wildfires;
  - Extreme Temperatures;
  - Thunderstorms / High Winds;
  - Tornadoes; and
  - Winter Storms.

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No.	Location	Historical Event	Source of Information
1	Nashville Eighth Avenue Reservoir Break	11/5/1912	Chronology of Disasters in TN (Including Natural and Man caused Disasters, Epidemics and Civil Disturbances) Allen P. Coggins, 1988

Dam Failure-1

No.	Location	Historical Event	Time	Type	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
1	Davidson County	July 1780		Flood					Cumberland and Stones Rivers	Chronology of Disasters in TN (Including Natural and Man caused Disasters, Epidemics and Civil Disturbances) Allen P. Coggins, 1991
2	Davidson County	25-Dec-1808		Flood					Cumberland River, Newsoms Mill, Davidson County	
3	Nashville	1841		Flood					Cumberland River at Nashville	
4	Nashville	21-Jan-27		Flood	2				The Cumberland River at Nashville crested at a record 56.2' -- 16.2' above flood stage -- in the "Great Flood of 1927." The river swelled to 3 miles wide at one point. Two persons were killed and 10,400 were left homeless. Ryman Auditorium became a shelter. One young man, whose Old Hickory girlfriend lived ½-mile across the river, had to drive 110 miles around the flooded area to get to her. Water reached as far inland as 3rd Avenue. Two steamboats floated onto 1st Avenue. Sixty square blocks were under water. Grocery shopping in some cases was done Venetian style -- by rowboat.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
5	Mill and Sevenmile Creeks	21-Mar-55		Flood					This storm event lasted 24 hours, beginning at 6pm on March 20th, producing approximately 6.5 inches of rain in the upper reach and approximately 4.9 inches in the lower reach. Mill Creek reached a maximum stage of 19.73 feet. The estimated average frequency was 40 years for Mill Creek and 30 years for Sevenmile Creek. An area of approximately 1,300 acres in the base was inundated by the flood event.	Floodplain Management Report; Metro Water Services; October 2002
6	Mill and Sevenmile Creeks	17-Jun-60		Flood					The storm event lasted approximately 6 hours, beginning at 9pm on June 16th. Over 6.7 inches of rain fell on the basin. Mill Creek reached a maximum stage of 19.15 feet. The flood was severe in the upper reaches of Mill Creek while the lower reaches of Mill Creek and Sevenmile Creek experienced only moderate rise.	
7	Nashville	23-Feb-62		Flood					Cumberland River at Nashville	Chronology of Disasters in TN (Including Natural and Man caused Disasters, Epidemics and Civil Disturbances) Allen P. Coggins, 1988
	Mill and Sevenmile Creeks	23-Feb-62		Flood					Following a 60-hour period of precipitation, beginning in the afternoon of February 25th, an average of 6 inches of rain fell over the Mill Creek basin. The creek crested on the morning of the 27th at a stage of 18.38 feet.	Floodplain Management Report; Metro Water Services; October 2002
8	Cumberland River	1-May-75		Flood			6.6 million		At Nashville, 6.4 inches of rainfall were recorded in a 3-day period (66 hour). Flood stages above Cumberland River Mile 175 were the highest experienced since large flood control reservoirs were constructed on the Cumberland River and three of its tributaries. The flood caused major damages and many counties in Tennessee and Kentucky were declared disaster areas by Presidential proclamation. The Cumberland River crested at a stage of 47.6 feet, 7.6 feet above the officially designated flood stage. This was the flood of record for the Cumberland River in Metro Nashville under regulated conditions, with an estimated average frequency of 80 years. The river remained above flood stage for over six days and damages in the Metro Nashville amounted to approximately 6.6 million dollars.	
9	Mill and Sevenmile Creeks	4-May-79		Flood					This is the flood of record on Mill Creek. Mill Creek crested at a stage of 23.78 feet at the USGS gage near Antioch. Estimates of the peak discharge on May 4th indicate that 30,100 cfs passed the gage. This is approximately twice the magnitude of the March 1955 event.	
10	Richland and Sugartree Creeks	Sep-79		Flood					Richland and Sugartree Creeks are subject to flooding during the winter or early spring. The flood of record occurred in September 1979; 11.44 inches was recorded.	
11	Nashville	5-May-93	7:15 PM	Flash Flood	0	0	5	0	An animal shelter was flooded. Several roads were flooded as well.	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
12	Nashville		1:00 PM	Flash Flood	0	0	5	0	Several roads were closed due to flash flooding.	
13	Nashville	14-May-95	9:00 AM	Flash Flood	0	0	5	0	The New Song Christian Fellowship Church had about two feet of water in their parking lot after a nearby creek flooded.	
14	Nashville	18-May-95	11:26 AM	Flash Flood	0	0	5	0	A few roads had water over them and were closed.	
15	Nashville	8-Aug-95	2:00 PM	Flash Flood	0	0	0	0	Flooding of a few roads reported by local law enforcement.	
16	Nashville	23-Jun-96	7:10 PM	Flash Flood	0	0	0	0	Local law enforcement reported many streets flooded around Nashville.	
17	Nashville	21-Jul-96	9:09 PM	Flash Flood	0	0	0	0	Street flooding, underpasses flooded, 6 feet of water on I-24 at I-24 and I-40 split.	

No.	Location	Historical Event	Time	Type	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
18	Nashville	27-Sep-96	3:55 PM	Flash Flood	0	0	0	0	Police department reported street flooding in northwest Davidson County and the Nashville area.	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
19	Nashville	27-Sep-96	6:18 AM	Flash Flood	0	0	0	0	METRO EOC reported numerous flooding problems around the city. There were several road closures, and a few cars were stranded.	
20	Nashville	16-Dec-96	10:45 PM	Flash Flood	0	0	0	0	Sheriff's Office reported two roads closed due to high water in Nashville. They were Harding and Davidson roads.	
21	Nashville	2-Mar-97	5:00 PM	Flood	0	0	0	0	High water over roads in the southern part of the city.	
22	Nashville	5-Mar-97	6:38 AM	Flash Flood	0	0	0	0	Roads were flooded in the downtown area near the Bicentennial Mall. Culverts were full.	
23	Nashville	5-Mar-97	8:16 AM	Urban/sml Stream Fld	0	0	0	0	Street flooding occurred at 10th Circle North in the downtown area.	
24	Nashville	5-Mar-97	8:34 AM	Urban/sml Stream Fld	0	0	0	0	Street flooding at Davidson Road and Harding Road.	
25	Nashville	5-Mar-97	8:45 AM	Urban/sml Stream Fld	0	0	0	0	Street flooding at Tulip Grove Road and Chandler Road.	
26	Nashville	5-Mar-97	8:53 AM	Flash Flood	0	0	0	0	Flooding at junction of Interstate 24 and Interstate 40. Also flooding on I-40 at Charlotte Pike exit.	
27	Nashville	13-Jun-97	11:30 PM	Flash Flood	0	0	0	0	Several roads had high water.	
28	Whites Creek	30-Jun-97	3:50 PM	Flash Flood	0	0	0	0	A creek was out of its banks.	
29	Northeast Davidson County	30-Jun-97	4:00 PM	Flash Flood	0	0	0	0	Many streets were Flooded in northeast Davidson county.	
30	Nashville	28-Jul-97	4:40 PM	Flash Flood	0	0	0	0	Street Flooding citywide. Murfreesboro Road underpass was under water. Riverside Drive also had a lot of standing water.	
31	Nashville	30-Nov-97	3:30 PM	Flash Flood	0	0	50	0	High water over Highways 41 and 31A in the southeast part of town. A number of motorists were stranded in their vehicles and had to be rescued. Doppler radar rainfall estimates were as high as 4 inches per hour during this event.	
32	Hermitage	16-Apr-98	5:25 AM	Flash Flood	0	0	0	0	NWS employee reported Dobson Chappel Road down to one lane due to high water. Culverts were overflowing.	
33	Hermitage	16-Apr-98	6:25 AM	Flash Flood	0	0	0	0	One half foot of water at Lebanon Road and Matterhorn Road.	
34	Joelton	26-May-98	8:04 AM	Flash Flood	0	0	0	0	Car swept off the side of the road on I-24 due to high water.	
35	Southern Davidson County	4-Jun-98	9:00 AM	Flash Flood	0	0	0	0	Water covered the roads in the southern half of Davidson County. Water threatened the Harding Mall and other structures in south and west Nashville.	Floodplain Management Report; Metro Water Services; October 2002
	Mill and Sevenmile Creeks	4-Jun-98							Mill Creek near Nolensville flooded June 4th and 5th reaching the year's highest marks on June 4th at 16.23 ft and a peak discharge greater than 10,000 cfs.	
36	Nashville	5-Jun-98	1:35 AM	Flash Flood	0	0	0	0	Spotter reported flash flooding in the western part of the city. Flash flooding in Brentwood caused damage to 30 homes.	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
37	Goodlettsville	10-Jun-98	10:30 AM	Flash Flood	0	0	0	0	Street Flooding was reported by the local EMA.	
38	Nashville	28-Jun-99	4:41 PM	Flash Flood	0	0	0	0	EMA office reported flooding at several major intersections such as Union and Larksburg, Myatt Drive and Gallatin Pike, and Dickerson Pike & Alhambre.	
39	Nashville	24-May-00	11:05 PM	Flash Flood	0	0	0	0	Three feet of water on Nolensville Road. The road closed after cars were swept away at 2305 CST. Flooding occurred at Sevenmile Creek near the Harding Mall at 0120 CST. Also, water was getting into homes on Whiteman Road in the southern part of the county.	

FLOODING-2

No.	Location	Historical Event	Time	Type	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
40	Nashville	16-Feb-01	5:00 PM	Flood	0	0	0	0	EMA reported that several roads were flooded and closed in Davidson county such as Newsom Station and Merrymount, Bluff Road and Nolensville Road.	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
41	Belle Meade	16-Feb-01	9:50 AM	Flood	0	0	0	0	Highway 100 flooded at Warner Park.	
42	Nashville	12-Aug-01	1:15 PM	Flash Flood	0	0	0	0	House flooding at the intersection of Hillsboro Road and the eastern part of Overhill Drive. Standing water of about 1/2 to one foot in these homes.	
43	Nashville	12-Aug-01	1:15 PM	Flash Flood	0	0	0	0	Two roads were covered with water and were impassable.	
44	Nashville	12-Aug-01	1:45 PM	Flash Flood	0	0	0	0	Flooding reported along Brown's Creek near Lipscomb University.	
45	Nashville	12-Aug-01	1:55 PM	Flash Flood	0	0	0	0	Street Flooding off Harding Place.	
46	Nashville	29-Nov-01	2:55 PM	Flash Flood	0	0	0	0	OEM reported Whites Creek was over its banks and was affecting several backyards of residences. Also, Sevenmile Creek overflowed its banks and spilled into many backyards.	
47	Nashville	24-Jan-02	6:20 AM	Flash Flood	0	0	0	0	EMA reported several intersections were flooded in Nashville. Seventeen counties in Tennessee requested federal assistance due to the flooding. The counties are: Anderson, Bedford, Cannon, Coffee, Cumberland, Fentress, Giles, Hardin, Jackson, Lawrence, Lewis, Lincoln, McNairy, Maury, Putnam, Warren and Wayne. Doppler radar estimated as much as 6 to 8 inches of rain fell over the southern part of Middle Tennessee during this flood event.	
48	Nashville	24-Jan-02		Flood	6	11	$2 million		Three-day flooding event across Middle Tennessee ended, with flooding reported in 39 of the mid state's 42 counties. Two persons were killed in Cookeville on the 23rd during a rescue attempt. In Bedford County, a couple and their son were killed when their car was swept into Carr Creek during the evening of the 24th. A woman was killed at the Cedars of Lebanon State Park in Wilson County when she was swept away in a flooded creek. Overall, 6 people were killed, with another 11 injuries. A total of 97 homes were damaged, along with 37 businesses, and at least 34 bridges. Some 40 roads were damaged in Lawrence County alone. There were also numerous school and road closings, and 180 people were evacuated from their homes, and 46 of them placed in shelters. Rainfall totals during the three days were topped off by Wartrace, which measured 9.25". Flooding also occured along many rivers, the Duck River at Columbia crested more than 13 feet above flood stage. Damage was estimated at $2 million.	
49	Nashville	17-Mar-02	6:00 PM	Flash Flood	0	0	0	0	Spotter reported Hadley Drive in Old Hickory was flooded. Also, Central Pike had 1 to 2 feet of water near the Davidson County and Wilson County line. By 7:55 PM, there was 3-4 feet of water near the fairgrounds. Two cars were stranded on Nolensville Road.	
50	Nashville	13-May-02	4:25 AM	Flash Flood	0	0	0	0	EMA reported flooding at 703 Murfreesboro Rd., in front of the Alladin plant. A few cars stalled out.	
51	Nashville	6-Jun-02	3:00 AM	Flash Flood	0	0	0	0	Several roads closed in Nashville due to high water.	
52	Davidson County	12-Jul-02	2:20 PM	Flash Flood	0	0	0	0	EMA and SKYWARN spotters reported flooding on Brown's Creek, Leelan Lane, Granny White Pike, Woodvale Drive, Green Hills and Forest Hills area. By 240 PM CST, Otter Creek Road was closed due to high water. By 308 PM CST, Brown's Creek was out of its banks at the fairgrounds.	
53	Nashville	5-May-03		Flash Flood/Tornado					Two waves of severe weather droped a total of 12 twisters across Middle Tennessee during the late evening and early morning, then from late morning through early afternoon. Two persons were injured in Lincoln County. Baseball-size hail was reported in Lutts (Wayne County). In addition, widespread flash flooding occured as a result of excessive rainfall. Nashville measured 4.63" of rain, which established a new one-day record for May. This was also the 5th largest tornado outbreak in mid state history.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm

FLOODING-3

No.	Location	Historical Event	Time	Type	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
54	Nashville	5-May-03	3:15 AM	Flash Flood	0	0	0	0	Spotter reported flooding at Edmonson Pike and Blackman St. There was 6 feet of water over roads and some homes were flooded. The White House granted Governor Phil Bredesen's request for Presidential Disaster Declaration for 20 counties in West and Middle Tennessee for damage as a result of tornadoes, flooding and severe thunderstorms which began on Sunday , May 4, 2003.	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
55	Davidson County	7-May-03	12:00 AM	Flash Flood	0	0	0	0	EMA reported Mill Creek, Sevenmile Creek and Richland Creek out of their banks. The White House granted Governor Phil Bredesen's request for Presidential Disaster Declaration for 20 counties in West and Middle Tennessee for damage as a result of tornadoes, flooding and severe thunderstorms which began on Sunday, May 4, 2003.	
56	Inglewood	31-Jul-03	11:28 PM	Flash Flood	0	0	10	0	Several homes were flooded with 3 feet of water in them along Gallatin Pike. The flash flood event ended on August 1, 0100 CST.	
57	Inglewood	1-Aug-03	12:00 AM	Flash Flood	0	0	10	0	Several homes were flooded with 3 feet of water in them along Gallatin Pike. The flash flood event started on July 31, 2328 CST and ended on August 1, 0100 CST.	
58	Nashville	30-Aug-03	5:40 PM	Flash Flood	0	0	0	0	Spotter reported street flooding near Vanderbilt Hospital.	
59	Nashville	30-Aug-03	6:30 PM	Flash Flood	0	0	1	0	Davidson County OEM reported heavy rains in East Nashville caused 4 to 5 inches of water to get into a home on Joseph Avenue.	
60	Davidson County	5-Feb-04	10:00 AM	Flood	0	0	88	0	Mill Creek was 6 feet over its banks at the intersection of Thompson Lane and Glen Rose at 1019 AM CST in Davidson County. Stewarts Ferry Pike was flooded and impassable around 11 PM CST.	
61	Nashville	30-May-04	10:50 PM	Flash Flood	0	0	1	0	Numerous flooding at Harding Place and Bellmeade Rd.	
62	Nashville	5-Aug-04	5:30 AM	Flash Flood	0	0	1	0	Flooding was occurring on some streets in Nashville according to station WKRN-TV 2. Portions of I-440 was flooded in the western part of the city.	
63	Nashville	2-Sep-04	6:30 PM	Flash Flood	0	0	1	0	NWS employee reported street flooding near the intersection of Old Hicklory Boulevard and Merritt Street in the Old Hickory area of Davidson County.	
64	Nashville	18-Oct-04	10:54 PM	Flash Flood	0	0	1	0	Major flooding on U.S. Highway 70 South and Old Harding Rd.	
65	Nashville	19-Oct-04	1:11 AM	Flash Flood	0	0	1	0	Harding and Hillwood Road flooded	
66	Nashville	19-Oct-04	1:12 AM	Flash Flood	0	0	5	0	Vehicles trapped in flooded road at Edmonson Pike and Blackman Rd.	
67	Nashville	19-Oct-04	1:36 AM	Flash Flood	0	0	5	0	Mill Creek was out of its banks and into nearby homes.	
68	Nashville	30-Nov-04	12:55 PM	Flash Flood	0	0	1	0	Davidson County OEM reported the intersection of Bell Road and Smith Springs Road was impassable due to high water in the Antioch section of Nashville. Also...the intersection of Nolensville Road and Culbertson Road had high water.	
69	Nashville	7-Dec-04	5:00 AM	Flash Flood	0	0	1	0	Davidson County OEM reported Mill Creek was out of its banks. Low spots on Nolensville Road were flooded in South Nashville. Other roads were flooded as well in the county.	
70	Nashville	27-Jun-05	4:55 PM	Flash Flood	0	0	1	0	Street flooding reported at Eight Avenue and Lafayette Streets.	
71	Goodlettsville	22-Jan-06	9:30 PM	Flash Flood	0	0	1	0	Low water bridge at Hix Road was covered with water.	
72	Hermitage	31-May-06	4:50 PM	Flash Flood	0	0	1	0	I-40 westbound lanes in Hermitage was flooded over.	
73	Davidson County	4-Aug-06	3:05 PM	Flash Flood	0	0	1	0	Roads were flooded in the Mill Creek area in Davidson County. Nolensville Road flooded as well from southern Davidson County into Williamson County.	
74	Nashville	2-Apr-09	15:07 PM	Flash Flood	0	0	5	0	Flash flooding reported near Centennial Park with water over wheel wells of cars. Newspaper also reported that manhole covers popped off because of the force of water and police closed a few streets because of flooding in the surrounding areas.	
75	Donelson	2-Apr-09	16:00 PM	Flash Flood	0	0	5	0	Street flash flooding was reported in Donelson.	
76	Goodlettsville	9-May-09	4:00 AM	Flash Flood	0	0	100	0	Several people were rescued from their homes.	
77	Walnut Grove	1-May-10	1045 AM	Flash Flood	1	0	25000	0	Dozens of cars and trucks were trapped by flash flooding along Mill Creek near the Bell Rd. exit on I-24. A portable classroom trailer from a school half a mile away floated to the Interstate and was destroyed as it was sucked into a culvert. A 21 year old man was killed attempting to cross water in the Bell Rd. area.	NWS-Nashville Office

FLOODING-4

No.	Location	Historical Event	Time	Type	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
78	Davidson County	1-May-10	1045 AM	Flood	10	0	1500000	1	At U.S. Highway 431 near the Robertson/Davidson County Line at Sycamore Creek, water was overflowing its banks, resulting in flooding of low lying areas. At least one home and farm was reported to be covered with flood waters. At the time of this report, U.S. Highway 431 was still open, although the water level near the base of the road and bridge was rising fast. No additional information was provided concerning any damage to the road or bridge. Also, flooding was reported along Charlotte Road just west of downtown Nashville by the public. Emergency Manager reported closing of Bluff Road due to water covering the road. Water was reported over Culbertson Road along Mill Creek near Nolensville. This made the road impassible to traffic. On Estes Road, approximately one mile west of Green Hills, a creek was flowing over the road. Depth was estimated at three to six inches. This caused the road to become impassible to traffic. Water was running over Old Harding Pike from the Harpeth River near Morton Mill Road. Also, numerous homes, numerous businesses, numerous non comercial buildings, along with several county, state, and federal roads across the county received damage due to the flood. This damage also included major damage to the Opryland Hotel, Grand Ole Opry House, and Opry Mills shopping mall.	NWS-Nashville Office
79	Joelton	14-May-10	1230 PM	Flash Flood	0	0	10	1	Elaines Salon in Joelton reported about a foot of water standing in their parking lot.	
80	Goodlettsville	14-May-10	1254 PM	Flash Flood	0	0	25	1	Goodletsville Police reported that the I-65 Ramp at Long Hollow Pike was flooded and blocked off.	
81	Antioch	14-May-10	254 PM	Flash Flood	0	0	25	1	Sheriff's Office reported that Interstate 24 at Exit 57 was flooded with 8 inches of water on the road.	
82	Glencliff	24-Feb-11	1250 PM	Flash Flood	0	0	1	0	Spotter reported Murfreesboro Road flooded between Kermit Drive and Thompson Lane. Water was deep enough to cause some larger trucks problems while driving through this area.	
83	Richland	28-Feb-11	825 AM	Flash Flood	0	0	1	1	Road was flooded and impassible at the intersection of Charlotte Pike and American Road.	
84	Providence	27-Apr-11	404 PM	Flash Flood	0	0	1	0	Flooding was occurring at the intersection of Citrus and Tampa Drives.	
85	Davidson County	11-Jan-12	600 AM	Flash Flood	0	0	1	1	Numerous reports of minor flooding of secondary roads were reported across the county.	
86	Woodbine	4-Apr-12	315 PM	Flood	0	0	0	0	Street flooding was reported on East Thompson Lane at Murfreesboro Road with the roadway becoming impassable.	
87	Donelson	14-Jul-12	1100 AM	Flash Flood	0	0	1	1	Water over roadway near the intersection of McCampbell Avenue and Stewarts Ferry Pike.	
88	Hermitage	14-Jul-12	1126 AM	Flash Flood	0	0	1	1	Water was over the roadway near the intersection of Tulip Grove Road and Central Pike.	
89	Linton	5-Sep-12	542 PM	Flash Flood	0	0	1	1	Some roads in this area were flooded due to a few creeks overflowing their banks and causing overflow onto county roadways. 2.4 inches of rainfall was measured near McCrory Lane in Bellevue.	
90	Antioch	27-Apr-13	1130 AM	Flash Flood	0	0	10	0	Considerable flooding affected the Antioch area of southeast Davidson County on Saturday afternoon April 27 after radar estimates indicated 2 to 3 inches of rain had fallen since midnight. Locations along Mill Creek saw the most substantial flooding, such as Culbertson Road which was impassable due to high water, the Lighthouse Christian Ball Park along Blue Hole Road at I-24, and the old Family Fun Center on Bell Road at I-24.	
91	Forest Grove	27-Apr-13	1000 PM	Flash Flood	0	0	100	0	Moderate rainfall of 1 to 2 inches during the morning of April 27 was followed by heavy thunderstorms that produced an additional 2 to 4 inches of rainfall during the evening and into the early morning hours on April 28. The result was widespread flash flooding of roadways and a few homes across Davidson County, with numerous water rescues from people trapped in vehicles. Several homes flooded along Dry Creek in Goodlettsville on Jannett Avenue at Monticello Avenue. Roadways that were flooded included Bear Hollow Road, Porter Road, Riverside Drive, and Eatons Creek Road near Old Hickory Boulevard.	

No.	Location	Historical Event	Time	Type	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
92	Newsome	28-Apr-13	200 AM	Flood	0	0	0	0	The parking lot of the Harpeth Valley Golf Center on Old Hickory Pike in Bellevue was covered by one and a half feet of flood waters from the Harpeth River.	
93	Goodlettsville	17-Jun-13	330 PM	Flood	0	0	0	0	Trained spotters reported water from Dry Creek covered Dickerson Pike, Old Dickerson Pike, and Dry Creek Road in Goodlettsville.	
94	Bakers	3-Jul-13	1022 PM	Flash Flood	0	0	1	0	The Davidson County Emergency Manager reported flash flooding of Mansker Creek over Tinnin Road. Also, a trained spotter reported minor flooding of a home on Old Springfield Pike just west of Millersville in Davidson County. The flooding was due to Bakers Fork overflowing its banks.	
95	Linton	5-Jul-13	120 PM	Flash Flood	0	0	5	0	The 1100 block of Murfreesboro Road was reported impassable due to high water. A Local Broadcast Media outlet reported 12 to 16 inches of water over the intersection of Charlotte Ave and American Road. A report of water flowing across Regent Drive near the Hogan Road intersection in Crieve Hall and a report of water rising into yards of homes near the intersection of West Meade and Brownlee Roads was received via Twitter.	
96	Nashville	10-Jul-13	555 PM	Flash Flood	0	0	0	0	The intersection of McGavock Pike and Elm Hill Pike was reported to have 7 to 8 inches of water standing over the roadway. Also, water was flowing over roadways near The Pharmacy in East Nashville located at the intersection of McFerrin Ave and West Eastland Ave.	
97	Scottsboro - North Nashville	8-Aug-13	405 AM	Flash Flood	0	0	50,000	0	More than 100 homes and businesses were damaged and a couple homes destroyed by significant flash flooding across metro Nashville. There were dozens of water rescues across the city, including along Interstate 24 and Briley Parkway where several motorists had to be rescued. All told, Nashville OEM responded to over 200 calls for help from residents.	
98	Woodbine	6-Jun-14	730 PM	Flash Flood	0	0	10	0	Murfreesboro Road was closed at Thompson Lane due to water covering the road. Three vehicles were stranded and stalled in the flood waters.	
99	Little Creek	8/30/2014	1700	Flash Flood	0	1	0	0	Heavy rainfall resulted in flash flooding across parts of Nashville. A man was swept away into a creek around 7pm in Madison between 2nd Avenue and Elm Street. He was rescued at 1245am on August 31 but only had minor injuries. In southeast Nashville, Murfreesboro Road was flooded between Vultee Drive and Glengarry Drive.	NWS-Nashville Office
100	Antioch	10/10/2014	2000	Flood	0	0	0	0	High water was reported on I-24 between Haywood Lane and Bell Road.	
101	Whites Creek	6/8/2015	1500	Flash Flood	0	0	10000	0	Flooding and significant ponding of water occurred at DB Todd Blvd and Charlotte Avenue in Nashville. Significant amounts of water also reported at Jefferson Street and DB Todd Blvd. One water rescue occurred and three vehicles were stranded in flood waters. In north Nashville, the left lane of I-65 near Briley Pkwy was flooded with one vehicle stranded.	
102	Tulip Grove	5/11/2016	0	Heavy Rain	0	0	10000	0	Heavy rainfall falling over a short period of time collected on the roof of a gym in Hermitage, causing a section of the roof to partially collapse and flood part of the interior of the gym.	
103	Maplewood	7/6/2016	600	Heavy Rain	0	0	0	0	CoCoRaHS station Madison 1.2 WSW measured a 24 hour rainfall total of 4.59 inches.	
104	Maplewood	7/6/2016	600	Heavy Rain	0	0	0	0	CoCoRaHS station Nashville 5.0 NE measured a 24 hour rainfall total of 4.80 inches.	
105	The Hermitage	7/7/2016	230	Flash Flood	0	0	250000	0	Significant flash flooding affected much of Davidson County, with several homes and roads damaged by flooding. Homes that were flooded included several on Brick Church Pike at Ewingdale Drive in north Nashville, where many residents were evacuated due to the flooding. Roads that were flooded and closed included I-24 East at Shelby Avenue, I-40 West near Spence Lane, Church Street at I-40 in downtown Nashville which was blocked by 2 to 3 feet of water, Murfreesboro Pike at Menzler Road, Neelys Bend Road near Gallatin Pike, Old Hickory Blvd near Carney Road, Brick Church Pike at Ewingdale Drive, Charlotte Pike at American Road in west Nashville, and Shute Lane at Saundersville Road in Old Hickory. No injuries or fatalities were reported.	

FLOODING-6

No.	Location	Historical Event	Time	Type	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
106	Oglesby	8/3/2016	1515	Flood	0	0	0	0	Social media reports and photos indicated street flooding on several roads in Brentwood including Edmondson Pike. No road closures or stalled vehicles.	
107	Glencliff	11/28/2016	1840	Flood	0	0	10000	0	Amateur radio and local media reported minor roadway flooding at Thompson Ln at Nolensville Rd, Murfreesboro Rd at Thompson Ln, and Harding Pl at Antioch Pk in southeastNashville. In addition, Orr Ave was partially flooded, and a car became stranded with a water rescue performed.	
108	Nashville	4/18/2017	1830	Flash Flood	0	0	0	0	George L. Davis Blvd. was closed due to flooding near Jo Johnston Road. Browns Creek also overflowed its banks and caused flooding along portions of Sutton Hill Road.	
109	Wrencoe	4/22/2017	600	Flood	0	0	0	0	A tSpotter Twitter report and photo showed flooding from Mill Creek had covered parts of Culbertson Road near Nolensville Road.	
110	Newsom	4/23/2017	1100	Flood	0	0	0	0	River flooding along the Harpeth River in Bellevue put the athletic fields at Bellevue Sports Athletic Association under water as well as parts of Newsom Station Road.	
111	Old Hickory	7/2/2017	1410	Flash Flood	0	0	5000	0	Tspotter Twitter reports and photos showed several streets were flooded in Old Hickory and Lakewood with water up to the bumpers of some cars. A house also suffered minor flooding in Neely's Bend.	
112	Richland	7/2/2017	1430	Flood	0	0	0	0	A tSpotter Twitter video showed high water covering Charlotte Pike at American Road which commonly floods in heavy rainfall.	
113	Belle Meade	7/3/2017	1145	Flood	0	0	0	0	A tSpotter Twitter video showed flood waters covering Davidson Road at Brook Hollow Road.	
114	Nashville	7/15/2017	830	Flash Flood	0	0	0	0	Several tSpotter Twitter reports and photos showed West End Avenue near Centennial Park was flooded and impassable, and other reports showed Mufreesboro Road was flooded and closed between Thompson Lane and Briley Parkway.	
115	Forest Grove	8/31/2017	1800	Flash Flood	0	0	25000	0	Major flash flooding affected the western two-thirds of Davidson County, with the worst flooding occurring in northwest Davidson County. Numerous homes were flooded in the Whites Creek area with many water rescues conducted. Several roads were also flooded in Whites Creek including Lickton Pike and Knight Road. Other roads were flooded and closed in parts of Nashville with several vehicles submerged and water rescues conducted, including at Vantage Way and Rosa Parks Blvd, Murfreesboro Pike north of Briley Parkway, Rolland Road, and Interstate 40 eastbound at Dr. D.B. Todd Jr. Blvd. where 5 cars stalled in the high water. Flooding continued into the early morning hours on September 1.	NWS-Nashville Office
116	Forest Grove	9/1/2017	0	Flash Flood	0	0	200000	0	Major flash flooding continued to affect much of the western two-thirds of Davidson County from the evening hours on August 31 into the early morning hours on September 1, with the worst flooding occurring in northwest Davidson County. Numerous homes were flooded on Cato Road and Eatons Creek Road in northwest Nashville and a home was flooded on Vailview Drive in north Nashville. Other homes and cars were flooded on Battlefield Drive near Belmont University with apartments and cars flooded at the Royal Arms Apartments in Green Hills. Many roadways were underwater and closed due to flooding including West End Avenue near Centennial Park and Highway 100 near Lynnwood Terrace in Belle Meade. A total of 30 water rescues were conducted across Davidson County including in Goodlettsville and Whites Creek as well as along Browns Creek, Mill Creek, and Sevenmile Creek.|||in the Whites Creek area with many water rescues conducted. Several roads were also flooded in Whites Creek including Lickton Pike and Knight Road. Other roads were flooded and closed in parts of Nashville with several vehicles submerged and water rescues conducted, including at Vantage Way and Rosa Parks Blvd, Murfreesboro Pike north of Briley Parkway, Rolland Road, and Interstate 40 eastbound at Dr. D.B. Todd Jr. Blvd. where 5 cars stalled in the high water.	
117	Goodlettsville	9/2/2017	800	Heavy Rain	0	0	0	0	A 72 hour rainfall total of 7.87 inches was measured at CoCoRaHS station Goodlettsville 1.5 W.	

FLOODING-7

No.	Location	Historical Event	Time	Type	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
118	West Meade	11/6/2017	2300	Flood	0	0	0	0	Street flooding affected parts of southern Davidson County, including Sawyer Brown Road in Bellevue and Hill Road in Crieve Hall.	NWS-Nashville Office
119	West Meade	11/7/2017	345	Flash Flood	0	0	50000	0	Flash flooding affected parts of southern Davidson County. Blackman Road near Sevenmile Creek was covered in water and closed, and two nearby homes were evacuated due to flooding. Wild Oaks Court near Eagle View Blvd. at Bell Road in Antioch was washed out. Areas along Mill Creek were also flooded including the Mill Creek Greenway, with large debris reported floating down the creek. Several basements of homes throughout southern Nashville were also flooded including the Forest Hills area.	
120	Brentwood	11/7/2017	605	Heavy Rain	0	0	0	0	CoCoRaHS station Brentwood 2.8 NNE measured a 24 hour rainfall total of 5.76 inches.	
121	Little Creek	4/23/2018	1240	Flash Flood	0	0	15000	0	Davidson County Emergency Management and trained spotters reported widespread flash flooding across northern Davidson County with several roads flooded and closed. Roads that were closed due to high water included Old Springfield Pike, Lickton Pike, Freeman Hollow Road, New Brick Church Pike, Brick Church Pike at Hart Lane, Baker Road at Old Springfield Creek. Several other roads were also flooded in other areas of the Goodlettsville, Union Hill, Lickton Pike, and Bellshire areas. In addition, the Grand Ole RV park on Highway 11 at Old Springfield Pike in Goodlettsville was flooded with several RVs submerged.	
122	Newsom	5/20/2018	1700	Flood	0	0	0	0	Considerable street and parking lot flooding was reported around Bellevue.	
123	Goodlettsville	5/22/2018	1630	Flood	0	0	0	0	A tSpotter Twitter video showed considerable street flooding around Rivergate Mall.	
124	Richland	7/6/2018	1100	Flood	0	0	0	0	A tSpotter Twitter report indicated significant street flooding occurred on Charlotte Pike near Richland Creek.	
125	Madison	11/5/2018	2345	Flash Flood	0	0	10000	0	Video from a trained spotter showed two feet of water from Whites Creek rushing across Knight Drive at Brook Manor Drive. A nursing home and other properties in the area were flooded.	
126	Nashville Cornelia F	2/6/2019	647	Heavy Rain	0	0	0	0	The public reported a 24 hour rainfall total of 6.12 inches in the Opryland area along McGavock Pike.	
127	Inglewood	2/6/2019	800	Heavy Rain	0	0	0	0	A NWS employee in East Nashville measured a 24 hour rainfall total of 6.10 inches.	
128	Belle Meade	2/6/2019	855	Heavy Rain	0	0	0	0	CoCoRaHS station Belle Meade 1.7 WNW measured a 24 hour rainfall total of 5.48 inches.	
129	Richland	2/6/2019	855	Heavy Rain	0	0	0	0	CoCoRaHS station Nashville 4.4 WSW measured a 24 hour rainfall total of 5.94 inches.	
130	Oak Hill	2/6/2019	855	Heavy Rain	0	0	0	0	CoCoRaHS station Belle Meade 1.2 ESE measured a 24 hour rainfall total of 6.20 inches.	
131	Richland	2/6/2019	855	Heavy Rain	0	0	0	0	CoCoRaHS station Nashville 5.2 WSW measured a 24 hour rainfall total of 6.62 inches.	
132	Berry Hill	2/6/2019	855	Heavy Rain	0	0	0	0	CoCoRaHS station Berry Hill 1.6 WNW measured a 24 hour rainfall total of 6.11 inches.	
133	West Meade	2/6/2019	1710	Flash Flood	0	0	0	0	Twitter and Facebook reports indicated flooding around an Exxon gas station on Charlotte Pike just west of I-40, and a creek was overflowing its banks flooding the sports fields at Montgomery Bell Academy on West End Avenue in Belle Meade.	

No.	Location	Historical Event	Time	Type	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
134	Richland	2/6/2019	1945	Flash Flood	0	0	1000000	0	Davidson County Emergency Management reported major flash flooding affected central portions of Nashville during the evening hours on February 6, with numerous roads flooded and closed, vehicles stranded in flood waters with water rescues conducted, and several homes, businesses, and schools flooded. Roadways that were flooded and closed including the two right lanes of westbound I-440 just east of the Nolensville Pike exit, James Kay Lane at Dodsons Chapel Road in Hermitage, Harding Pike at Woodmont Boulevard in Belle Meade, Dartmouth Avenue at Woodmont Boulevard, and numerous other streets around Vanderbilt University and in Hillsboro Village. Flash flooding from Browns Creek near the Fairgrounds stranded numerous vehicles on Nolensville Road between Moore Avenue and Polk Avenue, with several water rescues conducted. Homes and businesses in this same area were also flooded, including a used car dealership on Nolensville Road and an apartment building on Lewis Street. Elsewhere, St. Bernard Academy was flooded with four inches of water inside the school, and several homes flooded in the Inglewood area of East Nashville.	NWS-Nashville Office
135	Wrencoe	2/20/2019	900	Flash Flood	0	0	0	0	Several roads were flooded and closed across southeast Davidson County, including Knapp Boulevard near Donelson Pike, as well as Bluff Road and Culbertson Road near Nolensville Pike.	
136	Nashville	2/20/2019	1130	Flash Flood	0	0	0	0	Numerous roads were flooded and closed across Davidson County, including Granada Avenue at Apex Street, Glenrose Avenue at Old Glenrose Avenue, Newsom Station Road at Merrymount Drive, and areas around the Ellington Ag Center Barns and Arena. Mill Creek was also flooding low lying areas around Briley Parkway near I-24.	
137	Berry Hill	2/23/2019	955	Flash Flood	0	0	0	0	Rising water on Percy Priest Lake resulted in water rescues from Four Corners marina, as several docks went underwater with multiple people stuck on boats. Flooding was also reported on the I-65S at Harding Place exit ramp.	
138	West Meade	2/23/2019	1801	Flash Flood	0	0	20000	0	Social media reports indicated numerous roads across Davidson County were flooded. River Road near the Commodore Yacht Club was flooded with nearby buildings flooding and people moving vehicles to higher ground. Southbound Ellington Parkway near the Douglas Road exit was also flooded, and Rosa Parks Boulevard by the Farmers Market was flooded with a water rescue conducted for a person stranded in a submerged vehicle. General Bate Drive at Graybar Lane in Berry Hill was also flooded with the basement of a nearby home flooded.	
139	Goodlettsville	2/23/2019	1810	Flash Flood	0	0	0	0	Lickton Pike near Old Springfield Highway was flooded in Goodlettsville. Old Hitt Lane at the low water crossing just south of New Hitt Lane in Goodlettsville was also flooded, and the high water barrier had been swept away into trees.	
140	Little Creek	2/23/2019	2230	Flash Flood	0	0	250000	0	TDOT and local media reported a large landslide covered both lanes of I-24 eastbound between Old Hickory Boulevard and Briley Parkway in north Nashville. The interstate was closed for nearly 3 weeks through March 15 to remove debris and repair the roadway.	

No.	Date	Richter Magnitude	Associated Fault	Comment	Source of Information
1	16-Dec-1811 (2) 23-Jan-1812 7-Feb-1812	XII, 8	New Madrid	The three great earthquakes that occurred in the Upper Mississippi region near New Madrid in 1811 - 1812 rank among the most significant events in U.S. history. Maximum intensity for each of the large shocks is estimated at XII. Topographic changes were noted over an area of 75,000 to 130,000 square kilometers; the total area shaken was at least 5 million square kilometers. Damage was very small for such great earthquakes because of sparse population. Chimneys were knocked down in many places in Tennessee, Kentucky, and Missouri. The most seriously affected area was characterized by raised and sunken lands, fissures, sinks, sand blows, and large landslides. The most typical sunken land is Reelfoot Lake in Tennessee. This lake is from 12 to 16 kilometers in length and from 3 to 5 kilometers in width. The depth ranges from 1.5 to perhaps 6 meters, although greater depths have been reported.	Earthquake Information Bulletin, Volume 9, Number 2, March - April 1977.
2	January 4, 1843	VII	New Madrid	On January 4, 1843, a severe earthquake (intensity VIII) affected Memphis and other places in western Tennessee. The shock was reported to have lasted 2 minutes, though this is probably exaggerated. Walls were cracked, chimneys fell, and windows were broken. The total felt affected was about 1 million square kilometers. The shock was strongly felt in Knoxville and caused considerable alarm but did no damage. It was also sharply felt in Nashville.	
3	March 28, 1913	VII	Southern Appalachian	A strong shock centered at Knoxville on March 28, 1913 was felt over an area of 7,000 square kilometers in eastern Tennessee. Two shocks were felt in many places. Movable objects were overthrown, and bricks fell from chimneys (VII). A number of false alarms were set off at fire stations. Buildings throughout the city shook violently. The Knox County Courthouse, a massive brick structure, trembled noticeably. People outdoors experienced a distinct rise and fall in the ground; there were some cases of nausea.	
4	May 7, 1927	VII	New Madrid	Another earthquake in the Mississippi Valley region caused damage in Tennessee and Arkansas on May 7, 1927. It was strongest at Jonesboro, Arkansas, where some chimneys fell (VII). However, the felt area indicated that the epicenter was farther to the east, in Tennessee. Damage there was limited to the shattering of window panes and breaking of dishes in the Memphis area. Many people were awakened by the early morning (2:28 AM) rapid rocking motion; in addition, surface and subterranean sounds were heard. The shock was also felt in parts of Alabama, Illinois, Kentucky, Mississippi, and Missouri, an area of about 337,000 square kilometers.	
5	November 16, 1941	V-VI	New Madrid	A sizable area in western Tennessee was affected by a fairly strong earthquake centered near Covington on November 16, 1941. Cracks appeared in the courthouse at Covington, where the tremor was noticed by everyone (V-VI). At Henning, it was felt by many, and an explosive noise preceded the trembling. The shock was also felt at Dyersburg, Frayser, Memphis, Millington, Pleasant Hill, and Ripley.	
6	July 16, 1952	VI	New Madrid	Dyersburg was the center of another disturbance on July 16, 1952. The press reported numerous cracks in a concrete-block structure. The earthquake was felt by nearly all, and many persons were frightened (VI). It was also felt at Finley and Jenkinsville. A weak aftershock was felt by a few people.	
7	January 25, 1955	VI	New Madrid	An earthquake centered near the Arkansas - Tennessee border (near Finley) awakened many residents on January 25, 1955. The 1:24 AM shock broke windows and damaged plaster walls at Finley, where it was felt by all (VI). The total felt area, including points in Illinois and Kentucky, covered about 75,000 square kilometers.	
8	March 29, 1955	VI	New Madrid	An early morning shock (3:02 AM) on March 29, 1955, was felt by everyone in Finley (VI). Plaster was cracked in one home. A roaring noise and violent shaking were reported. The tremor was felt by many as far away as Caruthersville, Missouri.	
9	January 28, 1956	VI	New Madrid	Minor damage occurred at Covington from a January 28, 1956, earthquake. Chimneys and walls were cracked (VI). Many were awakened at Covington, and the press reported some residents left their homes at Henning. The shock was also felt in Arkansas and Missouri.	
10	September 7, 1956		New Madrid	Two tremors about 13 minutes apart were felt over a broad area of eastern Tennessee and adjoining parts of Kentucky, North Carolina, and Virginia on September 7, 1956. At Knoxville, both shocks were felt by nearly all, many of whom were alarmed (VI). Windowpanes shattered, dishes broke, objects were shaken from shelves, pictures fell, and some plaster was knocked from walls. The total felt area covered approximately 21,500 square kilometers.	
11	October 30, 1973	V, 3.4	Southern Appalachian	An earthquake sequence consisting of one foreshock, a magnitude 4.6 main shock, and more than 30 aftershocks occurred south of Knoxville during the latter part of 1973. The foreshock, magnitude 3.4, on October 30, was felt over an area of 2,100 square kilometers, with a maximum intensity of V. The main shock cause minor damage (VI) in several towns in eastern Tennessee, Georgia, Kentucky, and North Carolina. Minor cracks in walls at the University of Tennessee Hospital at Knoxville were reported. Minor damage to walls, windows, and chimneys occurred in the Maryville - Alcoa area. The shock disrupted relay contacts at the Alcoa switching station, causing a temporary loss of power. The total felt area, including parts of South Carolina, Virginia, and West Virginia, as well as the region mentioned above, covered about 65,000 square kilometers. A network of eight portable seismographs was installed in the main epicentral area. This network was operational from December 2 through December 12 and recorded 30 small magnitude aftershocks. Additional aftershocks were reported felt on December 13, 14, and 21.	Earthquake Information Bulletin, Volume 9, Number 2, March - April 1977.
12	1975-2018		New Madrid	Since 1974, There have been 118 earthquakes over 3.0, with the largest earthquake of 5.0 in 1976.	http://folkworm.ceri.memphis.edu/catalogs/scratch/cat_s_5517

EARTHQUAKES-1

No.	Historical Event	Width (ft)	Length (ft)	Relief (ft)	Scarp (ft)	Material	Probable Cause	Damage	Comment	Source of Information
1	Winter 1975	138	125	38	7	colluvium	oversteepening of slope, excessive rain	minor		Landslides in the Nashville, Tennessee Area - Winter 1975 Environmental Geology Series No. 3 State of Tennessee; Department of Conservation; Division of Geology; Robert Miller and John Wiethe; 1975.
		205	155	58	24	colluvium		minor		
		240	53	28	14	colluvium		minor		
		262	111	34	3	colluvium		moderate		
		88	75	48	10	colluvium; bedrock		minor	joint set parallel to axis of movement	
		220	95	42	3	colluvium; roadfill		moderate		
		162	105	47	9	colluvium		minor		
		132	170	54	4	colluvium				
		220	115	40	7	colluvium		moderate		
		155	100	44	3	colluvium		minor		
		154	167	45	6	colluvium		major		
		138	110	26	3	residuum (Hermitage)				
			240	50	0	colluvium		major	translational movement	
		110	110	28	3	colluvium				
2	Bellevue 1979					Deeply weathered limestone	Heavy rains	Closed U.S. 70		
						Colluvium	Construction, heavy rains	Ruined lawn		
						Colluvium	Construction, heavy rains	Ruined lawn		
						Colluvium	Construction, heavy rains	Ruined lawns	Same location as 2a and 2b from Winter 1975 study	
						Colluvium and weathered bedrock	Undercutting of hillside for fill material			
						Fill, colluvium, residuum	Construction loading, slope steepening	Failure of road during construction, later blockage		
						Colluvium	Slope steepening, heavy rains	Foundation, retaining wall, driveway	Same location as 3 from Winter 1975 study	
						Fill composed of colluvium	Steepness of fill, heavy rains	Roadway cracked		
						Colluvium	Notching of hill, heavy rains	Retaining wall, driveway	Same location as 1 from Winter 1975 study	

LANDSLIDES/SINK HOLES-1

No.	Historical Event	Width (ft)	Length (ft)	Relief (ft)	Scarp (ft)	Material	Location	Damage	Comment	Source of Information
3	May Flood 2010						225 Ash Grove		Back of house on slope falling away from road.	Metro Planning-GIS
							5421 Ashlawn Dr		Back of house on slope falling away from road.	
							5425 Ashlawn Dr		Back of house on slope falling away from road.	
							5413 Ashlawn Dr		Back of house on slope falling away from road. Per Codes: Issues have existed for several years.	
							5405 Ashlawn Dr		Back of house on slope falling away from road.	
							223 Ash Grove		Back of house on slope falling away from road.	
							5409 Ashlawn Dr		Back of house on slope falling away from road. Per Codes: Issues have existed for several years.	
							305 Forrest Valley Dr		Steep slope rising behind house	
							1016 Shadow Lane			
							2619 Highview Dr.		Reported by Mr. Gordon; probably not on his property	
							1014 Shadow Lane, 37206.		All down low	
							2271 Luster Rd.			
							5830 Lickton Pike			
							2474 Clay Lick Rd.			
							2331 Luster Rd.			
							2608 Crocker Springs Rd.			
							Across from 2301 Luster Rd.			
							3743 Knight Dr.			
							3748 Moss Rose		Not a landslide; bank behind house collapsed from flood water erosion	
							320 Woodberry Dr		Sinkhole	
							5849 Fredricksburg Dr			
							1316 Beddington Park			
							5609 Skymont Dr			
							1404 Beddington			
							5 St. James			
							1209 Cliftee Drive			
							4378 Chickering Lane			
							5320 Stanford Dr			
							1239 Saxon Drive 37215			
							1239 Saxon Dr			
							1237 Cliftee Dr			
							1916 Cromwell			
							5337 S. Stanford			
							1528 Dresden Circle			
							1712 Tyne Blvd			
							4354 Chickering Ln			
							5335 Stuart Glen			
							1311 Saxon Dr			
							5424 Forest Acres Dr			
							2133 Chickering Lane			
							412 Oakleigh Hill			
							1765 Tyne Blvd			
							1220 Taggartwood Rd			

LANDSLIDES/SINK HOLES-2

No.	Historical Event	Width (ft)	Length (ft)	Relief (ft)	Scarp (ft)	Material	Location	Damage	Comment	Source of Information
3 cont'	May Flood 2010						1766 Tyne Blvd			Metro Planning-GIS
							1829 Tyne Blvd			
							5 Agincourt Way			
							1205 Cliftee Dr			
							1119 Chickering Park			
							5165 Granny White Pike			
							1540 Old Hickory Blvd			
							1147 Crater Hill Dr			
							4713 Stuart Glen			
							5527 Stanford Dr			
							1244 Cliftee Dr			
							5815 Still Hollow Rd			
							1700 Tyne Blvd			
							5200 Stanford Dr			
							1436 Old Hickory Blvd.			
							1241 Cliftee Dr.			
							1247 Saxon Dr. 37215			
							1247 Saxon Dr			
							1952 Edenbridge Way 37215			
							1084 Lynnwood Blvd			
							2201 Chickering Ln			
							1109 Chateau Ln			
							6005 Andover Dr			
							2112 Piccadilly Pl			
							1159 Crater Hill Dr			
							1630 Chickering Rd			
							5420 Stanford			
							1617 Tynewood			
							1251 Saxon Dr			
							1324 Beddington Park			
							1107 Park Ridge Dr			
							844 Forest Hills Dr			
							1912 Cromwell Dr			
							1502 Chickering			
							5541 South Stanford			
							1600 Chickering Rd			
							1137 Balbade Dr			
							One Club Dr			
							4717 Stuart Glen			
							1243 Saxon Dr			
							1117 Park Ridge Dr			
							1229 Cliftee Dr.			
							1221 Cliftee Dr.			
							1235 Saxon Dr			
							4333 Chickering Ln			
							1301 Saxon Dr			
							1766 Tyne Blvd			
							4375 Chickering Ln			
							1210 Cliftee Dr			
							1155 Crater Hill Dr			
							2201 Chickering Ln			
							5426 Stanford			
							5996 Andover Drive 37215			
							2227 Chickering Ln 37215			

No.	Historical Event	Width (ft)	Length (ft)	Relief (ft)	Scarp (ft)	Material	Location	Damage	Comment	Source of Information
3 cont'	May Flood 2010						1249 Saxon Drive 37215			Metro Planning-GIS
							5849 Beauregard Drive			
							1255 Saxon Dr			
							906 Travelers Ct 37220			
							844 Lakemont Dr			
							5509 Hillview Dr			
							1417 Calloway Court 37221			
							108 River Court (also ref. to include 106 River Court) 37211			
							1084 First Ave. North			
							209 Still Spring Hollow Ct 37221			
							521 Holt Valley Rd			
							525 Holt Valley Rd			
							517 Holt Valley Rd			
							5360 Village Way			
							5280 Village Trace			
							6500 Cornwall Dr			
							6569 Rolling Fork Dr			
							6700 Rodney Ct			
							6615 Ormond Dr			
							6505 Cornwall Dr			
							6558 Rolling Fork Dr			
							155 Carnavon Parkway			
4	1/8/2013						520 Scott's Creek Trail, Cedar Creek Subdivision	Sinkhole		Metro Water
5	4/25/2013						301 McGavock Pike	Sinkhole	side of road, but within roadway	Metro Public Works
6	2/20/2014						444 Hicks	Sinkhole	middle of two lane road. Anticipated to be due to drain pipe collapse	Metro Public Works
7	3/28/2014						Antioch Cluster Elementary, 3132 & 3142 Smith Springs Rd	Sinkhole		Metro Water
8	5/13/2014						5th Ave South/Korean Vets Blvd	Sinkhole	middle of two lane road.	Metro Water
9	6/4/2014						Hogget Ford Rd, The Villages of Riverwood Phase V & VI	Sinkhole		Metro Water
10	1/8/2015						3150 McGavock Pk, Two Rivers Gulf Course	Sinkhole		Metro Water
11	3/18/2015						2350 Franklin Pike, Berry Hills Apt	Sinkhole		Metro Water
12	6/1/2015						275 Stewarts Ferry Pike, Clover Bottom Development Ctr	Sinkhole		Metro Water
13	8/18/2015						8215 Highway 100, Dairy Queen	Sinkhole		Metro Water
14	1/15/2016						3781 Pin Hook Rd, Bright Pointe Subdivision	Sinkhole		Metro Water
15	2/23/2016						3185 Old Franklin Rd, CHSPSC	Sinkhole		Metro Water
16	3/23/2016						7434 Centennial Place, Cline Development	Sinkhole		Metro Water

No.	Historical Event	Width (ft)	Length (ft)	Relief (ft)	Scarp (ft)	Material	Location	Damage	Comment	Source of Information
17	5/27/2016						Airport Logistics Park, between Reynolds Rd and Old Murfreesboro Rd	Sinkhole		Metro Water
18	6/1/2016						100 Centerview Dr, Larchwood Commercial Subdivision Commerce Center	Sinkhole		Metro Water
19	6/30/2016						Burkitt Commons, Nolensville Pike and Burkitt Rd	Sinkhole		Metro Water
20	7/25/2016						Hamilton Church Rd, Proposed Hamilton Run Single Family	Sinkhole		Metro Water
21	8/23/2016						122 Eagle View Blvd, school site	Sinkhole		Metro Water
22	9/30/2016						12525 Old Hickory Blvd, CIC Warehouse	Sinkhole		Metro Water
23	10/14/2016						Lot 118 Claycreek Rd	Sinkhole		Metro Water
24	5/3/2017						Burkitt Rd, Villages at Burkitt	Sinkhole		Metro Water
25	5/25/2017						I-40 off ramp, from Stewarts Ferry Pike	Sinkhole		Metro Water
26	7/7/2017						Stone Hall Blvd, Ravenwood Phase II	Sinkhole		Metro Water
27	2/23/2019						I-24 eastbound, mile marker 42	Landslide	I-24 eastbound was completely closed from February 23rd - March 13th. TDOT temporarily widened around the site to accommodate two lanes of traffic while crews continue to work on permanent slope repairs. Approximately 36, 000 cubic yards of material were removed from the slope in order to make the area safe for drivers. Permanent repairs included additional excavation oft he slope, installation of rock buttress behind a rock bench approximately 50 feet wide. Estimated cost for permanent repairs and roadwork is $8 million.	TN Department of Transportation

LANDSLIDES/SINK HOLES-5

#	Location	Year	Type of Infestation/Disease	Comment	Source of Information
1	Statewide	1832-33	Cholera Epidemic		Chronology of Disasters in TN (Including Natural and Man caused Disasters, Epidemics and Civil Disturbances) Allen P. Coggins, 1994
2	Statewide	1916	Polio Epidemic		
3	Statewide	fall 1918	Influenza	Statewide pandemic	
4	Statewide	1923	Measles	High incidence across state	
5	Statewide		Influenza	Heavy outbreak	
6	Statewide	1930-31	Meningitis	State-wide very high incidence	
7	Statewide	1943	Measles		
8	Statewide	1936	Meningitis		
9	Statewide	Sum-Fall 1936	Polio Epidemic		
10	Statewide	1939	Typhus Fever	Rat-flea borne epidemic in Nashville	
11	Statewide	1941	Whooping Cough	High incidence across state	
12	Statewide	Sum-Fall 1941	Polio Epidemic	Primarily in Davidson, Franklin, Hamilton, and Sumner counties along main highway routes	
13	Statewide	1941-43	Measles		
14	Statewide	1943	Whooping Cough		
15	Statewide	1943	Meningitis		
16	Statewide	1945-56	Polio Epidemic		
17	Statewide	1945	Diptheria Epidemic		
18	Statewide	1957	Influenza		
19	Statewide	1960-61	Hepatitis Epidemic		
20	Knox and Davidson counties (greatest number of cases in state history)	1962-63	Type E Botulism		
21	Worldwide	2009	H1N1 Influenza	health.state.tn.us/Ceds/WebAim/interactive.htm	TN Dept of Health
22	Nationwide	2012	Fungal Meningitis	Causes by tainted steroid injections from the New England Compounding Center	CDC Website
23	Worldwide	2014-2016	Ebola	No residents of Davidson were infected; however, extensive traveler monitoring was conducted by Metro Public Health Department to mitigate the potential spread of the virus in Davidson County	CDC Website
24	Worldwide	2016-2017	Zika	Vector Borne Virus	CDC Website
25	Nationwide	2017-2019	Opioid Epidemic	High incidence across state	CDC Website
26	Nationwide	2017-2019	Hepatitis A	Began in Davidson county before moving throughout Tennessee	TN Dept of Health

COMMUNICABLE DISEASES/PUBLIC HEALTH-1

No.	Location	Historical Event	Type	Comment	Source of Information
1	Davidson County	1950 - 2003	Drought	No drought event(s) were reported in Davidson County, Tennessee between 01/01/1950 and 09/30/2003.	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
2	Statewide	1797	Drought		
3	Statewide	1819	Drought		
4	Statewide	1830	Drought		
5	Statewide	1853-54	Drought		
6	Statewide	1877-78	Drought		
7	Statewide	1887	Drought		
8	Statewide	1894-96	Drought		
9	Statewide	1913-14	Drought		
10	Statewide	1925-26	Drought		
11	Statewide	1930-1931	Drought		
12	Statewide	1940-42	Drought		
13	Statewide		Drought		
14	Statewide	1966-1967	Drought		
15	Statewide	1969-1971	Drought		
16	Statewide	1980-1981	Drought		
17	Statewide	1985-1988	Drought		
18	Statewide	2007-2009	Drought	At the height of the drought in October of 2007, just about all of the state was classified as at least D3 - Extreme Drought, with about 71% classified as D4 - Exceptional Drought. Davidson County was in an Exceptional Drought in September and October of 2007.	
19	Statewide	2012	Drought	Drought conditions developed in April 2012, but intensified in late June and early July with D2 - Severe Drought affecting the county. D1 - Moderate Drought continued to affect the area until early August, when conditions improved to D0 - Abnormally Dry. Davidson County remained in this category until the early fall.	
20	Statewide	2016	Drought	A continued significant lack of rainfall across Middle Tennessee during November 2016 led to worsening drought conditions throughout the region and the driest start to the fall season since 1953. Most of Middle Tennessee received less than one half of an inch of rain through November 22, which is only around 5% of the normal rainfall. As a result, severe (D2) drought conditions spread across all of Middle Tennessee by the middle of the month, with extreme (D3) drought conditions affecting most southern and eastern counties, and even exceptional (D4) drought conditions reaching Cumberland County. Effects of these drought conditions led to many forest, grass and brush fires throughout Middle Tennessee, although no homes, businesses, or other buildings were reportedly burned. Agriculture also continued to suffer losses, and many area lakes and rivers were at unusually low levels for the time of year.||On November 23 and again on November 29-30, separate storm systems brought several inches of significant rainfall to the region, which began to ease drought conditions in many areas.	NWS-Nashville Office
21	Statewide	2016	Drought	Significant rainfall across Middle Tennessee during late November 2016 into December 2016 begin to improve drought conditions throughout the region. Severe (D2) drought conditions across most of Middle Tennessee and extreme (D3) drought conditions in Cumberland County at the beginning of the month improved to moderate (D1) drought or less by the end of the month. Frequent rainfall led to significantly improved conditions for agriculture and area lakes and rivers.	

DROUGHT-1

No.	Location	Year	Historical Event	Source of Information
1	East Nashville	1922	Urban Fire	Chronology of Disasters in TN (Including Natural and Man caused Disasters, Epidemics and Civil Disturbances) Allen P. Coggins, 1988
2	Statewide	1925	Forest Fires	
3	Statewide	1935	Forest Fires	
4	Statewide	1987	Forest Fires	
5	Statewide	1987	"Since 1960, the worst year for Tennessee wildfires was 1987 when 5,478 fires burned 112,000 acres."	The Oak Ridger newspaper http://www.oakridger.com/stories/092199/com_0921990036.html
6	Statewide	1995	1 fire, 0.5 acres 2 prescribed fires, 120 acres	U.S. Fish and Wildlife Service http://fire.fws.gov/fm/stats/stats.htm
7	Statewide	1996	3 fires, 4.3 acres 3 prescribed fires, 130.1 acres	
8	Statewide	1997	3 fires, 2.5 acres 1 prescribed fire, 7.5 acres	
9	Statewide	1998	4 fires, 55.1 acres 1 prescribed fire, 49.8 acres	
10	Statewide	1999	4 fires, 55.1 acres 0 prescribed fires, 0 acres	
11	Statewide	1999	September - Forestry officials have said the state could be headed for its worst wildfire season in more than a decade. So far this year, more than 2,100 fires have burned 25,000 acres. The state has 13 million acres of forests."	The Oak Ridger newspaper http://www.oakridger.com/stories/092199/com_0921990036.html
12	Statewide	2000	5 fires, 49 acres 0 prescribed fires, 0 acres	U.S. Fish and Wildlife Service http://fire.fws.gov/fm/stats/stats.htm
13	Statewide		1 fire, 6 acres Prescribed fires not listed for Tennessee	
14	Statewide	2001	November -"Since the end of October, 520 fires -- most set intentionally -- have burned 29,000 acres across the state. The largest fire in the state was a 4,000-acre blaze between Nashville and Knoxville. Womack said crews were having a hard time because of the rugged terrain and remote area. No homes were in immediate danger." One fire, six acres. Prescribed fires not listed for Tennessee.	USA Today paper - November 16, 2001http://www.usatoday.com/weather/news/2001/2001-11-16-southern-wildfires.htm
15	Statewide	2001	November - "The 37,000 acres were burned by about 800 fires, Bible said. He said officials suspect as many as 80 percent of those were arson. So far this year 2,600 fires have burned about 63,000 acres of Tennessee, Bible said. One state firefighter was killed, two others injured and at least four homes destroyed."	The Oak Ridger newspaper http://www.oakridger.com/stories/112701/stt_1127010029.html
16	Statewide	2003	1089 fires, 7110 acres burned	Tennessee Department of Agriculture http://www.state.tn.us/agriculture/forestry/fires/statistics.html
17	Statewide	2004	1565 fires, 14,513 acres burned	TN Dept of Agricutlture, Division of Forestry, http://burnsafetn.org/pdfs/summary.pdf
18	Statewide	2005	2,073 fires, 24,744 acres burned	
19	Statewide	2006	2,198 fires, 30,800 acres burned	
20	Statewide	2007	3,000 fires, 44,126 acres burned	
21	Statewide	2008	1,290 fires, 18,068 acres burned	TN Dept of Agricutlture, Division of Forestry, http://burnsafetn.org/pdfs/summary.pdf

WILDFIRES-1

WILDFIRES-2

No.	Location	Year	Historical Event	Source of Information
22			Federal funds have been made available by the Federal Emergency Management Agency (FEMA) to help Tennessee fight uncontrolled wildfires that pose a threat to populated areas in the counties of Anderson and Sevier. The states request for federal fire suppression aid was approved when it was reported that the Knoxville Fire Complex, consisting of 136 fires, was endangering 200 homes in Sevier County and another 100 in Anderson County. At the time of the request, the fires had consumed 8,800 acres of land and were forcing the evacuation of residents in the city of Pigeon Forge	Regulatory Intelligence Data - November 3, 2000 http://www.highbeam.com/library/doc0.asp?docid=1P1:37954085&refid=ink_key
23	Statewide	2009	1,218 fires, 15,558 acres burned	Tennessee Department of Agriculture http://www.state.tn.us/agriculture/forestry/fires/statistics.html
24	Statewide	2010	1,671 fires, 20,322 acres burned	
25	Statewide	2011	1,039 fires, 13,326 acres burned	Tennessee Department of Agriculture http://www.state.tn.us/agriculture/forestry/fires/statistics.html
26	Statewide	2012	1,062 fires, 19,325 acres burned	http://www.burnsafetn.org/pdfs/annual.pdf
27	Statewide	2014	1,192 fires, 15,541 acres burned	
28	Davidson county	2016	226 fires	US Fire Administrations NFIRS, National Fire Incident Reporting System (Nashville Fire Dept)
29	Davidson county	2017	172 fires	
30	Davidson county	2018	150 fires	

#	Location	Historical Event	Time	Record Highs / Lows ^{O}F	Type	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
1	Statewide	Summer 1816			Cold					Unusually low temperatures Statewide	Chronology of Disasters in TN (Including Natural and Man caused Disasters, Epidemics and Civil Disturbances)
2	Statewide	1876-77			Cold						
3	Nashville	09-Jan-1886		7 / -8	Cold					One of the coldest days in Nashville's history -- high temperature topped out at 7 degrees, with a low of -8, which made a daily mean value of -1. All three were records.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
4	Statewide	January 1893			Cold					Severe cold statewide	Chronology of Disasters in TN (Including Natural and Man caused Disasters, Epidemics and Civil Disturbances) Allen P. Coggins, 1991
5	Nashville	28-Dec-1894		3 Low	Cold	0	0	0	0	A cold snap brought record low temperatures to the mid state. Nashville's high struggled to just 10 degrees after a low temperature of 3.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
6	Nashville	10-Feb-1899		10 / -7	Cold	0	0	0	0	Temperature at Nashville dropped to -7 degrees during the second coldest February on record. It was the lowest reading ever observed on this date. The high temperature topped out at a mere 10 degrees, a record "cool high."	
7	Nashville	13-Feb-1899		-13	Cold	0	0	0	0	Nashville's -13 set a record low for February	
8	Nashville	15-Dec-01		-2 Low	Cold	0	0	0	0	A strong cold front ushered in a blast of arctic air. Nashville's temperature sank to -2 degrees following the previous day's high of 42.	
9	Nashville	2-Jan-04		59 / 13	Cold					A powerful cold front dunked Nashville's temperature 46 degrees, from a daytime high of 59 degrees, to a low of 13 the following morning.	
10	Statewide	3-Feb-05			Cold						Chronology of Disasters in TN (Including Natural and Man caused Disasters, Epidemics and Civil Disturbances) Allen P. Coggins, 1990
11	Nashville	11-Oct-06		29	Cold	0	0	0	0	An early freeze occured at Nashville, as the morning temperature bottoms out at 29 degrees.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
12	Nashville	9-Dec-17		0	Cold	0	0	0	0	It was a cold day in Middle Tennessee. Nashville, 0.	
13	Nashville	10-Dec-17		15 / 1	Cold	0	0	0	0	A record cold air mass penetrated Middle Tennessee. Nashville's low temperature was 1 degree, with a high reaching just 15.	
14	Nashville	12-Jan-18		2 High	Cold					High temperature at Nashville reached just 2 degrees -- the lowest daily maximum temperature on record.	
15	Nashville	19-Dec-24		67 / 17	Cold	0	0	0	0	The temperature at Nashville dropped from a high of 67 degrees to 17 degrees by midnight.	
16	Nashville	29-Oct-25		26 Low	Cold	0	0	0	0	Temperature at Nashville dropped to 26, setting a record low for the month.	
17	Nashville	31-Dec-27		58 \ 2	Cold	0	0	0	0	A cold front dropped the temperature at Nashville a remarkable 56 degrees -- from a high of 58 to 2 degrees the following day.	
18	Nashville	21-Jan-35		69 / 12	Cold					Nashville reported an early morning high temperature of 69 degrees before a strong cold front passed through, dropping the temperature to 36 degrees by 7:00 a.m., 24 degrees by noon, and 14 degrees by 7:00 p.m. The temperature dropped another 2 degrees during the evening, for a low of 12, and a daily range of 57 degrees. Three inches of snow fell by evening.	
19	Nashville	18-Feb-36		-1 Low	Cold	0	0	0	0	Low temperature at Nashville fell to -1 -- the latest sub-zero temperature on record.	
20	Nashville	6-Dec-37		17 \ 11	Cold	0	0	0	0	A chilly day brought record cold to the mid state. Nashville's low temperature is 11, with the high reaching just 17 degrees.	

EXTREME COLD TEMPERATURES-1

#	Location	Historical Event	Time	Record Highs / Lows	Type	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
21	Nashville	25-Jan-40		1 Low	Cold					Following a cold spell lasting several days, the Cumberland River froze, as the low temperature at Nashville dropped to 1 degree.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
22	Nashville	15-Nov-40		29 / 17	Cold	0	0	0	0	A cold outbreak produces the lowest high, low, and mean temperatures ever observed on this date at Nashville. The high was 29, with a low of 17, producing a mean temperature of 23 degrees.	
23	Nashville	31-Aug-46		47 Low	Cold	0	0	0	0	Temperature at Nashville dropped to 47, setting a record low for the month.	
24	Nashville	8-May-47		36 Low	Cold	0	0	0	0	It was an almost winter-like day in Middle Tennessee, as Nashville's low dropped to 36 degrees	
25	Nashville	23-Jul-47		51 Low	Cold	0	0	0	0	Temperature at Nashville dropped to 51, setting a record low for the month.	
26	Nashville	29-Jan-48		28 High	Cold	0	0	0	0	The high temperature at Nashville reached just 28 degrees. This is the 7th consecutive day in which temperatures have remained below freezing, setting a record. During this stretch, the temperature never rose above 31 degrees, nor fell below -2 degrees.	
27	Nashville	19-Oct-48		29 Low	Cold	0	0	0	0	A Cold snap brought the 3rd consecutive day of sub-freezing temperatures to Nashville, with a morning low of 29 degrees. Clarksville got down to 26 degrees for the 2nd day in a row.	
28	Nashville	30-Sep-49		36 Low	Cold	0	0	0	0	Temperature at Nashville dropped to 36, setting a record low for the month.	
29	Nashville	13-Apr-50		42 / 27	Cold	0	0	0	0	A cold outbreak produced the lowest high, low, and mean temperatures ever observed on this date at Nashville. The high was 42, with a low of 27, producing a mean temperature of 35 degrees.	
30	Nashville	25-Nov-50		-1 Low	Cold	0	0	0	0	Temperature at Clarksville plummets to -2 degrees, setting a record low for the month. Nashville's -1 also established a monthly record.	
31	Nashville	28-Jan-51	1:00 PM		Cold	0	0	0	0	A strong cold front moved through Nashville shortly after 1:00 p.m., causing temperatures to fall during the afternoon and evening, and ushered in one of the most remarkable weather events in Nashville's history.	
32	Nashville	2-Feb-51		-13	Cold	0	0	0	0	Temperature at Nashville dropped to -13, tying the record low for the month.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
33	Nashville	30-Oct-52		26 Low	Cold	0	0	0	0	Temperature at Nashville dropped to 26, tying the record low for the month.	
34	Nashville	1-Oct-53		94 High	Cold	0	0	0	0	Temperature at Clarksville reached 97 degrees, setting a record high for the month, as did Nashville, with a reading of 94 degrees.	
35	Nashville	16-Nov-55		73 / 30	Cold	0	0	0	0	A strong cold front produced a 44-degree temperature drop at Crossville, from a daytime high of 69 degrees to 25. A 43-degree drop occured at Nashville, as the temperature fell to 30 degrees by midnight, following a daytime high of 73.	
36	Nashville	28-Oct-57		28 Low	Cold	0	0	0	0	A cold wave brought record low temperatures to the mid state. Nashville observed a reading of 28 degrees. Crossville dropped to 20.	
37	Nashville	21-Jan-59		74 / 15	Cold					A cold front dropped the temperature at Nashville a remarkable 59 degrees -- from a high of 74, to 15 degrees the next morning	
38	Nashville	11-Nov-60		20 Low	Cold	0	0	0	0	An unusually strong cold outbreak produced a low of 19 degrees at Crossville, 20 at Nashville	

EXTREME COLD TEMPERATURES-2

#	Location	Historical Event	Time	Record Highs / Lows	Type	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
39	Nashville	1-May-63		34 Low	Cold	0	0	0	0	Temperature at Nashville dropped to 34, setting a record low for the month	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
40	Nashville	2-May-63		34 Low	Cold	0	0	0	0	Temperature at Nashville dropped to 34 for the 2nd consecutive day	
41	Nashville	24-Dec-63		32 / 5	Cold	0	0	0	0	The high temperature at Nashville reached just 32 degrees. This was the 7th consecutive day in which temperatures remained below freezing, tying a record. During this stretch, the temperature never rose above 32 degrees, nor fell below 5 degrees	
42	Nashville	6-Jun-66		42 Low	Cold	0	0	0	0	Temperatures at Nashville and Clarksville drop to 42 degrees, setting record lows for the month.	
43	Nashville	24-Feb-67		10 Low	Cold	0	0	0	0	Record lows for this date are set at both Nashville (10 degrees) and Crossville (2 degrees).	
44	Nashville	4-May-76		34 Low	Cold	0	0	0	0	Temperature at Nashville dropped to 34, tying the record low for the month	
45	Nashville	1-Jan-78		31 / 7	Cold					The high temperature at Nashville reached just 28 degrees. This was the 7th consecutive day in which temperatures fell below freezing, tying a record. During this stretch, the temperature never rose above 31 degrees, nor fell below 7 degrees	
46	Nashville	3-Mar-80		2 Low	Cold	0	0	0	0	Temperature for Nashville dropped to 2, setting a record low for the month	
47	Nashville	24-Oct-81		28 Low	Cold	0	0	0	0	Nashville broke its daily record with 28 degrees.	
48	Nashville	7-Apr-82		23 Low	Cold	0	0	0	0	Temperature at Nashville dropped to 23, setting a record low for the month.	
49	Nashville	22-Sep-83		36 Low	Cold	0	0	0	0	Temperature at Nashville dropped to 36, tying the record low for the month. Crossville's low of 33 tied the record low for the month.	
50	Nashville	24-Sep-83		36 Low	Cold	0	0	0	0	Temperature at Nashville dropped to 36 for the 2nd time in three days.	
51	Nashville	2-Oct-84		32 Low	Cold	0	0	0	0	Temperature at Nashville dropped to 32 -- the earliest freeze ever.	
52	Nashville	20-Jan-85		7 / -16	Cold					Nashville set an all-time record low mean temperature of -5. Following a daytime high of 7 degrees, the temperature fell to -16 by midnight. Temperature at Crossville fell to -21 by midnight, which established an all-time record low.	
53	Nashville	21-Jan-85		-17 Low	Cold					Temperature at Nashville dropped to -17, setting an all-time record low.	
54	Nashville	29-Aug-86		49 Low	Cold	0	0	0	0	A low temperature of 44 degrees broke Clarksville's record for August. In addition, Crossville's 44 degrees and Nashville's 49 set new daily record lows	
55	Nashville	22-Oct-87		26 Low	Cold	0	0	0	0	Temperature at Nashville drops to 26, which tied the record low for the month.	
56	Nashville	27-Oct-88		29 / 72	Cold/Hot	0	0	0	0	Nashville's temperature rocketed 43 degrees from a morning low of 29 to an afternoon high of 72.	
57	Nashville	21-Dec-89		-2 Low	Cold	0	0	0	0	The beginning of perhaps the worst December cold wave ever saw Nashville's temperature drop to -2.	
58	Nashville	22-Dec-89		-10 Low	Cold	0	0	0	0	Nashville broke its monthly record with a reading of -10.	
59	Nashville	15-Jan-94	6:00 AM		Cold	1	0	0	0	A homeless man died due to exposure to the cold.	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms

EXTREME COLD TEMPERATURES-3

#	Location	Historical Event	Time	Record Highs / Lows ^{o}F	Type	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
60	Nashville	18-Jan-94		10 Low	Cold					A record cold air mass pushed into the mid state. The high temperature reached just 10 degrees at Nashville. The plateau is especially hard-hit, as Crossville checked in with a low of -8.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
61	Nashville	13-Oct-00		38 / 81	Cold/Hot	0	0	0	0	Despite a start of 38 degrees, the afternoon temperature at Nashville soared to 81.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
62	Nashville	26-Sep-01		38 Low	Cold	0	0	0	0	Nashville's low of 38 degrees is the Coldest ever observed on this date.	
63	Nashville	11-Jun-03		75 High	Cold	0	0	0	0	The mean temperature at Nashville of 75 degrees was one degree above normal, which ended a remarkable streak of 22 consecutive cooler-than-normal days.	
64	Nashville	8-Apr-07		23 Low	Cold	0	0	0	0	The low of 23 tied the record low for the month of April.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
65	Nashville	2013								Deaths related to cold weather: Age DOD Immediate COD Contributing factors Circumstances 50 1/3/2013 Complications of cardiomegaly Hypothermia, chronic ethanolism Found outside in cold weather 54 2/16/2013 Environmental hypothermia Chronic ethanolism, ASCVD, COPD Found outside in tent in cold weather 53 2/21/2013 Environmental hypothermia Found indoors in cold environment 53 10/21/2013 Environmental hypothermia Acute and chronic ethanolism Drank alcohol and laid outside in cold temperature.	Davidson County Medical Examiners Office
66	Nashville	2014								Deaths related to cold weather: Age DOD Immediate COD Contributing factors Circumstances78 2/3/2014 Hypothermia Atherosclerotic cardiovascular disease Found outside in inclement weather.	Davidson County Medical Examiners Office
67	Nashville	2018				1				Davidson County Emergency Management reported a middle-aged homeless woman on Charlotte Avenue in Nashville died due to hypothermia from the extremely cold temperatures in the first few days of January 2018. In addition, numerous homes and businesses reported water damage from broken water pipes across Davidson County, and several water mains underneath city streets also ruptured, which resulted in hundreds of thousands of dollars in damage.	

EXTREME COLD TEMPERATURES-4

#	Location	Historical Event	Time	Record Highs / Lows	Type	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
1	Nashville	11-Jul-01		107	Hot	0	0	0	0	An unusually hot day occurred across the mid state, as Nashville hit 102 degrees. Some of the country stations measured as high as 107.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
2	Nashville	18-Aug-05		102 High	Hot	0	0	0	0	Record heat wave pushed toward late summer, as Nashville hit 102 degrees. Morning low was a miserable 79.	
3	Nashville	21-Mar-07		89 High	Hot	0	0	0	0	Temperature at Nashville reached 89, setting a record high for the month.	
4	Nashville	28-May-11		96 High	Hot	0	0	0	0	Temperature at Nashville reached 96, setting a record high for the month.	
5	Nashville	6-Jul-30		99 / 76	Hot	0	0	0	0	It was a sultry day in one of the most oppressive heat waves in Middle Tennessee history. The high at Nashville reached 99 degrees, following a morning low of 76.	
6	Nashville	28-Jul-30		112 High	Hot	0	0	0	0	Madison recorded a temperature of 112 degrees, tying the all-time record high for Middle Tennessee. The temperature at McMinnville reached 106, setting an all-time record high there. In addition, the mean temperature of 95 degrees measured at Nashville is also an all-time record.	
7	Nashville	7-Aug-30		104 High	Hot	0	0	0	0	One of the most notorious heat waves was underway in Middle Tennessee. Nashville's 104 degrees was the second of 4 consecutive days with highs greater than 100.	
8	Nashville	9-Aug-30		105 High	Hot	0	0	0	0	The mercury soared to 110 degrees at Dickson, setting an all-time mark there. Nashville's thermometer peaked at 105, setting a record high for the month.	
9	Nashville	2-Nov-35		85 High	Hot	0	0	0	0	Temperature at Nashville reached 85, setting a record high for the month.	
10	Nashville	31-May-37		96 High	Hot	0	0	0	0	Temperature at Nashville reached 96, tying the record high for the month.	
11	Nashville	7-Oct-41		93 High	Hot	0	0	0	0	Temperature at Nashville climbed to 93 degrees for the second straight day.	
12	Nashville	21-Nov-42		77 / 63	Hot	0	0	0	0	A spring-like day was enjoyed at Nashville, with a high of 77 degrees, and a low of 63.	
13	Nashville	26-Aug-43		103 High	Hot	0	0	0	0	Mercury soared to 103 at Nashville -- the third in a remarkable four-day run with highs of 100+.	
14	Nashville	6-Aug-47		101 High	Hot	0	0	0	0	Temperature at Nashville reached 101 degrees, the third straight day with readings above 100.	
15	Nashville	14-Oct-47		89 High	warm	0	0	0	0	Unseasonably warm weather continues across Middle Tennessee. Nashville's high topped out at 89 degrees.	
16	Nashville	15-Jun-52		100 High	Hot	0	0	0	0	The temperature at Nashville climbed to 100 degrees -- the earliest date ever for a 100 degree reading	
17	Nashville	30-Jun-52		106 High	Hot	0	0	0	0	Temperature at Nashville reached 106, setting a record high for the month. It also marked the 8th consecutive day of 100+ readings, a record.	
18	Nashville	3-Jul-52		97.3 High	Hot	0	0	0	0	The temperature at Nashville hit 94 degrees, the 31st consecutive day with 90+ degree readings, a record. The average high temperature during this remarkable stretch was 97.3 degrees.	
19	Nashville	26-Jul-52		63 / 103	Hot	0	0	0	0	One of the most notorious heat waves assaulted Nashville with its first of four consecutive daily record high temperatures. Today, the mercury rose to 103 degrees. The air mass was unusually dry, though, with a temperature range of 40 degrees, following a pleasant morning low of 63.	

EXTREME HOT TEMPERATURES-1

#	Location	Historical Event	Time	Record Highs / Lows	Type	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
20	Nashville	27-Jul-52		107 High	Hot	0	0	0	0	Temperature at Nashville reached 107, setting an all-time record high. Other record highs include Clarksville (110).	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
21	Nashville	28-Jul-52		107 High	Hot	0	0	0	0	Temperature at Nashville reached 107 for the 2nd consecutive day. All-time record highs were set at Centerville, Columbia, and Palmetto (109), Shelbyville (107), Springfield (106), Tullahoma (106), and Monteagle (101).	
22	Statewide	June and July of 1952			Hot						http://www.srh.noaa.gov/ohx/climate/calendar.htm
23	Nashville	14-Jul-54		85 Low	Hot	0	0	0	0	Low temperature of 85 was Nashville's highest minimum temperature on record. In addition, the mean temperature of 95 degrees tied a record high.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
24	Nashville	5-Aug-54		97 High	Hot	0	0	0	0	The temperature at Nashville reached 97 degrees, the 27th consecutive day with 90+ degree readings. This was the 3rd longest such period in Nashville's history. In addition, the high temperature reached at least 90 degrees on 58 out of the last 59 days.	
25	Nashville	15-Aug-54		102 High	Hot	0	0	0	0	Temperature at Nashville hit 102 degrees. It's the highest temperature ever observed on this date, and marked day 2 of a 3-day run with highs above 100.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
26	Nashville	2-Sep-54		55 / 95	Hot/Cold	0	0	0	0	At Nashville, a 40-degree difference between high (95) and low (55) was observed.	
27	Nashville	3-Sep-54		60 / 101	Hot	0	0	0	0	Arid weather continues, as Nashville hit 101 degrees, following a morning low of 60. At Crossville, the high temperature hit 93, despite a morning low of 50 degrees.	
28	Nashville	5-Sep-54		105 High	Hot	0	0	0	0	Mount Pleasant (1 N) set it's all-time record high with a reading of 105 degrees. At 106 degrees, Clarksville measured it's highest temperature ever in September, as did Nashville, with a 105-degree reading, and Crossville, with 99 degrees.	
29	Nashville	19-Sep-54		97 High	Hot	0	0	0	0	One of the Hottest summers on record continued its strangle-hold on the mid state. Nashville's high hit 97 degrees, Crossville got to 93.	
30	Nashville	17-Apr-55		90 High	Hot	0	0	0	0	Temperature at Nashville reached 90 -- the earliest date ever for 90 degrees to be observed.	
31	Nashville	13-Feb-62		84 High	Hot	0	0	0	0	Temperature at Nashville reached 84, setting a record high for the month.	
32	Nashville	24-Jan-72		78 High	Hot					Nashville's 78 degrees set a record high for January.	
33	Nashville	1-Jul-80			Hot	0	0	0	0	Severe heat wave-West and Middle TN	
34	Nashville	9-Oct-80		91 High	Hot	0	0	0	0	A unusually warm spell saw temperatures climb to 91 at Nashville, 83 at Crossville -- the highest temperatures ever observed on this date at either location.	Chronology of Disasters in TN (Including Natural and Man caused Disasters, Epidemics and Civil Disturbances) Allen P. Coggins, 1988
35	Nashville	10-Oct-80		90 High	Hot	0	0	0	0	The temperature at Nashville reached 90 degrees -- the latest date ever for a 90 degree reading.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
36	Nashville	1-Dec-82		62 / 70	Hot	0	0	0	0	A mild air mass brought record warmth to Middle Tennessee. Nashville recorded a high of 70, with a low of 62.	
37	Nashville	3-Dec-82		79 High	Hot	0	0	0	0	Temperature at Nashville reached 79, setting a record high for the month.	

EXTREME HOT TEMPERATURES-2

No.	Location	Historical Event	Time	Record Highs / Lows	Type	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
38	Nashville	27-Dec-82		75 High	Hot	0	0	0	0	Middle Tennessee experienced record warmth, as Nashville's high reached 75 degrees.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN, http://www.srh.noaa.gov/ohx/climate/calendar.htm
39	Nashville	20-Aug-83		101 High	Hot	0	0	0	0	Nashville's high of 101 was the first of four straight 100+ readings	
40	Nashville	11-Sep-83		100 High	Hot	0	0	0	0	The temperature at Nashville reached 100 degrees -- the latest date ever for a 100 degree reading.	
41	Nashville	22-Jun-88		100 High	Hot	0	0	0	0	Summer began with a record heat wave. Nashville's high of 100 degrees is the second in a six-day string of 100+ readings	
42	Nashville	2-Aug-88		99 High	Hot	0	0	0	0	Oppressive heat wave stretched into August. Thermometer at Nashville climbed to 99 degrees	
43	Nashville	26-Apr-89		91 High	Hot	0	0	0	0	Temperature at Nashville reached 91, setting a record high for the month.	
44	Nashville	28-Apr-89		91 High	Hot	0	0	0	0	Temperature at Nashville reached 91 for the 2nd consecutive day	
45	Nashville	30-Jul-99		101 High	Hot	0	0	0	0	The thermometer hit 101 degrees at Nashville. It was the hottest temperature observed in the city in nearly nine years.	
46	Nashville	3-Jan-00		61 / 72	Hot					A very pleasant, almost spring-like day settled over the mid state. At Nashville, the high temp. reached 72 degrees, with a low of 61.	
47	Nashville	10-Nov-02		81 High	Hot	0	0	0	0	Then, followed record high temperatures at Nashville (81)	
48	Nashville	3-Nov-03		82 High	Hot	0	0	0	0	An unseasonably warm spell brought record warmth to the mid state. Nashville's 82 degrees broke the daily record, and Crossville's 79 degrees tied the record high for November.	
49	Nashville	16-Aug-07		106 High	Hot	0	0	0	0	In the midst of one of the worst droughts in Middle Tennessee's history, the temperature at Nashville climbs to 106 degrees, setting a record high for the month. It is only the fifth time in Nashville's history that this mark has been hit. It is the fifth consecutive day with 100+ degree readings -- the 9th in the last ten days -- and also the twelfth consecutive day of at least 99 degrees.	
50	Nashville	26-Aug-07		94 High	Hot	0	0	0	0	Temperature hits 94 degrees at Nashville, the 32nd consecutive day with 90+ degree readings, a record. The average high temperature during this remarkable stretch is 98.2 degrees.	
51	Nashville	4-Aug-10		101 High	Hot	0	25	100	0	Afternoon heat index readings ranged from 110 to 115 degrees over much of Middle Tennessee on August 4th. Around the Nashville Metropolitan area, a couple dozen people were hospitalized suffering from heat exhaustion along with several others being hospitalized suffering from burnt feet. There were no known fatalities. There were also numerous reports of damage from the heat, including exploding tires on automobiles.	National Weather Service Forecast Office; Nashville, TN;
52	Nashville	6/28/2012 - 7/7/2012		109 High	Hot	2	0	0	0	An all time record high of 109 degrees was set in Nashville on June 29th. This was the hottest day of a 10 day stretch from June 28th through July 7th in which the average daily high temperature was 104 degrees. Age DOD Immediate COD Contributing factors Circumstances 57 7/1/2012 Environmental hyperthermia Decedent living in storage unit 64 7/2/2012 Hypertensive cariovascular disease Hyperthermia Environmental exposure - Found outside of residence 5 months 8/7/2012 Hyperthermia Exposed to high temperature inside minivan	National Weather Service Forecast Office; Nashville, TN;

EXTREME HOT TEMPERATURES-3

#	Location	Historical Event	Time	Type	Magnitude (knots)	Precipitation (in.)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
1	Nashville	8-Jun-1872		rain		2.56	0	0	0	0	Nashville records 2.56" of rainfall.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
2	Nashville	22-Feb-1874		rain		5.36	0	0	0	0	Nashville records a record 2.58" of rain, for a 2-day total of 5.36".	
3	Nashville	24-Aug-1876		rain		2.65	0	0	0	0	Nashville gets a rare August downpour of 2.65".	
4	Nashville	17-Sept-1877		rain		2.93	0	0	0	0	Nashville measures 2.93" of rainfall.	
5	Nashville	13-Feb-1880		rain		5.2	0	0	0	0	Nashville records greatest one-day rainfall for February, with 5.20". This caps off a three-day total of 7.65", another Nashville record.	
6	Nashville	15-Sept-1881		rain		4.21	0	0	0	0	Nashville measures 4.21" of rainfall.	
7	Nashville	22-Apr-1883		rain		5.03	0	0	0	0	Nashville records greatest one-day rainfall for April, with 5.03".	
8	Nashville	5-Jul-1883		wind			0	0	0	0	Wind gust of 61 mph is recorded at Nashville.	
9	Nashville	10-Jul-1886		wind			0	0	0	0	Wind gust of 75 mph is recorded at Nashville.	
10	Nashville	18-Sept-1887		rain		4.66	0	0	0	0	Nashville measures 3.12" of rainfall, for a 2-day total of 4.66".	
11	Nashville	Dec-87		rain and flood			0	0	0	0	West and middle Tennessee	Chronology of Disasters in TN (Including Natural and Man Diseasters, Epidemics and Civil Disturbances) © Allen P. Coggins, 1988
12	Nashville	10-Sept-1895		rain		4.93	0	0	0	0	Nashville measures 4.93" of rainfall.	
13	Middle TN	Summer 1896		rain							Very rainy summer	Chronology of Disasters in TN (Including Natural and Man Diseasters, Epidemics and Civil Disturbances) © Allen P. Coggins, 1988
14	Nashville	9-Aug-1898		rain		5.2	0	0	0	0	Nashville records greatest one-day rainfall for August, with 5.20".	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather
15	Nashville	23-Mar-01		wind			0	0	0	0	Wind gust of 58 mph is recorded at Nashville.	National Weather Service Forecast Office, Nashville, TN
16	Nashville	28-Sep-06		rain		2.6	0	0	0	0	Nashville culminates its second-wettest September ever with 2.60" of rainfall	National Weather Service Forecast Office, Nashville, TN
17	Nashville	17-Nov-06		rain		3.17	0	0	0	0	Nashville measures 3.17" of rainfall.	National Weather Service Forecast Office, Nashville, TN
18	Nashville	23-Feb-09		rain		3.69	0	0	0	0	Nashville measures 3.69" of rain.	National Weather Service Forecast Office, Nashville, TN
19	Nashville	21-Sep-09		wind			0	0	0	0	Wind gust of 60 mph is recorded at Nashville.	National Weather Service Forecast Office, Nashville, TN
20	Nashville	24-Jun-10		wind			0	0	0	0	Wind gust of 60 mph is recorded at Nashville.	National Weather Service Forecast Office, Nashville, TN
21	Nashville	6-Oct-10		rain		2.41	0	0	0	0	Nashville is hit with 2.41" of rain.	National Weather Service Forecast Office, Nashville, TN
22	Nashville	4-Apr-11		wind			0	0	0	0	Wind gust of 62 mph is recorded at Nashville.	National Weather Service Forecast Office, Nashville, TN
23	Nashville	25-Jun-11		rain		3.79	0	0	0	0	Nashville sees a remarkable 3.79" of rainfall.	National Weather Service Forecast Office, Nashville, TN
24	Nashville	12-Nov-11		wind			0	0	0	0	Following a high temperature of 73 degrees, a strong cold front brings 48 mile per hour winds to Nashville, followed by a 52 degree drop by midnight.	National Weather Service Forecast Office, Nashville, TN
25	Nashville	26-Dec-11		rain		4.06	0	0	0	0	Nashville measures 4.06" of rainfall.	National Weather Service Forecast Office, Nashville, TN

THUNDERSTORMS-1

#	Location	Historical Event	Time	Type	Magnitude (knots)	Precipitation (in.)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
26	Nashville	17-Dec-15		rain		2.72	0	0	0	0	Nashville records 2.72" of rainfall.	National Weather Service Forecast Office, Nashville, TN
27	Nashville	1-Aug-16		rain		2.58	0	0	0	0	Nashville measures 2.58" of rain.	National Weather Service Forecast Office, Nashville, TN
28	Nashville	27-Jan-18		rain		2.88	0	0	0	0	Nashville measures 2.88" of rain.	National Weather Service Forecast Office, Nashville, TN
29	Nashville	26-Oct-20		rain		2.08	0	0	0	0	Nashville gets soaked with 2.08" of rain.	National Weather Service Forecast Office, Nashville, TN
30	Nashville	19-Jul-21		rain		4.02	0	0	0	0	Nashville records greatest one-day rainfall for July, with 4.02".	National Weather Service Forecast Office, Nashville, TN
31	TN and other states	24-Dec-21		severe storm								Chronology of Disasters in TN (Including Natural and Man Diseasters, Epidemics and Civil Disturbances) © Allen P. Coggins, 1988
32	Nashville	11-Mar-23		wind			0	0	0	0	Wind gust of 72 mph is recorded at Nashville.	
33	Nashville	27-Jun-23		wind			0	0	0	0	Wind gust of 62 mph is recorded at Nashville.	
34	Nashville	20-Dec-26		rain		2.03	0	0	0	0	Nashville gets 2.03" of rain. This marks the beginning of a 2-day stretch that will see 5.52" fall on the city.	
35	Nashville	16-Sep-27		rain			0	0	0	0	Very summer-like weather is felt across the mid state. The afternoon temperature hits 98 degrees at Nashville.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
36	Nashville	29-Jun-28		rain		4.22	0	0	0	0	Allardt records its greatest one-day rainfall ever, with 6.75". Nashville records greatest one-day rainfall for June, measuring 4.22".	
37	Nashville	17-Oct-28		rain		3.18	0	0	0	0	Nashville records its greatest one-day rainfall for October, with 3.18".	
38	Nashville	21-Oct-29		rain		2.14	0	0	0	0	Nashville is drenched with 2.14" of rain.	
39	Nashville	14-Aug-30		rain		3.98	0	0	0	0	Nashville gets 3.98" of rainfall.	
40	Nashville	16-Oct-32		rain		2.98	0	0	0	0	A wet day for Nashvillians, as 2.98" of rain is measured.	
41	Bolivar to Nashville	January 5-9, 1946		severe storm								Chronology of Disasters in TN (Including Natural and Man Diseasters, Epidemics and Civil Disturbances) © Allen P. Coggins, 1988
42	Nashville	31-Oct-51		rain		2.3	0	0	0	0	Nashville measures 2.30" of rain.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
43	Nashville	14-Dec-51		rain		2.91	0	0	0	0	Nashville gets soaked with 2.91" of rainfall.	
44	Nashville	13-Jun-53		wind			0	0	0	0	Wind gust of 61 mph is recorded at Nashville.	
45	Nashville	22-Mar-55		rain			0	0	0	0	Nashville measures precipitation for the 11th consecutive day, setting a record.	
46	Davidson County	3-Apr-57	6:00 PM	tstm wind	0 kts.		0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
47	Nashville	17-May-57		hail			0	0	0	0	Golfball size hail is reported in Davidson County.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm

THUNDERSTORMS-2

#	Location	Historical Event	Time	Type	Magnitude (knots)	Precipitation (in.)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
48	Davidson County	17-May-57	11:10 AM	tstm wind	0 kts.		0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm
49	Davidson County	18-Nov-57	2:00 PM	tstm wind	0 kts.		0	0	0	0	None Reported	
50	Davidson County	5-Apr-58	6:30 PM	tstm wind	0 kts.		0	0	0	0	None Reported	
52	Davidson County	27-Apr-58	2:34 PM	tstm wind	75 kts.		0	0	0	0	None Reported	
53	Davidson County	1-Jun-58	6:00 PM	tstm wind	0 kts.		0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
54	Davidson County	1-Jun-58	6:00 PM	tstm wind	0 kts.		0	0	0	0	None Reported	
55	Davidson County	1-May-59	1:45 PM	tstm wind	0 kts.		0	0	0	0	None Reported	
56	Davidson County	13-May-59	4:30 PM	tstm wind	0 kts.		0	0	0	0	None Reported	
57	Nashville	8-Oct-59		rain		2.93	0	0	0	0	Nashville measures 2.93" of rain for a 3-day total of 4.75".	
58	Davidson County	16-Jun-60	8:00 PM	tstm wind	0 kts.		0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
59	Davidson County	29-Jun-60	1:33 AM	tstm wind	65 kts.		0	0	0	0	None Reported	
60	Davidson County	8-May-61	7:33 PM	tstm wind	50 kts.		0	0	0	0	None Reported	
61	Davidson County	21-Jul-61	1:47 PM	tstm wind	80 kts.		0	0	0	0	None Reported	
62	Nashville	26-Feb-62		rain		2.86	0	0	0	0	Nashville records 2.86" of rain in the middle of a 3-day stretch during which 5.31" are measured.	
63	Davidson County	27-Feb-62	8:04 PM	tstm wind	58 kts.		0	0	0	0	None Reported	
64	Davidson County	7-Aug-62	7:20 AM	tstm wind	50 kts.		0	0	0	0	None Reported	
65	Davidson County	8-Jul-63	4:00 PM	tstm wind	0 kts.		0	0	0	0	None Reported	
66	Nashville	28-Aug-63		rain		4.1	0	0	0	0	Nashville measures 4.10" of rainfall.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
67	Davidson County	4-Mar-64	4:10 PM	tstm wind	50 kts.		0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm
68	Davidson County	27-May-64	3:00 PM	tstm wind	57 kts.		0	0	0	0	None Reported	
69	Davidson County	27-May-64	10:00 PM	tstm wind	0 kts.		0	0	0	0	None Reported	
70	Davidson County	15-Jun-64	7:45 PM	tstm wind	0 kts.		0	0	0	0	None Reported	
71	Davidson County	15-Apr-65	5:57 PM	tstm wind	51 kts.		0	0	0	0	None Reported	
72	Davidson County	5-Jul-66	4:00 PM	tstm wind	56 kts.		0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
73	Davidson County	5-Jul-66	4:30 PM	tstm wind	59 kts.		0	0	0	0	None Reported	
74	Davidson County	7-Jul-66	2:00 PM	tstm wind	0 kts.		0	0	0	0	None Reported	
75	Davidson County	7-Jul-66	2:05 PM	tstm wind	60 kts.		0	0	0	0	None Reported	
76	Davidson County	10-Jul-66	11:15 PM	tstm wind	50 kts.		0	0	0	0	None Reported	
77	Davidson County	15-Jul-66	12:00 AM	tstm wind	50 kts.		0	0	0	0	None Reported	
78	Davidson County	6-Mar-67	4:05 AM	tstm wind	0 kts.		0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
79	Davidson County	22-Nov-67	1:30 PM	tstm wind	0 kts.		0	0	0	0	None Reported	
80	Davidson County	1-Jul-68	10:45 PM	tstm wind	70 kts.		0	0	0	0	None Reported	

#	Location	Historical Event	Time	Type	Magnitude (knots)	Precipitation (in.)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
81	Nashville	29-Dec-69		rain		2.18	0	0	0	0	Nashville measures 2.18" of rainfall during the 2nd day of a 3-day wet spell that produces 4.86". Crossville's 3.46" contributes to a 3-day total of 7.60".	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
82	Davidson County	19-Apr-70	8:20 PM	tstm wind	70 kts.		0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
83	Davidson County	3-Jul-70	8:05 PM	tstm wind	0 kts.		0	0	0	0	None Reported	
84	Davidson County	3-Aug-70	6:00 PM	tstm wind	0 kts.		0	0	0	0	None Reported	
85	Davidson County	27-Jun-71	4:20 PM	tstm wind	50 kts.		0	0	0	0	None Reported	
86	Nashville	7-Apr-72		wind			0	0	0	0	Wind gust of 63 mph is recorded at Nashville.	
87	Davidson County	7-Apr-72	5:17 PM	tstm wind	63 kts.		0	0	0	0	None Reported	
88	Davidson County	28-Jun-72	4:20 AM	tstm wind	0 kts.		0	0	0	0	None Reported	
89	Davidson County	27-Jul-72	6:50 PM	tstm wind	0 kts.		0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
90	Davidson County	12-Aug-72	12:00 PM	Tstm Wind	0 kts.		0	0	0	0	None Reported	
91	Davidson County	12-Aug-72	12:15 PM	Tstm Wind	65 kts.		0	0	0	0	None Reported	
92	Nashville	18-Oct-72		rain		2.33	0	0	0	0	Crossville measures 2.42" of rain. Nashville is not far behind with 2.33".	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
93	Davidson County	1-Apr-74	7:15 PM	tstm wind	0 kts.		0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events
94	Davidson County	1-Apr-74	7:20 PM	tstm wind	82 kts.		0	0	0	0	None Reported	
95	Nashville	12-Mar-75		rain			0	0	0	0	Nashville records greatest one-day rainfall for March, with 4.66".	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
96	Davidson County	13-Jan-76	3:04 PM	tstm wind	57 kts.	4.66	0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
97	Davidson County	17-Jul-77	5:54 PM	tstm wind	0 kts.		0	0	0	0	None Reported	
98	Nashville	17-Mar-78		rain			0	0	0	0	Nashville measures precipitation for the 11th consecutive day, tying a record.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
99	Nashville	28-May-78		rain		3.47	0	0	0	0	Downpour at Nashville sets rainfall intensity records for 30 minutes (1.86"), 1 hour (2.82"), & 2 hours (3.47").	
100	Davidson County	19-Aug-78	6:26 PM	tstm wind	0 kts.		0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms

#	Location	Historical Event	Time	Type	Magnitude (knots)	Precipitation (in.)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
101	Nashville	8-Dec-78		rain		4.46	0	0	0	0	Nashville records greatest one-day rainfall for December, with 4.46".	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
102	Davidson County	28-Jul-79	12:00 PM	tstm wind	0 kts.		0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
103	Nashville	13-Sep-79		rain		6.6	0	0	0	0	Nashville records its greatest one-day rainfall ever, with 6.60", as the remnants of Hurricane Frederic push inland. Rainfall intensity records for 3 hours (4.12"), 6 hours (5.17"), & 12 hours (6.37") are also set.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
104	Nashville	19-Apr-81		rain		1.6	0	0	0	0	Downpour at Nashville sets rainfall intensity records for 5 minutes (0.95"), 10 minutes (1.35"), & 15 minutes (1.60").	
105	Davidson County	10-Jun-81	3:00 PM	tstm wind	0 kts.		0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
106	Davidson County	10-Jun-81	3:23 PM	tstm wind	51 kts.		0	0	0	0	None Reported	
107	Davidson County	25-Jun-81	2:42 PM	tstm wind	50 kts.		0	0	0	0	None Reported	
108	Nashville	May-Sept 1981		lightning			0	0	0	0	Weather related deaths: numerous lightening fatalities across the state	Chronology of Disasters in TN (Including Natural and Man Diseasters, Epidemics and Civil Disturbances) © Allen P. Coggins, 1988
109	Davidson County	3-Jun-83	10:20 PM	tstm wind	56 kts.		0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events
110	Davidson County	11-Aug-83	5:19 PM	tstm wind	50 kts.		0	0	0	0	None Reported	
111	Davidson County	23-Aug-83	6:00 PM	tstm wind	52 kts.		0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm
112	Davidson County	15-Mar-84	11:50 PM	tstm wind	0 kts.		0	0	0	0	None Reported	
113	Davidson County	28-Apr-84	6:00 AM	tstm wind	0 kts.		0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
114	Davidson County	7-May-84	2:00 AM	tstm wind	0 kts.		0	0	0	0	None Reported	
115	Davidson County	7-May-84	2:00 PM	tstm wind	54 kts.		0	0	0	0	None Reported	
116	Davidson County	4-Jul-84	2:55 PM	tstm wind	0 kts.		0	0	0	0	None Reported	
117	Davidson County	3-Sep-84	9:30 AM	tstm wind	0 kts.		0	0	0	0	None Reported	
118	Davidson County	27-Nov-84	10:30 AM	tstm wind	0 kts.		0	0	0	0	None Reported	
119	Davidson County	31-May-85	6:00 PM	tstm wind	0 kts.		0	0	0	0	None Reported	
120	Nashville	4-Jun-85		hail			0	0	0	0	Softball-sized hail is reported in Davidson County. This is the largest known hail ever to fall in Tennessee's history.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm

THUNDERSTORMS-5

#	Location	Historical Event	Time	Type	Magnitude (knots)	Precipitation (in.)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
121	Davidson County	30-Aug-85	6:30 PM	tstm wind	0 kts.		0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
122	Nashville	26-Nov-85		wind			0	0	0	0	Wind gust of 60 mph is recorded at Nashville.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather
123	Davidson County	26-Nov-85	10:55 PM	tstm wind	52 kts.		0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
124	Davidson County	27-Nov-85	5:15 PM	tstm wind	0 kts.		0	0	0	0	None Reported	
125	Davidson County	26-Jul-86	2:45 PM	tstm wind	87 kts.		0	0	0	0	None Reported	
126	Nashville	May-Sept. 1986		lightning			0	0	0	0	Numerous lightning fatalities across the state	Chronology of Disasters in TN (Including Natural and Man Diseasters, Epidemics and Civil Disturbances) © Allen P. Coggins, 1988
127	Davidson County	1-Oct-86	5:20 PM	tstm wind	0 kts.		0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
128	Davidson County	18-Mar-87	3:58 AM	tstm wind	0 kts.		0	0	0	0	None Reported	
129	Davidson County	24-Jun-87	3:00 PM	tstm wind	0 kts.		0	0	0	0	None Reported	
130	Davidson County	13-Jul-87	1:30 PM	tstm wind	0 kts.		0	1	0	0	None Reported	
131	Davidson County	23-Jul-87	2:15 PM	tstm wind	0 kts.		0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events
132	Davidson County	9-May-88	8:00 PM	tstm wind	0 kts.		0	0	0	0	None Reported	
133	Davidson County	26-Jun-88	3:15 PM	tstm wind	0 kts.		0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
134	Davidson County	20-May-89	3:00 AM	tstm wind	0 kts.		0	0	0	0	None Reported	
135	Nashville	29-Aug-90		wind			0	0	0	0	Wind gust of 70 mph is recorded at Nashville	
136	Davidson County	29-Aug-90	4:12 PM	tstm wind	61 kts.		0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
137	Davidson County	11-Sep-90	6:30 PM	tstm wind	0 kts.		0	0	0	0	None Reported	
138	Davidson County	4-Oct-90	2:00 AM	tstm wind	0 kts.		0	0	0	0	None Reported	
139	Nashville	9-Nov-90		rain		2.58	0	0	0	0	Nashville measures 2.58" of rainfall.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
140	Davidson County	22-Mar-91	6:20 PM	tstm wind	0 kts.		0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
141	Davidson County	22-Mar-91	7:10 PM	tstm wind	0 kts.		0	0	0	0	None Reported	
142	Davidson County	27-Mar-91	4:15 PM	tstm wind	0 kts.		0	0	0	0	None Reported	

THUNDERSTORMS-6

#	Location	Historical Event	Time	Type	Magnitude (knots)	Precipitation (in.)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
143	Davidson County	27-Mar-91	4:30 PM	tstm wind	0 kts.		0	0	0	0	None Reported	
144	Nashville	9-Apr-91		wind			0	0	0	0	Wind gust of 67 mph is recorded at Nashville.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
145	Davidson County	9-Apr-91	12:00 PM	tstm wind	58 kts.		0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
146	Davidson County	9-Apr-91	12:16 PM	tstm wind	0 kts.		0	4	0	0	None Reported	
147	Davidson County	21-Jun-91	5:00 AM	tstm wind	0 kts.		0	0	0	0	None Reported	
148	Davidson County	2-Jul-91	4:10 PM	tstm wind	0 kts.		0	0	0	0	None Reported	
149	Davidson County	8-Jul-91	9:00 PM	tstm wind	0 kts.		0	1	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
150	Davidson County	10-Jul-91	3:45 PM	tstm wind	0 kts.		0	0	0	0	None Reported	
151	Nashville	2-Dec-91		rain		3.07	0	0	0	0	Nashville measures 3.07" of rainfall, for a 3-day total of 5.96".	National Weather Service Forecast Office; Nashville, Calendar of Significant Weather Events in Middle http://www.srh.noaa.gov/ohx/climate/calendar.htm
152	Davidson County	12-May-92	7:00 PM	tstm wind	0 kts.		0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
153	Davidson County	3-Jul-92	2:50 AM	tstm wind	0 kts.		0	0	0	0	None Reported	
154	Davidson County	16-Jul-92	8:15 PM	tstm wind	0 kts.		0	0	0	0	None Reported	
155	Davidson County	27-Aug-92	5:00 PM	tstm wind	0 kts.		0	0	0	0	None Reported	
156	Davidson County	27-Aug-92	6:15 PM	tstm wind	0 kts.		0	0	0	0	None Reported	
157	Southeast Davidson County	21-Feb-93	1:30 PM	tstm wind	N/A		0	0	1	0	A few trees were blown down.	
158	Davidson County	4-Mar-93	10:30 PM	tstm wind	51 kts.		0	0	0	0	None Reported	
159	Donelson	31-Mar-93	3:20 PM	tstm wind	N/A		0	0	1	0	A few trees were knocked down.	
160	Nashville	6-May-93	6:00 PM	tstm wind	N/A		0	0	1	0	A few trees were knocked down.	
161	West Nashville	25-Aug-93	2:38 PM	tstm wind	N/A		0	0	1	0	Some trees were blown down.	
162	Lakewood	3-Sep-93	2:45 PM	tstm wind	N/A		0	0	1	0	Some trees and power lines were blown down.	
163	Southeast Corner of Tennessee	28-Jan-94	12:00 AM	High Winds	0 kts.		0	0	500	0	High winds blew through the southeast corner of the state. Some roofs, shingles and awning were blown down in Etowah, McMinn County. A building that was holding six helicopters was demolished in Maryville, Blount County. Numerous trees were blown down.	
164	Antioch	10-Apr-94	12:30 PM	Lightning	N/A		1	18	0	0	One person was killed and 18 others were injured when lightning struck during an Ultimate Frisbee Match. M29O	
165	Nashville	27-Apr-94	9:00 AM	tstm wind	N/A		0	0	5	0	A few trees and power lines were blown down.	National Climatic Data Center
166	Goodlettsville	29-Apr-94	1:45 PM	tstm wind	N/A		0	0	1	0	A few trees were blown down	
167	Donelson	5-Jun-94	5:00 PM	tstm wind	N/A		0	0	50	0	Several trees were knocked down. One fell on the roof of an apartment building. Twenty-five people were evacuated from the building.	
168	Nashville	9-Jun-94	5:45 PM	tstm wind	N/A		0	0	1	0	A few trees were knocked down in the north part of the city.	

THUNDERSTORMS-7

#	Location	Historical Event	Time	Type	Magnitude (knots)	Precipitation (in.)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
169	Southern Davidson County	25-Jun-94	3:30 PM	tstm wind	N/A		0	0	1	0	A few power lines were blown down.	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
170	Western Davidson County	26-Jun-94	3:45 PM	tstm wind	N/A		0	0	1 M	0	The roof was blown off of a harbor marina producing around $1 million in damage. Several trees were blown down as well.	
171	Nashville	23-Sep-94		rain		2.86	0	0	0	0	Nashville measures 2.86" of rainfall.	
172	Nashville	27-Nov-94	8:30 PM	tstm wind	N/A		0	0	50	0	Several large tree limbs fell on top of some power lines knocking out power to about 500 homes.	
173	State of Tennessee	11-Apr-95	6:30 AM	High Winds	0 kts.		0	4	1.0M	0	A large part of the state experienced high winds after a line of thunderstorms moved through. The winds were not associated with the thunderstorms. Winds speeds exceeded 70 mph at times. Two persons were injured in Clarksville (Montgomery County) when a tree was blown on top of the truck they were in. Another person was injured in Decherd (Franklin County) when the car they were driving was blown off the road. A fourth person was also injured in Decherd when they were struck by a portable sign. A church that was under construction in Clarksville was destroyed. A greenhouse collapsed in St. James (Greene County). A church steeple was broken off in McEwen (Humphreys County). A boat dock and a 17-foot fishing boat were damaged in Wilson County. One person was trapped in an elevator that had lost power on the campus of East Tennessee State University in Johnson City. There were widespread reports of damage to mobile homes and outbuildings. Numerous homes and businesses suffered roof or awning damage. Trees, power lines and power poles by the hundreds were blown down.	
174	Goodlettsville	9-May-95	7:01 AM	Lightning	N/A		0	0	2	0	A mobile home was destroyed by a fire started by lightning. A 3-year-old girl and a 26-year-old woman were injured in the fire.	
175	Nashville	18-May-95	11:27 AM	tstm wind	N/A		0	0	2	0	Part of a roof was torn off. Many trees and telephone poles were blown down.	
176	Southeastern Davidson County	18-May-95	6:25 PM	tstm wind	N/A		0	0	2	0	A few trees were knocked down.	
177	Davidson County	6-Jun-95	4:30 PM	tstm wind	N/A		0	0	7	0	Five trees and some power lines were blown down.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather
178	Nashville	7-Jun-95	7:00 PM	tstm wind	N/A		0	0	2	0	Some trees were blown down.	
179	Nashville	4-Jul-95		wind			0	0	0	0	Wind gust of 58 mph is recorded at Nashville.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
180	Joelton	4-Jul-95	5:30 PM	Lightning	N/A		0	1	0	0	A man was injured by a lightning strike while sitting on his front porch.	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
181	Nashville	22-Jul-95	2:40 PM	tstm wind	N/A		0	0	2	0	Several power lines were blown down.	
182	Hermitage	22-Jul-95	2:55 PM	tstm wind	N/A		0	0	2	0	A couple of trees were blown down.	
183	Nashville	8-Aug-95	12:40 PM	tstm wind	N/A		0	0	0	0	Tennessee Highway Patrol reported a couple of trees down.	

THUNDERSTORMS-8

#	Location	Historical Event	Time	Type	Magnitude (knots)	Precipitation (in.)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
184	Nashville	18-Aug-95	2:00 PM	tstm wind	N/A		0	0	1	0	Large tree blown down five miles west of Nashville. Telephone pole blown down near Whites Creek Pike.	
185	Nashville	18-Jan-96	1:35 PM	tstm wind	0 kts.		0	0	1	0	Four trees blown down near intersection of Old Hickory Blvd. and Clarksville Highway. Report was by Davidson County Emergency Management Agency.	
186	Davidson County	27-May-96	2:15 PM	tstm wind	50 kts.		0	0	0	0	Emergency Management Agency reported numerous trees and power lines down around the county.	
187	Joelton	3-Jun-96	6:25 PM	tstm wind	50 kts.		0	0	0	0	Power lines and trees were blown down.	
188	Nashville	3-Jun-96	6:25 PM	tstm wind	0 kts.		0	0	1	0	Power lines and trees were blown down in the south part of Nashville.	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
189	Hermitage	3-Jun-96	7:05 PM	tstm wind	50 kts.		0	0	0	0	TEMA reported trees down and hail covering the ground in spots at Hermitage. Hail size is unknown.	
190	Nashville	3-Jun-96	7:05 PM	tstm wind	50 kts.		0	0	0	0	Davidson County Emergency Management Agency reported power lines down across the western parts of downtown Nashville.	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
191	Nashville	14-Jul-96	5:15 PM	tstm wind	50 kts.		0	0	0	0	Trees and wires down along Kirkwood St., Clayton Ave., and Bellmont Blvd.	
192	Nashville	21-Jul-96	6:05 PM	tstm wind	50 kts.		0	0	0	0	SKYWARN spotter reported minor damage to Polk Building in downtown Nashville.	
193	Nashville	21-Jul-96	6:05 PM	`	0 kts.		0	0	200	0	Strong thunderstorm winds knocked down a transmission tower for WKDF-AM radio station in downtown Nashville. It landed on a Nissan truck which was to be a promotional item for the radio station and on another car in the parking lot. Nashville Electric Service reported more than 200 power lines down; about 13,000 people were without power. Ther hardest hit areas without power were West and North Nashville, Antioch and Goodlettsville. One apartment lost a roof in West Nashville at Sequoia Village. Also, a tree fell on top of a car in a church parking lot.	
194	Hermitage	21-Jul-96	6:12 PM	tstm wind	50 kts.		0	0	0	0	Numerous trees and power lines down.	
195	Madison	21-Jul-96	6:12 PM	tstm wind	50 kts.		0	0	0	0	Numerous trees and power lines blown down.	
196	Nashville	21-Jul-96	6:12 PM	tstm wind	50 kts.		0	0	0	0	Numerous trees and power lines were down in the west and northwest part of the city.	
197	Nashville	29-Jul-96	11:50 AM	tstm wind	50 kts.		0	0	0	0	Trees and power lines were down 7 to 8 miles west of downtown Nashville.	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
198	Antioch	27-Sep-96	6:10 AM	tstm wind	50 kts.		0	0	0	0	Power company reported tree limbs down on power lines.	
199	Hermitage	18-Oct-96	12:10 AM	tstm wind	50 kts.		0	0	0	0	National Weather Service employee reported large tree limbs were blown down.	
200	Nashville	7-Nov-96	1:40 PM	tstm wind	50 kts.		0	0	1	0	Numerous trees and power lines were down.	

#	Location	Historical Event	Time	Type	Magnitude (knots)	Precipitation (in.)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
201	Nashville	3-Jan-97	11:20 PM	tstm wind	50 kts.		0	0	0	0	Local law enforcement reported power lines were down and signs were blown down.	
202	Madison	4-Jan-97	9:20 PM	tstm wind	50 kts.		0	2	500	0	Severe property damage in Madison near Gallatin Rd. and Myatt Dr. Parts of roofs were ripped off several buildings including the Olive Garden restaurant. About 200 people scurried under tables when the Olive Garden lost part of its roof. The facade of a Blockbuster Music store was also destroyed. Other businesses that sustained heavy damage were Audio Video Environments, Bow Boot Store, Picture Frame Warehouse, Rio Bravo Restaurant, and Doctor's ValuVision. Several homes in Madison had roof damage. A power pole was knocked down on Jannette Ave. Several trees were blown down in the Madison area. An outdoor satellite dish was blown over. A total of 12 businesses and 6 homes received some damage. There were 2 minor injuries. Both individuals were treated and released.	
203	Cane Ridge	21-Feb-97	7:30 AM	tstm wind	50 kts.		0	0	0	0	A tree was blown down on Burkitt Rd. in the southeast part of Davidson county.	
204	Antioch	5-Mar-97	6:14 AM	tstm wind	50 kts.		0	0	0	0	Large tree limbs were blown down.	
205	Nashville	5-Mar-97	6:28 AM	tstm wind	50 kts.		0	0	0	0	Large tree limb was down at downtown Nashville.	
206	Forest Hills	21-Apr-97	6:00 AM	Lightning	N/A		0	0	100	0	A lightning strike started a fire and severely damaged a Forest Hill home.	
207	Nashville	19-May-97	7:24 PM	tstm wind	50 kts.		0	0	0	0	Metro Nashville EOC reported one tree was down on McCrory Lane in west Nashville.	
208	Bellevue	26-May-97	10:20 AM	`	50 kts.		0	0	0	0	A few trees were blown down.	
209	Joelton	13-Jun-97	1:43 PM	tstm wind	50 kts.		0	0	10	0	Numerous trees down. A tree fell on top of a house.	
210	Joelton	13-Jun-97	6:45 PM	tstm wind	50 kts.		0	0	0	0	Several trees were blown down. At one point 30,000 customers were without power in Davidson county.	
211	Goodlettsville	4-Jul-97	4:10 AM	tstm wind	0 kts.		0	0	1	0	Trees down over the road	
212	Nashville	14-Jul-97	9:30 PM	tstm wind	50 kts.		0	0	0	0	Local law enforcement reported several trees and power lines were down.	
213	Nashville	28-Jul-97	4:25 PM	tstm wind	0 kts.		0	0	10	0	Power poles were down along River Road in west Nashville.	
214	Goodlettsville	19-Aug-97	5:00 PM	tstm wind	50 kts.		0	0	0	0	Thunderstorm winds blew down 12 to 16 trees in the vicinity of highway 41.	
215	Nashville	30-Nov-97		rain		4.2	0	0	0	0	Nashville records greatest one-day rainfall for November, with 4.20". High water covers Highways 41 and 31A in the southeast part of town. A number of motorists are stranded in their vehicles and have to be rescued.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
216	Nashville	30-Nov-97	2:58 PM	tstm wind	50 kts.		0	0	10	0	NWS employee reported a billboard sign was blown down. The location was about 2 miles west of the Stones River on the north side of Interstate 40.	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
217	Inglewood	8-Mar-98	5:10 PM	tstm wind	50 kts.		0	0	0	0	Large tree limbs were blown down.	

#	Location	Historical Event	Time	Type	Magnitude (knots)	Precipitation (in.)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
218	Nashville	8-Apr-98		wind			0	0	0	0	Wind gust of 59 mph is recorded at Nashville.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
219	Inglewood	8-Apr-98	2:00 AM	tstm wind	0 kts.		0	0	5	0	Tree fell on a car. A few bricks were out of a chimney.	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
220	Donelson	8-Apr-98	2:15 AM	tstm wind	50 kts.		0	0	0	0	Local law enforcement reported trees and powerlines down.	
221	Donelson	8-Apr-98	11:48 AM	tstm wind	60 kts.		0	0	0	0	Local law enforcement reported 2 trees blown down.	
222	Nashville	18-Apr-98	1:55 AM	tstm wind	50 kts.		0	0	0	0	EMA official reported a tree down on Whites Creek Pike.	
223	Antioch	21-May-98	6:10 PM	tstm wind	0 kts.		0	0	10	0	A few roofs were blown off homes from strong thunderstorm winds.	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
224	Nashville	25-May-98	7:40 PM	tstm wind	0 kts.		0	0	5K	0	Roof and some bricks blown off business in west Nashville, 50th St. and Charlotte Pike.	
225	Nashville	4-Jun-98	9:00 AM	Lightning	N/A		0	0	250	0	Lightning struck the 108-year-old St. Patrick Catholic Church on Second Ave. So. The fire had done serious structural damage to the roof and steeple.	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
226	Inglewood	4-Jun-98	6:20 AM	tstm wind	50 kts.		0	0	0	0	8 inch diameter wide branch snapped off a tree.	
227	Nashville	10-Jun-98	4:10 PM	tstm wind	50 kts.		0	0	0	0	EMA reported scattered areas of trees and power lines were blown down in the western part of the city.	
228	Goodlettsville	10-Jun-98	8:30 AM	tstm wind	50 kts.		0	0	0	0	Trees were blown down.	
229	Nashville	10-Jun-98	9:46 AM	tstm wind	50 kts.		0	0	0	0	EMA reported trees and power lines down.	
230	Nashville	10-Jun-98	10:02 AM	tstm wind	0 kts.		0	0	5	0	Tree fell on a house.	
231	Hermitage	14-Jun-98	9:25 PM	tstm wind	50 kts.		0	2	10	0	A tree fell on a car which injured 2 people.	
242	Nashville Metro Airport	20-Jun-98	6:00 PM	tstm wind	85 kts.		0	0	0	0	98 mph wind gust was recorded in a thunderstorm at the control tower at Metro Airport. Rotating wall cloud was also observed by tower personnel.	
243	Davidson County	3-Jul-98	1:40 PM	tstm wind	50 kts.		0	0	0	0	A few trees, large limbs, and power lines were blown down across the county.	
244	Hermitage	10-Nov-98	11:45 AM	tstm wind	50 kts.		0	0	0	0	Powerlines were down.	
245	Nashville Metro Airport	17-Jan-99	8:16 PM	tstm wind	60 kts.		0	0	0	0	70 mph thunderstorm wind gust recorded at the airport.	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
246	Nashville Metro Airport	2-Mar-99	5:00 PM	tstm wind	0 kts.		0	0	50	0	Straight line thunderstorm winds hit east Nashville. Trees were blown down, and 30 homes were damaged.	
247	Davidson County	5-Apr-99	11:10 PM	tstm wind	50 kts.		0	0	0	0	EMA reported power lines were down.	
248	Nashville	19-Apr-99		Hail			0	0	0	0	Baseball-size hail is reported northwest of Nashville at Whites Creek Pike.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm

THUNDERSTORMS-11

#	Location	Historical Event	Time	Type	Magnitude (knots)	Precipitation (in.)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
249	Bellevue	5-May-99	8:34 PM	tstm wind	52 kts.		0	0	0	0	Spotter reported 60 mph wind gust.	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
250	Nashville	5-May-99	8:34 PM	tstm wind	0 kts.		0	0	5	0	EMA reported roof blown off a house on 10th and Monroe.	
251	Bellevue	5-May-99	8:35 PM	tstm wind	61 kts.		0	0	0	0	Spotter reported 70 mph wind gust.	
252	Nashville	5-May-99	8:40 PM	tstm wind	70 kts.		0	0	0	0	Spotter reported 80 mph wind gust in the Fessler's Lane and Murfreesboro Road area of Nashville.	
253	Nashville Metro Airport	5-May-99	8:45 PM	tstm wind	86 kts.		0	0	2.7M	0	FAA wind equipment clocked a 99 mph wind gust in the strong thunderstorm downdrafts. 70 planes were damaged, and 2 hangars were destroyed. Many trees and power lines were down around the county. Debris and jet fuel was scattered across the runway. The airport was closed for several hours. The hardest hit areas in Davidson county were Pennington Bend, Elysian Fields, Antioch, Old Hickory, east Nashville and Radnor lake. Part of a roof was lifted off Stratford H.S. Metro schools were cancelled on May 6 so crews could restore power and clean up debris around the county.	
254	Western Davidson County	5-May-99	8:45 PM	tstm wind	50 kts.		0	0	0	0	Widespread trees were blown down across the western part of the county.	
255	Joelton	5-May-99	8:57 PM	tstm wind	50 kts.		0	0	0	0	Tree fell on top of a car.	
256	Goodlettsville	5-May-99	9:05 PM	tstm wind	50 kts.		0	0	0	0	Large trees were uprooted.	
257	Brentwood	10-Jun-99	3:18 PM	tstm wind	50 kts.		0	0	0	0	EMA reported trees blown down.	
258	Nashville	24-Jul-99	2:13 PM	tstm wind	50 kts.		0	0	0	0	Police department reported power lines down in south Nashville.	
259	Nashville	1-Aug-99	2:25 PM	tstm wind	50 kts.		0	0	0	0	Several power lines and trees were down. A tree was blocking Overhill Road and Hillsboro Rd. 4000 homes were without power.	
260	Nashville	12-Aug-99	3:55 PM	tstm wind	0 kts.		0	0	100	0	Newspaper article stated Antioch Middle School, Una Elementary School, and Donelson's Two Rivers Middle School sustained water damage after winds lifted the roofs, allowing rain to seep in. Also, 5 private planes were damaged, 3 of them heavily, on the ramp of Mercury Air, a charter operation at Nashville International Airport. Strong winds collapsed a section of a warehouse in east Nashville.	
261	Bellevue	26-May-00	11:18 AM	tstm wind	61 kts.		0	0	0	0	Spotter reported 70 mph wind gust.	
262	Nashville	26-May-00	11:38 AM	tstm wind	65 kts.		0	0	10	0	Spotter reported trees and power lines down as well as damage to a structure at I-65 and Harding.	
263	Donelson	27-May-00	3:00 PM	tstm wind	51 kts.		0	0	0	0	Spotter reported 60 mph wind gusts and trees down.	
264	Nashville	27-May-00	3:00 PM	tstm wind	61 kts.		0	0	0	0	70 mph wind gusts moved through the Nashville area with many trees and power lines down.	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
265	Nashville	29-Jul-00	12:00 PM	tstm wind	50 kts.		0	0	1	0	Spotter measured 58 mph wind gust. Also, a tree fell on a MTA bus in south Nashville.	

#	Location	Historical Event	Time	Type	Magnitude (knots)	Precipitation (in.)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
266	Bellevue	4-Aug-00	4:45 AM	tstm wind	50 kts.		0	0	0	0	Tree was down at intersection of Sawyer Brown Road and Hicks Road.	
267	Davidson County	9-Nov-00	11:50 AM	tstm wind	55 kts.		0	0	0	0	EMA reported numerous trees and power lines down countywide.	
268	Nashville	25-Feb-01	12:15 AM	tstm wind	50 kts.		0	0	0	0	EMA reported a few trees and power lines down.	
269	Nashville	15-Apr-01	5:30 AM	tstm wind	60 kts.		0	0	0	0	EMA reported a large tree fell on a house located at 4429 Franklin Rd. About 60% of the house was destroyed.	
270	Nashville	15-Apr-01	6:10 AM	tstm wind	65 kts.		0	0	0	0	EMA reported numerous trees down and 7 homes damaged mainly in west Nashville and the Antioch area. A tree fell on a mobile home, trees also fell on cars and damaged an apartment building.	
271	Nashville	28-Apr-01	1:00 PM	tstm wind	60 kts.		0	0	0	0	Spotter reported numerous trees were down, and some fell on cars.	
272	Nashville	7-May-01	5:20 PM	tstm wind	55 kts.		0	0	0	0	Trained spotter reported trees blown down on Old Hickory Golf Course. Also, trees and power lines were	
273	Nashville	11-May-01	12:30 PM	tstm wind	50 kts.		0	0	0	0	EMA reported power lines down in South Nashville.	
274	Nashville	20-May-01	6:54 PM	tstm wind	50 kts.		0	0	0	0	Davidson County Office of Emergency Management reported trees and a power pole down in South Nashville.	
275	Cheatham, Davidson, Dickson, Hickman, Humphreys, Macon, Montgomery, Rutherford, Sumner, Williamson, Wilson	4-Jun-01	7:12 PM	High Wind	52 kts.		0	0	0	0	Trees and power lines were down around the county. A decaying area of thunderstorms from Northern Alabama was entering the southern part of Middle Tennessee Monday evening. As a result a strong gust front developed ahead of this area of dissipating thunderstorms. Winds were estimated to be 40 mph with brief occasional gusts to 60 mph along this gust front. No thunderstorms were associated with these winds. Trees and power lines were blown down across several counties in Middle Tennessee. This gust front weakened as it entered southern Kentucky.	
276	Nashville	6-Jun-01	2:15 PM	tstm wind	50 kts.		0	0	0	0	Davidson County Office of Emergency Management reported trees and power lines down in west Nashville. Urban street flooding was also reported.	
277	Nashville	15-Jun-01	1:25 PM	tstm wind	55 kts.		0	0	0	0	Trees and power lines were down around Nashville. A tree was down on Belle Meade Road. Wires were down near Adelphia stadium.	
278	Nashville	26-Jun-01	4:00 PM	tstm wind	50 kts.		0	0	0	0	EMA reported tree down in downtown Nashville.	
279	Antioch	27-Jun-01	3:30 PM	tstm wind	50 kts.		0	0	0	0	Several trees down in Antioch and Woodbine.	
280	Nashville	30-Jun-01	5:00 PM	tstm wind	50 kts.		0	0	0	0	Office of Emergency Management reported trees and power lines down across the southern and western part of the county.	
281	Joelton	4-Jul-01	1:00 PM	tstm wind	50 kts.		0	0	0	0	Spotter reported trees snapped off.	
282	Nashville	5-Jul-01	3:38 PM	tstm wind	50 kts.		0	0	0	0	EMA reported a tree was blown down across a power line near 25th Avenue So.	
283	Nashville	5-Jul-01	9:16 AM	tstm wind	52 kts.		0	0	0	0	Spotter reported 60 mph wind gust in downtown Nashville.	
284	Goodlettsville	28-Jul-01	3:39 PM	tstm wind	50 kts.		0	0	0	0	Metro EOC reported power lines down.	

THUNDERSTORMS-13

#	Location	Historical Event	Time	Type	Magnitude (knots)	Precipitation (in.)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
285	Nashville	3-Aug-01	6:00 PM	tstm wind	50 kts.		0	0	0	0	Davidson County OEM reported a power line down at Peabody and Hermitage Ave.	
286	Nashville	24-Oct-01	6:40 PM	tstm wind	57 kts.		0	0	0	0	Numerous trees and power lines were down in Old Hickory.	
287	Nashville	24-Oct-01	7:01 PM	tstm wind	61 kts.		0	0	0	0	Amateur radio report of numerous trees and power poles down in the Nashville metro area.	
288	Nashville	29-Nov-01		rain		3.46	0	0	0	0	Nashville measures 3.46" of rainfall.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
289	Nashville	18-Mar-02		rain		4.12	0	0	0	0	Widespread heavy rainfall begins during the afternoon of the 17th and lasts into the early morning of the 18th. A total of 5 persons are killed across Middle Tennessee, three in Robertson County, one in Lewisburg, another in Nashville. All 5 deaths are vehicle-related. Manchester receives the most rainfall -- 6.44" in 24 hours, with Dickson reporting 5.45", Warner Park (Nashville), 4.12", and Morrison (Warren County), 3.67".	
290	Madison	28-Apr-02	4:30 AM	tstm wind	50 kts.		0	0	0	0	Spotter reported trees were blown down.	
291	Davidson County	30-Apr-02	11:15 PM	tstm wind	55 kts.		0	0	0	0	EMA reported 4 trees down and 5 power lines down around the county.	
292	Davidson County	13-May-02	3:30 AM	tstm wind	50 kts.		0	0	0	0	Numerous trees and power lines down around the county including Hermitage, Joelton, East Nashville and Old Hickory. Some trees fell on cars and homes.	
293	Northwest Davidson County	13-May-02	9:22 AM	tstm wind	50 kts.		0	0	0	0	EMA reported trees and power lines down.	
294	Hermitage	13-May-02	9:30 AM	tstm wind	50 kts.		0	0	0	0	NWS employee reported trees down.	
295	Bellevue	24-Jun-02	4:50 PM	tstm wind	50 kts.		0	0	0	0	EMA reported trees and power lines were down.	
296	Hermitage	25-Jun-02	5:27 AM	tstm wind	50 kts.		0	0	0	0	EMA reported a tree down on Shutes Lane and Saundersville Rd.	
297	Nashville	25-Jun-02	6:25 AM	tstm wind	50 kts.		0	0	0	0	EMA reported trees were down in the western sections of the city.	
298	Nashville	30-Jun-02	7:30 PM	tstm wind	50 kts.		0	0	0	0	Police reported several trees were down in East Nashville.	
301	Davidson County	10-Jul-02	2:08 PM	tstm wind	55 kts.		0	0	0	0	Davidson county OEM reported numerous trees and scattered power outages. Areas affected were Joelton...Whites Creek and Donelson.	
302	Nashville	12-Jul-02	2:30 PM	tstm wind	50 kts.		0	0	0	0	OEM reported a power line was down on Woodale Ln.	
303	Nashville	22-Jul-02	11:50 AM	tstm wind	50 kts.		0	0	0	0	Law enforcement reported numerous trees and power lines down in the West End area.	
304	Davidson County	30-Jul-02	11:31 AM	tstm wind	50 kts.		0	0	0	0	OEM reported 6 trees were blown down along with numerous power lines	
305	Nashville	16-Aug-02	12:35 PM	tstm wind	65 kts.		0	0	0	0	EMA reported an air conditioner unit was blown off a two-story building onto a car on 4th Ave. and Lafayette. Also, many large trees were blown down. There was some damage at Greer Stadium. The strong winds damaged the Nashville Sound's guitar-shaped scoreboard. There was also damage to the stadium's temporary bleachers.	
306	Madison	22-Aug-02	2:45 PM	tstm wind	50 kts.		0	0	0	0	SKYWARN spotter reported trees were blown down.	
307	Madison	22-Aug-02	2:45 PM	tstm wind	60 kts.		0	0	0	0	NWS employee reported numerous trees were down near Anderson Road, between Myatt Drive and Gallatin Road	
308	Nashville	1-May-03	2:20 PM	tstm wind	55 kts.		0	0	0	0	Numerous power lines and trees down in western portion of county.	

#	Location	Historical Event	Time	Type	Magnitude (knots)	Precipitation (in.)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
309	Nashville	1-May-03	2:45 PM	tstm wind	55 kts.		0	0	0	0	Numerous 3 to 8 inch diameter trees down.	
310	Nashville	5-May-03	1:38 AM	tstm wind	70 kts.		0	0	0	0	Spotter reported structural damage to homes near Madison. The White House granted Governor Phil Bredesen's request for Presential Disaster Declaration for 20 counties in West and Middle Tennessee for damage as a result of tornadoes, flooding and severe thunderstorms which began on Sunday , May 4, 2003.	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
311	Nashville	5-May-03	12:44 AM	tstm wind	50 kts.		0	0	0	0	Spotter reported power lines down near Skyline Medical Center. The White House granted Governor Phil Bredesen's request for Presential Disaster Declaration for 20 counties in West and Middle Tennessee for damage as a result of tornadoes, flooding and severe thunderstorms which began on Sunday , May 4, 2003.	
312	Nashville	7-May-03	1:10 AM	tstm wind	65 kts.		0	0	0	0	EMA reported numerous trees were blown down and 3 buildings were damaged at the Rivergate Mall. A McDonald Restaurant had damage to its signs, a Lenscrafter store had roof damage, and the El Chico Mexican Restaurant had its awnings torn away and minor roof damage. The White House granted Governor Phil Bredesen's request for Presential Disaster Declaration for 20 counties in West and Middle Tennessee for damage as a result of tornadoes, flooding and severe thunderstorms which began on Sunday , May 4, 2003.	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
313	Nashville	11-May-03	2:12 AM	tstm wind	50 kts.		0	0	0	0	Spotter reported a wind gust around 60 mph.	
314	Nashville	11-May-03	2:12 AM	tstm wind	68 kts.		0	0	0	0	Spotter reported a measured gust of 78 mph.	
315	Nashville	10-Jun-03	2:05 PM	tstm wind	55 kts.		0	0	10	0	Tree fell on a house located at 113 Belvedere Drive in Nashville.	
316	Antioch	10-Jun-03	2:08 PM	tstm wind	50 kts.		0	0	0	0	Large tree limbs were down about one mile west of Hickory Hollow Mall.	
317	Antioch	10-Jun-03	2:10 PM	tstm wind	60 kts.		0	0	0	0	Ham radio operator reported a 16 inch diameter tree blew down on a house. 2 other trees were uprooted.	
318	Forest Hills	11-Jun-03	2:00 PM	tstm wind	60 kts.		0	0	0	0	EMA reported numerous trees were down.	
319	Donelson	11-Jun-03	2:15 PM	tstm wind	55 kts.		0	0	0	0	Ham radio operator reported trees down and one power line down.	
320	Nashville	16-Jun-03	3:15 PM	tstm wind	50 kts.		0	0	0	0	Two trees were blown down near the Rivergate Mall.	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
321	Nashville	10-Jul-03	1:40 PM	tstm wind	55 kts.		0	0	0	0	Trees and power lines were down in downtown Nashville.	
322	Bellevue	12-Jul-03	4:11 PM	tstm wind	50 kts.		0	0	0	0	Public reported a tree down at the intersection of U.S. Highway 70 and U.S. Highway 70S.	

THUNDERSTORMS-15

#	Location	Historical Event	Time	Type	Magnitude (knots)	Precipitation (in.)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
323	Whites Creek Area	13-Jul-03	4:00 PM	tstm wind	55 kts.		0	0	0	0	EMA reported trees down.	
324	Davidson County	21-Jul-03	1:00 PM	tstm wind	65 kts.		0	0	493	0	EMA office reported trees and power lines were down around the county. The historic building "The Cannery" in downtown Nashville lost part of its roof, and the fourth floor was damaged. The four-story 120-year-old building was located at Eighth Avenue South. The historic building had to be torn down. The huge building started as the home of Liberty Mills in 1883. Wheat was ground into flour in the old building. The building and the land it was on was worth $493,200.	
325	Donelson	21-Jul-03	1:05 PM	tstm wind	60 kts.		0	0	15	0	Tree was blown down on a vehicle.	
326	Nashville	28-Jul-03	7:15 PM	tstm wind	55 kts.		0	0	0	0	TDOT reported a few trees were down on Maplehurst Ave., Walton Lane, and Old Hickory Blvd.	
327	Nashville	4-Aug-03	9:08 PM	tstm wind	55 kts.		0	0	0	0	Davidson County Office of Emergency Management reported a measured wind gust of 63 mph (55 knots) with numerous trees and power lines down around the county. Several trees fell on houses and cars. There were at least 200 calls about the downed trees and power lines.	
328	Nashville Metro Airport	4-Aug-03	9:15 PM	tstm wind	51 kts.		0	0	0	0	59 mph wind gust measured by BNA ASOS at the airport.	
329	Nashville	4-Aug-03	9:20 PM	tstm wind	65 kts.		0	4	50K	0	Law enforcement and newspaper articles reported 20 to 30 boats were overturned and part of the Elm Hill Marina was destroyed. 4 people were injured, and 2 of them had to be hospitalized. The storms struck during a fishing tournament.	
330	Nashville Metro Airport	4-Aug-03	9:20 PM	tstm wind	60 kts.		0	0	0	0	Law enforcement reported 2 planes flipped over at BNA airport.	
331	Nashville	4-Aug-03	9:25 PM	tstm wind	55 kts.		0	0	0	0	Spotter reported trees down at the corner of 46th Ave. and Charlotte.	
332	Nashville	22-Aug-03	6:50 PM	tstm wind	50 kts.		0	0	0	0	Spotter reported a tree was blown down on a house.	
333	Nashville	22-Aug-03	6:50 PM	tstm wind	50 kts.		0	0	0	0	NWS employee reported an interstate road sign was twisted near Percy Priest Dam.	
334	Nashville	22-Aug-03	6:50 PM	tstm wind	52 kts.		0	0	0	0	Spotter estimated wind gusts to be 60 mph.	
335	Nashville	22-Aug-03	7:00 PM	tstm wind	55 kts.		0	0	0	0	Davidson County OEM reported 78 downed trees, 146 downed power lines and 35,000 people with out power in the Nashville Metro area.	
336	Antioch	27-Aug-03	1:50 PM	tstm wind	50 kts.		0	0	0	0	Large tree limbs were blown down.	

#	Location	Historical Event	Time	Type	Magnitude (knots)	Precipitation (in.)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
337	Nashville	30-Aug-03	5:30 PM	Lightning	N/A		0	0	10	0	News article about lightning striking the William R. Snodgrass Tennessee Tower. The lightning set off the sprinkler system in the 31-story building. The water leaked through elevator shafts onto almost every floor of the building. The first four floors were the hardest hit. The elevator shafts filled up with more than 20 feet of water. The building was built in 1970 as the headquarters of the National Life and Accident Insurance Company.	
338	Nashville	18-Nov-03	1:25 PM	tstm wind	52 kts.		0	0	0	0	Ham radio spotter reported a 60 mph wind gust in the Green Hills section of Davidson County.	
339	Nashville	13-Jul-04	8:19PM	tstm wind	60 kts.		0	0	0	0	Winds were estimated to be 60 to 70 mph in the Green Hills area.	
340	Nashville	13-Jul-04	8:28 PM	tstm wind	60 kts.		0	0	0	0	Davidson County OEM reported hundreds of trees and power lines were down around the county.	
341	Nashville	13-Jul-04	8:39 PM	tstm wind	60 kts.		0	0	0	0	Trees down at the intersection of Nolensville Road and Old Hickory Blvd.	
342	Nashville	13-Jan-05	9:03 AM	tstm wind	65 kts.		0	0	20K	0	Strong thunderstorm winds took part of a roof of an apartment building located on Picadilly Row at the Signature Pointe Apartments in Antioch.	National Weather Service Forecast Office; Nashville, TN;
343	Donelson	19-May-05	3:40 PM	tstm wind	60 kts.		0	0	0	0	NWS Trained Spotter estimated wind gusts to be 65 to 70 mph.	
344	Joelton	6-Nov-05	4:10 AM	tstm wind	60 kts.		0	0	10K	0	Shallow rooted trees were uprooted, and a few trees were snapped. One home had roof damage. The hardest hit area was along Strawberry Hill Rd.	National Weather Service Forecast Office; Nashville, TN;
345	Nashville	9-Mar-06	4:37 PM	tstm wind	60 kts.		0	0	0	0	Trees and power lines were down. Roof was off one building near Bellevue. Winds toppled over a tractor-trailer truck on I-65 just south of Nashville. Winds were estimated to be about 70 mph.	National Weather Service Forecast Office; Nashville, TN;
346	Nashville	18-Oct-07	10:35 PM	tstm wind	63 kts.		0	0	0	0	Davidson County OEM official reported 73 mph wind gust with hand held anemometer at I-65 and Harding Road.A Tornado Watch was in effect for much of Middle Tennessee Thursday afternoon and evening. Squall line type thunderstorms developed and produced some wind damage, mainly downed trees and power lines. One tornado occurred in extreme northwest part of Stewart County.	
347	Nashville	18-Oct-07	10:40 PM	tstm wind	60 kts.		0	0	2k	0	Several large trees were blown down at the Crieve Hall area of Nashville near the Ellington Agricultural Center.A Tornado Watch was in effect for much of Middle Tennessee Thursday afternoon and evening. Squall line type thunderstorms developed and produced some wind damage, mainly downed trees and power lines. One tornado occurred in extreme northwest part of Stewart County.	

THUNDERSTORMS-17

#	Location	Historical Event	Time	Type	Magnitude (knots)	Precipitation (in.)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
348	Nashville	2-Apr-09	4:00 PM	tstm wind	60 kts.		0	0	100k	0	A newspaper reported that a spokeswomen with the Davidson County Office of Emergency Management said that the roof was blown off an Internal Revenue Service Building and the building had significant water damage.	
349	Nashville	26-Jun-10	6:30 PM	tstm wind	55 kts.		0	0	150k	0	A survey team consisting of personnel from the NWS and the Metro Nashville Office of Emergency Management surveyed damage in the Grieve Hall area of Southern Davidson County. A microburst, with maximum winds around 90 mph occurred. It resulted in around 100 trees being snapped or uprooted, several buildings with partial uplifting and shingle damage, and four wooden power poles being snapped. Initial damage was noted at the corner of Harding Place and Trousdale Drive. A couple of windows were blown out of a local businesses, several signs were destroyed, and a gas pump was blown over onto a car. The damage area then extended around one mile to the east and south, generally an area bordered by Elysian Fields Road to the north and Trousdale Road to the west.	National Weather Service Forecast Office; Nashville, TN;
350	Nashville	24-Feb-11	9:51 PM	tstm wind	75 kts.		0	0	250k	0	In the Cleveland Street area north of downtown Nashville, at least 100 large hardwood trees were uprooted and a few were snapped. Fallen trees damaged some roofs and vehicles. Some loss of shingles noted on house roofs. A small amount of aluminum siding peeled off a couple of exterior walls. A wood fence was also blown down.	National Weather Service Forecast Office; Nashville, TN;
351	Nashville	4-Apr-11	4:00 PM	tstm wind	60 kts.		0	0	80k	0	Near the intersection of Central Pike and Tulip Grove Road two metal high voltage power poles were bent over. Some trees were also snapped and uprooted.	National Weather Service Forecast Office; Nashville, TN;
352	Nashville	24-May-11	4:00 PM	tstm wind	55 kts.		0	0	60k	0	In the eastern part of Nashville, 40 plus trees were downed along with numerous power poles.	National Weather Service Forecast Office; Nashville, TN;
as of 2012, wind and hail events will not be significant enough to report if under $100k…per NWS												
358	(BNA)NASHVILLE METRO	1/23/2012	135	tstm wind	50		0	0	10000	0		National Weather Service Forecast Office; Nashville, TN; http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=47%2CTENNESSEE
359	BERRY HILL	3/2/2012	1603	tstm wind	71		0	0	0	0		
360	BERRY HILL	5/6/2012	1530	tstm wind	55		0	0	5000	0		
361	NASHVILLE	5/31/2012	1910	tstm wind	55		0	0	25000	0		
362	GLENCLIFF	5/31/2012	1915	tstm wind	55		0	0	5000	0		
363	WOODBINE	5/31/2012	1915	tstm wind	55		0	0	10000	0		
364	PASQUO	7/2/2012	1230	tstm wind	55		0	0	10000	0		
365	JOELTON	7/2/2012	1330	tstm wind	55		0	0	25000	0		
366	NASHVILLE TUNE ARPT	7/6/2012	1455	tstm wind	55		0	0	25000	0		
367	INGLEWOOD	7/8/2012	1520	tstm wind	55		0	0	5000	0		
368	INGLEWOOD	7/8/2012	1616	tstm wind	55		0	0	3000	0		
369	(BNA)NASHVILLE METRO	7/8/2012	1616	tstm wind	55		0	0	3000	0		
370	NASHVILLE	7/8/2012	1620	tstm wind	55		0	0	5000	0		
371	OAK HILL	7/8/2012	1620	tstm wind	55		0	0	20000	0		

THUNDERSTORMS-18

#	Location	Historical Event	Time	Type	Magnitude (knots)	Precipitation (in.)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
372	HERMITAGE	7/8/2012	2130	tstm wind	55		0	0	25000	0		National Weather Service Forecast Office; Nashville, TN; http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=47%2CTENNESSEE
373	FOREST HILLS	7/18/2012	1720	tstm wind	55		0	0	2000	0		
374	BELLE MEADE	7/18/2012	1720	tstm wind	55		0	0	1000	0		
375	GOODLETTSVILLE	7/19/2012	2020	tstm wind	52		0	0	0	0		
376	JOELTON	7/19/2012	2040	tstm wind	55		0	0	10000	0		
377	THE HERMITAGE	7/19/2012	2055	tstm wind	55		0	0	25000	0		
378	TULIP GROVE	7/19/2012	2115	tstm wind	55		0	0	5000	0		
379	BELLE MEADE	7/19/2012	2115	tstm wind	55		0	0	250	0		
380	BRENTWOOD	7/19/2012	2129	tstm wind	55		0	0	25000	0		
381	BELLE MEADE	7/19/2012	2130	tstm wind	55		0	0	10000	0		
382	NASHVILLE	7/19/2012	2130	tstm wind	55		0	0	10000	0		
383	BORDEAUX	8/1/2012	1632	tstm wind	52		0	0	5000	0		
384	NASHVILLE	8/1/2012	1647	tstm wind	48		0	0	1000	0		
385	TUSCULUM	8/1/2012	1650	tstm wind	52		0	0	5000	0		
386	TUSCULUM	8/1/2012	1655	tstm wind	52		0	0	10000	0		
387	NASHVILLE	8/13/2012	948	tstm wind	52		0	0	2000	0		
388	DONELSON	8/13/2012	955	tstm wind	48		0	0	1000	0		
389	TULIP GROVE	8/13/2012	1000	tstm wind	48		0	0	1000	0		
390	RICHLAND	8/16/2012	2120	tstm wind	52		0	0	2000	0		
391	NASHVILLE	8/16/2012	2120	tstm wind	52		0	0	5000	0		
392	AMQUI	8/16/2012	2127	tstm wind	52		0	2	15000	0		
393	FOUR CORNERS	8/16/2012	2140	tstm wind	52		0	0	30000	0		
394	DONELSON	8/16/2012	2140	tstm wind	52		0	0	2000	0		
395	BRENTWOOD	8/16/2012	2157	tstm wind	48		0	0	1000	0		
396	J PERCY PRIEST RES N	8/25/2012	1401	tstm wind	30		0	0	5000	0		
397	NASHVILLE	9/5/2012	1715	tstm wind	55		0	0	15000	0		
398	PASQUO	11/3/2012	1633	tstm wind	55		0	0	5000	0		
399	RICHLAND	1/30/2013	305	tstm wind	52		0	0	3000	0		
400	BORDEAUX	1/30/2013	307	tstm wind	52		1	0	5000	0		
401	BELLE MEADE	1/30/2013	308	tstm wind	52		0	0	15000	0		National Weather Service Forecast Office; Nashville, TN; http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=47%2CTENNESSEE
402	NASHVILLE	1/30/2013	310	tstm wind	61		0	0	10000	0		
403	GOODLETTSVILLE	1/30/2013	315	tstm wind	60		0	0	10000	0		
404	NASHVILLE CORNELIA F	1/30/2013	316	tstm wind	61		0	0	25000	0		
405	STONE RIVER	1/30/2013	321	tstm wind	61		0	0	10000	0		
406	TULIP GROVE	1/30/2013	323	tstm wind	61		0	0	5000	0		
407	BELLE MEADE	4/18/2013	2338	tstm wind	48		0	0	2000	0		
408	FOREST GROVE	4/24/2013	650	tstm wind	43		0	0	2000	0		
409	LICKTON	4/24/2013	655	tstm wind	43		0	0	5000	0		
410	NASHVILLE	5/21/2013	1120	tstm wind	50		0	0	50000	0		
411	WEST MEADE	5/21/2013	2103	tstm wind	50		0	0	1000	0		
412	VAUGHNS GAP	5/21/2013	2105	tstm wind	50		0	0	1000	0		
413	BELLEVUE	6/1/2013	1500	tstm wind	48		0	0	2000	0		
414	MADISON	6/1/2013	1515	tstm wind	48		0	0	2000	0		
415	GOODLETTSVILLE	6/1/2013	1515	tstm wind	48		0	0	1000	0		
416	NASHVILLE	6/1/2013	1520	tstm wind	48		0	0	1000	0		
417	NASHVILLE	6/10/2013	1323	tstm wind	52		0	0	1000	0		
418	WRENCOE	6/10/2013	1344	tstm wind	52		0	0	3000	0		
419	ANTIOCH	6/10/2013	1345	tstm wind	52		0	0	2000	0		
420	ANTIOCH	6/10/2013	1346	tstm wind	52		0	0	3000	0		
421	PARAGON MILL	6/20/2013	1337	tstm wind	48		0	0	1000	0		
422	MADISON	7/10/2013	1710	tstm wind	50		0	0	1000	0		

THUNDERSTORMS-19

#	Location	Historical Event	Time	Type	Magnitude (knots)	Precipitation (in.)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
423	BELLE MEADE	7/10/2013	1757	tstm wind	50		0	0	10000	0		National Weather Service Forecast Office; Nashville, TN; http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=47%2CTENNESSEE
424	STONE RIVER	7/18/2013	1347	tstm wind	43		0	0	1000	0		
425	SMITH SPGS	7/18/2013	1357	tstm wind	43		0	0	1000	0		
426	WRENCOE	7/18/2013	1401	tstm wind	48		0	0	2000	0		
427	PROVIDENCE	7/18/2013	1410	tstm wind	48		0	0	2000	0		
428	NASHVILLE	8/23/2013	1418	tstm wind	48		0	0	3000	0		
429	BELLE MEADE	10/31/2013	2100	tstm wind	52		1	0	3000	0	9 yo riding his bike made contact with a downed power line due to high winds at 585 Charles E. Davis Blvd.	
430	ANTIOCH	10/31/2013	2147	tstm wind	52		0	0	10000	0		
431	WRENCOE	10/31/2013	2150	tstm wind	52		0	0	5000	0		
432	LITTLE CREEK	11/17/2013	1905	tstm wind	50		0	0	2000	0		
433	JOELTON	12/21/2013	2103	tstm wind	52		0	0	1000	0		
434	WHITES CREEK	12/21/2013	2110	tstm wind	56		0	0	5000	0		
435	BORDEAUX	12/21/2013	2117	tstm wind	54		0	0	0	0		
436	NASHVILLE	12/21/2013	2120	tstm wind	52		0	0	10000	0		
437	NASHVILLE	12/21/2013	2123	tstm wind	52		0	0	15000	0		
438	WRENCOE	12/21/2013	2144	tstm wind	52		0	0	2000	0		
439	PASQUO	2/20/2014	1944	tstm wind	52		0	0	1000	0		
440	RICHLAND	2/20/2014	1948	tstm wind	52		0	0	1000	0		
441	UNION HILL	2/20/2014	1955	tstm wind	52		0	0	1000	0		
442	BELLEVUE	4/4/2014	429	tstm wind	52		0	0	5000	0		
443	J PERCY PRIEST RES N	6/7/2014	1750	tstm wind	52		0	0	10000	0		
444	RAYON CITY	6/20/2014	1525	tstm wind	52		0	0	5000	0		
445	THE HERMITAGE	6/20/2014	1532	tstm wind	48		0	0	2000	0		
446	UNION HILL	7/27/2014	2015	tstm wind	50		0	0	1000	0		
447	INGLEWOOD	7/27/2014	2040	tstm wind	50		0	0	50000	0		
448	TULIP GROVE	7/27/2014	2050	tstm wind	50		0	0	10000	0		
449	STONE RIVER	7/27/2014	2050	tstm wind	50		0	0	1000	0		
450	WRENCOE	7/27/2014	2115	tstm wind	50		0	0	0	0		
451	ANTIOCH	8/23/2014	1615	tstm wind	52		0	0	5000	0		
452	BELLEVUE	10/3/2014	115	tstm wind	52		0	0	5000	0		
453	BORDEAUX	10/3/2014	120	tstm wind	57		0	0	0	0		
454	NASHVILLE	10/13/2014	1722	tstm wind	48		0	0	1000	0		
455	WHITES CREEK	4/3/2015	1550	tstm wind	52		0	0	15000	0		
456	HOPEWELL	4/3/2015	1559	tstm wind	52		0	0	3000	0		
457	PEGRAM	4/3/2015	1600	tstm wind	52		0	0	5000	0		
458	THE HERMITAGE	4/3/2015	1602	tstm wind	52		0	0	1000	0		
459	WEST MEADE	4/3/2015	1604	tstm wind	56		0	0	3000	0		
460	TULIP GROVE	4/3/2015	1604	tstm wind	52		0	0	3000	0		
461	RICHLAND	4/3/2015	1604	tstm wind	56		0	0	10000	0		
462	RICHLAND	4/3/2015	1608	tstm wind	56		0	0	2000	0		
463	RICHLAND	4/3/2015	1608	tstm wind	56		0	0	3000	0		
464	BELLE MEADE	4/3/2015	1609	tstm wind	56		0	0	1000	0		
465	OAK HILL	4/3/2015	1610	tstm wind	56		0	0	100000	0		
466	MT JULIET	4/3/2015	1610	tstm wind	52		0	0	10000	0		
467	OAK HILL	4/3/2015	1612	tstm wind	61		0	0	10000	0		
468	ANTIOCH	4/10/2015	137	tstm wind	52		0	0	2000	0		
469	ANTIOCH	4/15/2015	1828	tstm wind	52		0	0	5000	0		
470	INGLEWOOD	4/19/2015	1433	tstm wind	52		0	0	5000	0		
471	MAPLEWOOD	4/19/2015	1437	tstm wind	52		0	0	1000	0		

THUNDERSTORMS-20

#	Location	Historical Event	Time	Type	Magnitude (knots)	Precipitation (in.)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
472	RAYON CITY	4/19/2015	1440	tstm wind	52		0	0	2000	0		
473	JOELTON	4/19/2015	2355	tstm wind	52		0	0	3000	0		
474	WHITES CREEK	4/20/2015	0	tstm wind	52		0	0	1000	0		
475	MADISON	4/20/2015	5	tstm wind	52		0	0	3000	0		
476	RAYON CITY	4/20/2015	10	tstm wind	52		0	0	10000	0		
477	WRENCOE	4/20/2015	20	tstm wind	52		0	0	1000	0		
478	NASHVILLE	5/27/2015	1227	tstm wind	52		0	0	5000	0		
479	GERMANTOWN	7/1/2015	1112	tstm wind	52		0	0	1000	0		
480	BERRY HILL	7/2/2015	500	tstm wind	52		0	0	1000	0		
481	BRENTWOOD	7/14/2015	1355	tstm wind	52		0	0	10000	0		
482	WEST MEADE	7/14/2015	1355	tstm wind	61		0	0	50000	0		
483	LA VERGNE	7/14/2015	1415	tstm wind	52		0	0	1000	0		
484	GOODLETTSVILLE	7/28/2015	1435	tstm wind	48		0	0	3000	0		
485	MAPLEWOOD	7/28/2015	1500	tstm wind	52		0	0	1000	0		
486	AMQUI	7/28/2015	1503	tstm wind	52		0	0	1000	0		
487	RAYON CITY	7/28/2015	1503	tstm wind	52		0	0	1000	0		
488	OLD HICKORY	7/28/2015	1505	tstm wind	52		0	0	5000	0		
489	DONELSON	7/28/2015	1507	tstm wind	52		0	0	1000	0		
490	DONELSON	7/28/2015	1510	tstm wind	52		0	0	1000	0		
491	J PERCY PRIEST RES N	7/28/2015	1512	tstm wind	52		0	0	5000	0		
492	GLENCLIFF	7/28/2015	1515	tstm wind	47		0	0	1000	0		
493	RURAL HILL	7/28/2015	1518	tstm wind	61		0	0	0	0		
494	PROVIDENCE	7/28/2015	1520	tstm wind	52		0	0	1000	0		
495	ANTIOCH	7/28/2015	1520	tstm wind	52		0	0	1000	0		
496	OAK HILL	7/28/2015	1520	tstm wind	52		0	0	4000	0		
497	OAK HILL	7/28/2015	1520	tstm wind	52		0	0	4000	0		
498	STONE RIVER	9/5/2015	1615	tstm wind	43		0	0	5000	0		
499	GLENCLIFF	9/5/2015	1625	tstm wind	43		0	0	2000	0		
500	NASHVILLE	10/9/2015	1257	tstm wind	43		0	0	15000	0		
501	LINTON	4/6/2016	1548	tstm wind	60		0	0	3000	0		
502	OAK HILL	4/6/2016	1601	tstm wind	52		0	0	1000	0		
503	NASHVILLE	4/6/2016	1603	tstm wind	52		0	0	2000	0		
504	NASHVILLE	4/6/2016	1604	tstm wind	52		0	0	5000	0		
505	NASHVILLE	4/6/2016	1605	tstm wind	52		0	0	3000	0		
506	INGLEWOOD	4/6/2016	1605	tstm wind	52		0	0	15000	0		
507	RAYON CITY	4/6/2016	1610	tstm wind	52		0	0	2000	0		
508	TULIP GROVE	4/6/2016	1616	tstm wind	48		0	0	1000	0		
509	GOODLETTSVILLE	5/4/2016	1534	tstm wind	43		0	0	2000	0		
510	NASHVILLE CORNELIA F	5/4/2016	1540	tstm wind	43		0	0	1000	0		
511	HERMITAGE	5/4/2016	1549	tstm wind	52		0	0	3000	0		
512	TULIP GROVE	5/4/2016	1550	tstm wind	52		0	0	2000	0		
153	OAK HILL	5/4/2016	1550	tstm wind	43		0	0	2000	0		
514	FOREST GROVE	5/10/2016	2133	tstm wind	52		0	0	3000	0		
515	GOODLETTSVILLE	5/10/2016	2205	tstm wind	52		0	0	0	0		
516	NASHVILLE	5/12/2016	1234	tstm wind	52		0	0	1000	0		
517	NASHVILLE	5/12/2016	1234	tstm wind	52		0	0	10000	0		
518	NASHVILLE	5/12/2016	1234	tstm wind	52		0	0	1000	0		
519	NASHVILLE	5/12/2016	1238	tstm wind	52		0	0	3000	0		
520	NASHVILLE CORNELIA F	5/12/2016	1240	tstm wind	48		0	0	1000	0		
521	NASHVILLE CORNELIA F	5/12/2016	1240	tstm wind	52		0	0	0	0		
522	RICHLAND	6/15/2016	1455	tstm wind	52		0	1	20000	0		
523	NASHVILLE	6/15/2016	1500	tstm wind	50		0	0	1000	0		
524	BORDEAUX	6/15/2016	1500	tstm wind	50		0	0	10000	0		
525	BORDEAUX	6/15/2016	1500	tstm wind	50		0	0	1000	0		
526	NASHVILLE	6/15/2016	1500	tstm wind	50		0	0	2000	0		

THUNDERSTORMS-21

#	Location	Historical Event	Time	Type	Magnitude (knots)	Precipitation (in.)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
527	AMQUI	6/15/2016	1502	tstm wind	52		0	0	10000	0		
528	OAK HILL	6/15/2016	1502	tstm wind	50		0	0	5000	0		
529	GOODLETTSVILLE	6/15/2016	1503	tstm wind	48		0	0	1000	0		
530	NASHVILLE	6/15/2016	1505	tstm wind	52		0	0	5000	0		
531	NASHVILLE	6/15/2016	1505	tstm wind	52		0	0	10000	0		
532	MAPLEWOOD	6/15/2016	1506	tstm wind	48		0	0	1000	0		
533	BERRY HILL	6/15/2016	1509	tstm wind	50		0	0	1000	0		
534	OGLESBY	6/15/2016	1510	tstm wind	50		0	0	3000	0		
535	DONELSON	6/15/2016	1512	tstm wind	50		0	0	1000	0		
536	THE HERMITAGE	6/15/2016	1513	tstm wind	52		0	0	3000	0		
537	TULIP GROVE	6/15/2016	1514	tstm wind	50		0	0	5000	0		
538	HERMITAGE	6/15/2016	1514	tstm wind	50		0	0	1000	0		
539	BORDEAUX	6/23/2016	2334	tstm wind	50		0	0	5000	0		
540	NASHVILLE	6/24/2016	145	tstm wind	50		0	0	5000	0		
541	BELLEVUE	6/28/2016	1555	tstm wind	48		0	0	2000	0		
542	INGLEWOOD	6/28/2016	1559	tstm wind	50		0	0	1000	0		
543	INGLEWOOD	6/28/2016	1605	tstm wind	50		0	0	5000	0		
544	NASHVILLE	6/28/2016	1611	tstm wind	48		0	0	1000	0		
545	ANTIOCH	6/28/2016	1617	tstm wind	50		0	0	3000	0		
546	PARAGON MILL	6/28/2016	1618	tstm wind	48		0	0	3000	0		
547	ANTIOCH	6/28/2016	1620	tstm wind	50		0	1	3000	0		
548	TULIP GROVE	7/4/2016	1329	tstm wind	50		0	0	1000	0		
549	TULIP GROVE	7/4/2016	1331	tstm wind	50		0	0	2000	0		
550	OGLESBY	7/4/2016	1740	tstm wind	48		0	0	2000	0		
551	LAKEWOOD	7/6/2016	1510	tstm wind	50		0	0	1000	0		
552	TULIP GROVE	7/6/2016	1514	tstm wind	50		0	0	2000	0		
553	NASHVILLE	7/6/2016	1515	tstm wind	50		0	0	10000	0		
554	BERRY HILL	7/6/2016	1517	tstm wind	48		0	0	1000	0		
555	BORDEAUX	7/7/2016	127	tstm wind	50		0	0	2000	0		
556	NASHVILLE	7/7/2016	130	tstm wind	48		0	0	5000	0		
557	NASHVILLE	7/7/2016	357	tstm wind	50		0	0	1000	0		
558	GLENCLIFF	7/7/2016	404	tstm wind	50		0	0	2000	0		
559	BAKERS	7/8/2016	1947	tstm wind	50		0	0	2000	0		
560	GOODLETTSVILLE	7/8/2016	1948	tstm wind	52		0	0	1000	0		
561	OAK HILL	7/8/2016	1950	tstm wind	50		0	0	1000	0		
562	INGLEWOOD	7/8/2016	1950	tstm wind	52		0	0	10000	0		
563	INGLEWOOD	7/8/2016	1951	tstm wind	50		0	0	2000	0		
564	MAPLEWOOD	7/8/2016	1951	tstm wind	50		0	0	1000	0		
565	RICHLAND	7/8/2016	1952	tstm wind	50		0	0	5000	0		
566	LINTON	7/8/2016	1955	tstm wind	56		0	0	5000	0		
567	OLD HICKORY	7/8/2016	1957	tstm wind	52		0	0	3000	0		
568	NASHVILLE CORNELIA F	7/8/2016	1958	tstm wind	52		0	0	2000	0		
569	BRENTWOOD	7/8/2016	1958	tstm wind	52		0	0	1000	0		
570	WOODBINE	7/8/2016	1959	tstm wind	52		0	0	3000	0		
571	TULIP GROVE	7/8/2016	2000	tstm wind	52		0	0	2000	0		
572	THE HERMITAGE	7/8/2016	2000	tstm wind	52		0	0	1000	0		
573	PROVIDENCE	7/8/2016	2001	tstm wind	50		0	0	2000	0		
574	STONE RIVER	7/8/2016	2002	tstm wind	50		0	0	1000	0		
575	PARAGON MILL	7/8/2016	2003	tstm wind	50		0	0	1000	0		
576	GLENCLIFF	7/8/2016	2003	tstm wind	52		0	0	0	0		
577	BELLEVUE	7/8/2016	2005	tstm wind	52		0	0	2000	0		
578	GLENCLIFF	7/8/2016	2013	tstm wind	51		0	0	0	0		
579	JOELTON	7/14/2016	1117	tstm wind	48		0	0	1000	0		
580	STONE RIVER	7/19/2016	1400	tstm wind	48		0	0	1000	0		
581	RICHLAND	7/19/2016	1518	tstm wind	48		0	0	1000	0		

THUNDERSTORMS-22

#	Location	Historical Event	Time	Type	Magnitude (knots)	Precipitation (in.)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
582	RICHLAND	7/22/2016	1700	tstm wind	52		0	0	10000	0		
583	TULIP GROVE	8/3/2016	1440	tstm wind	43		0	0	1000	0		
584	VAUGHNS GAP	8/27/2016	1504	tstm wind	48		0	0	1000	0		
585	BELLEVUE	8/27/2016	1510	tstm wind	43		0	0	1000	0		
586	OLD HICKORY	9/10/2016	1533	tstm wind	52		0	0	1000	0		
587	NASHVILLE	9/10/2016	1533	tstm wind	48		0	0	2000	0		
588	BERRY HILL	9/10/2016	1535	tstm wind	52		0	0	3000	0		
589	WOODBINE	9/10/2016	1540	tstm wind	43		0	0	1000	0		
590	TULIP GROVE	9/10/2016	1540	tstm wind	52		0	0	1000	0		
591	OAK HILL	11/28/2016	1815	tstm wind	50		0	0	1000	0		
592	BERRY HILL	12/17/2016	2306	tstm wind	52		0	0	3000	0		
593	NEWSOM	2/7/2017	954	tstm wind	50		0	0	1000	0		
594	WOODBINE	2/7/2017	1016	tstm wind	50		0	0	1000	0		
595	BELLE MEADE	3/1/2017	659	tstm wind	52		0	0	3000	0		
596	NASHVILLE	3/1/2017	701	tstm wind	52		0	0	3000	0		
597	JORDONIA	3/1/2017	702	tstm wind	52		0	0	2000	0		
598	INGLEWOOD	3/1/2017	705	tstm wind	52		0	0	2000	0		
599	INGLEWOOD	3/1/2017	706	tstm wind	56		0	0	5000	0		
600	WHITES CREEK	3/1/2017	707	tstm wind	61		0	0	5000	0		
601	OLD HICKORY	3/1/2017	709	tstm wind	56		0	0	10000	0		
602	LA VERGNE	3/1/2017	709	tstm wind	70		0	0	25000	0		
603	HERMITAGE	3/1/2017	710	tstm wind	52		0	0	0	0		
604	LAKEWOOD	3/1/2017	710	tstm wind	56		0	0	5000	0		
605	OLD HICKORY	3/1/2017	710	tstm wind	52		0	0	5000	0		
606	HOPEWELL	3/1/2017	713	tstm wind	52		0	0	2000	0		
607	OAK HILL	3/9/2017	2255	tstm wind	52		0	0	3000	0		
608	BELLEVUE	3/21/2017	1509	tstm wind	50		0	0	3000	0		
609	PASQUO	3/27/2017	1434	tstm wind	50		0	0	2000	0		
610	OAK HILL	3/27/2017	1441	tstm wind	43		0	0	1000	0		
611	OAK HILL	3/27/2017	1442	tstm wind	52		0	0	3000	0		
612	OAK HILL	3/27/2017	1443	tstm wind	50		0	0	1000	0		
613	RICHLAND	3/27/2017	1443	tstm wind	53		0	0	0	0		
614	OAK HILL	3/27/2017	1445	tstm wind	45		0	0	5000	0		
615	NASHVILLE	3/27/2017	1446	tstm wind	45		0	0	3000	0		
616	NASHVILLE	3/27/2017	1447	tstm wind	52		0	0	0	0		
617	NASHVILLE	3/27/2017	1447	tstm wind	50		0	0	5000	0		
618	NASHVILLE	3/27/2017	1450	tstm wind	50		0	0	2000	0		
619	INGLEWOOD	3/27/2017	1453	tstm wind	50		0	0	3000	0		
620	NASHVILLE	4/18/2017	1503	tstm wind	50		0	0	3000	0		
621	DONELSON	4/18/2017	1508	tstm wind	65		0	0	50000	0		
622	BELLE MEADE	4/23/2017	1103	tstm wind	48		0	0	1000	0		
623	BRENTWOOD	4/30/2017	1352	tstm wind	52		0	0	1000	0		
624	OGLESBY	4/30/2017	1353	tstm wind	50		0	0	2000	0		
625	WRENCOE	4/30/2017	1355	tstm wind	50		0	0	2000	0		
626	PROVIDENCE	4/30/2017	1355	tstm wind	50		0	0	3000	0		
627	OGLESBY	4/30/2017	1355	tstm wind	50		0	0	1000	0		
628	TUSCULUM	4/30/2017	1356	tstm wind	50		0	0	1000	0		
629	NASHVILLE	4/30/2017	1357	tstm wind	50		0	0	1000	0		
630	(BNA)NASHVILLE METRO	4/30/2017	1400	tstm wind	52		0	0	1000	0		
631	DONELSON	4/30/2017	1403	tstm wind	50		0	0	1000	0		
632	INGLEWOOD	4/30/2017	1404	tstm wind	50		0	0	1000	0		
633	NASHVILLE CORNELIA F	4/30/2017	1404	tstm wind	50		0	0	1000	0		
634	MORNY	5/20/2017	1447	tstm wind	50		0	0	2000	0		
635	BELLEVUE	5/20/2017	1450	tstm wind	39		0	0	1000	0		
636	OGLESBY	6/18/2017	1211	tstm wind	45		0	0	1000	0		

THUNDERSTORMS-23

#	Location	Historical Event	Time	Type	Magnitude (knots)	Precipitation (in.)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
637	NEWSOM	7/2/2017	1455	tstm wind	50		0	0	3000	0		
638	FOUR CORNERS	7/3/2017	1145	tstm wind	50		0	0	5000	0		
639	BELLEVUE	7/23/2017	1641	tstm wind	45		0	0	1000	0		
640	INGLEWOOD	8/31/2017	1658	tstm wind	48		0	0	2000	0		
641	OGLESBY	9/19/2017	1420	tstm wind	52		0	0	1000	0		
642	OGLESBY	9/19/2017	1420	tstm wind	56		0	0	25000	0		
643	JOELTON	11/18/2017	1627	tstm wind	65		0	0	15000	0		
644	UNION HILL	11/18/2017	1636	tstm wind	52		0	0	3000	0		
645	RICHLAND	2/24/2018	2220	tstm wind	52		0	0	1000	0		
646	BRENTWOOD	4/3/2018	1941	tstm wind	50		0	0	2000	0		
647	OGLESBY	4/3/2018	1942	tstm wind	50		0	0	1000	0		
648	PROVIDENCE	4/3/2018	1944	tstm wind	50		0	0	1000	0		
649	PARAGON MILL	4/3/2018	1945	tstm wind	50		0	0	3000	0		
650	ANTIOCH	4/3/2018	1948	tstm wind	55		0	0	5000	0		
651	OAK HILL	4/14/2018	730	tstm wind	43		0	0	1000	0		
652	OAK HILL	4/14/2018	732	tstm wind	43		0	0	1000	0		
653	BAKERS	4/23/2018	1300	tstm wind	39		0	0	3000	0		
645	HERMITAGE	5/6/2018	1600	tstm wind	45		0	0	3000	0		
655	OAK HILL	5/20/2018	1600	tstm wind	56		0	0	25000	0		
656	OGLESBY	6/10/2018	627	tstm wind	39		0	0	1000	0		
657	RICHLAND	6/15/2018	1605	tstm wind	43		0	0	2000	0		
658	BERRY HILL	6/15/2018	`	tstm wind	35		0	0	1000	0		
659	MADISON	6/15/2018	1631	tstm wind	50		0	0	1000	0		
660	NASHVILLE	6/15/2018	1634	tstm wind	50		0	0	1000	0		
661	OAK HILL	6/16/2018	1815	tstm wind	50		0	0	3000	0		
662	OGLESBY	6/17/2018	1410	tstm wind	43		0	0	2000	0		
663	NASHVILLE CORNELIA F	6/17/2018	1450	tstm wind	48		0	0	10000	0		
664	NASHVILLE CORNELIA F	6/17/2018	1508	tstm wind	43		0	0	3000	0		
665	UNA	6/27/2018	1605	tstm wind	52		0	0	5000	0		
666	WRENCOE	6/28/2018	1225	tstm wind	39		0	0	1000	0		
667	OAK HILL	7/6/2018	1047	tstm wind	45		0	0	1000	0		
668	LITTLE CREEK	7/6/2018	1137	tstm wind	50		0	0	3000	0		
669	JORDONIA	8/8/2018	903	tstm wind	50		0	0	5000	0		
670	NASHVILLE	8/8/2018	907	tstm wind	45		0	0	1000	0		
671	BORDEAUX	8/8/2018	908	tstm wind	50		0	0	100000	0		
672	NASHVILLE	8/8/2018	912	tstm wind	45		0	0	1000	0		
673	GOODLETTSVILLE	8/30/2018	1625	tstm wind	50		0	0	1000	0		
674	NEWSOM	12/31/2018	1413	tstm wind	52		0	0	2000	0		
675	(BNA)NASHVILLE METRO	12/31/2018	1439	tstm wind	52		0	0	1000	0		

THUNDERSTORMS-24

#	Location	Historical Event	Time	Type	Magnitude (knots)	Death (#)	Injury (#)	Path Length (miles)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
1	Nashville	12-Feb-1880	12:00 AM	Tornado	F2	0	0				A late evening F2 tornado rips a 4-mile path across the Hillsboro area of Davidson County.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
2	Nashville	Nov - 1811		Tornado								Chronology of Disasters in TN (Including Natural and Man caused Disasters, Epidemics and Civil Disturbances) Allen P. Coggins, 1996
3	Davidson County	6-May-1868	4:00 PM	Tornado		5	15	10			Brentwood area	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
4	Davidson County	18-Apr-1877	10:00 PM	Tornado		10	50	40			12 miles southeast of Nashville	
5	Davidson County	12-Feb-1880	10:00 PM	Tornado	F2			4			Hillsboro Pike	
6	TN and other states	9-Feb-1884		Tornado								Chronology of Disasters in TN (Including Natural and Man caused Disasters, Epidemics and Civil Disturbances) Allen P. Coggins, 1994
7	Davidson County	25-Mar-1884	7:30 PM	Tornado							6 miles north of Nashville	National Weather Service Forecast Office; Nashville, TN; Tornado Database http://www.srh.noaa.gov/ohx/tornado/davidson.htm
8	Davidson County	23-Mar-1893	8:15 PM	Tornado	F2	0	17	2			North edge of Nashville, south of the Cumberland River	
9	Davidson County	20-Nov-00	6:00 PM	Tornado	F3	9	40	25			5 miles south of Franklin to LaVergne, including Clovercroft, Nolensville, and Thompson Station	
	Nashville	20-Nov-00		Tornado	F3 & F4	9	40	8		$40,000	F4 tornado cuts a devastating swath 300 yards wide and 8 miles long along the northwest edge of Columbia. Hardin, Wayne, and Lewis Counties may have had related tornado activity before the storm reached Columbia. Most deaths are in the Macedonia community, 2 miles west of Columbia, where the homes and cabins are “turned into kindling wood.” The funnel was moving northeastward, heading for the center of Columbia, but turns suddenly to the north. Damage is estimated at $40,000. The tornado kills 27, and injures 75. It is the 4th deadliest tornado to ever strike Middle Tennessee. An F3 tornado kills 9 and injures 40 along a 25-mile path across Williamson, Davidson, and Rutherford Counties.	
10	Statewide	30-Apr-09		Tornado								Chronology of Disasters in TN (Including Natural and Man caused Disasters, Epidemics and Civil Disturbances) Allen P. Coggins, 1993
11	Madison	12-Jan-16		Tornado	F2		7	5			Seven are injured in Madison after an F2 tornado rips a five mile path during the middle of the afternoon.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
	Davidson County	12-Jan-16	2:55 PM	Tornado	F2	0	7	5			Madison area	
12	Middle TN	27-May-17		Tornado							Lake, Dyer, Henry, Gibson, Carrol, Stewart, McNairy, Wilson, Hickman, Weakley, Benton, Houston, Henderso, Perry, and Davidson counties	Chronology of Disasters in TN (Including Natural and Man caused Disasters, Epidemics and Civil Disturbances) Allen P. Coggins, 1992
	Davidson County	27-May-17	7:00 PM	Tornado	F2	2	30	35			North of Brentwood, Una, Bakertown, Dodoburg, and Lebanon	National Weather Service Forecast Office; Nashville, TN; Tornado Database http://www.srh.noaa.gov/ohx/tornado/davidson.htm
13	Nashville	12-May-23		Tornado	F2	0	6	10	0	0	An F2 tornado touches down 10 miles north of Nashville, and cuts a 10 mile path northeastward into Sumner County. There are 6 injuries	
13	Davidson County	12-May-23	2:15 PM	Tornado	F2	0	6	10			It started, apparently, in the north-central part of Davidson County about 8 miles north of Nashville, being first observed near and to the east of some hills that rise 200 to 300 feet higher than the surrounding country. It moved eastwardly across the Dickerson and Gallatin pikes, through the village of Edenwold, across the Cumberland River into the Powder Plant, and on into the southern part of Sumner County, where it spent its force. The length of the path was about 10 miles. Its width varied from 50 to 200 yards, being determined to some extent, no doubt, by the rolling character of the country. Fortunately, it passed mostly through open country and not much timber was destroyed. A few large trees were in the path, some being uprooted, others twisted into shreds, while still others were carried away entirely leaving only a portion of the trunk standing. The storm crossed the Dickerson Pike near Lowe's Store, about three miles south of Goodlettsville. Here one residence and five barns were damaged to the extent of about $2,500. A house a mile or so east of this pike was partly wrecked and a portion of the roof dropped into a yard near Edenwold, more than a mile away. From that point the destruction was of little consequence until it struck a large handsome residence a little east of the Gallatin Pike, tearing a gaping hole in the roof and wrenching off and carrying away a two-story veranda extending a distance of 125 feet along two sides of the house. The village of Edenwold, next in its path, suffered severely, several residences, two stores, and the schoolhouse being completely demolished and other buildings partly so. Six persons were injured at this point, one seriously, but, strange to say, no lives were lost. In one instance, there was nothing left of an eight-room cottage except the floor, and yet the occupants, a mother and two daughters, received only slight injuries. A man was buried beneath a pile of brick and debris as the roof of another house collapsed, but escaped with only cuts about the head. One house clearly showed the effect of the sudden expansion of the air within. The roof was entirely gone and two of the walls were flat on the ground, as if pushed outward, while the remaining walls were unharmed. The loss from the storm in the vicinity of Edenwold was probably not less than $35,000, at least half of which was suffered by the large mansion, mentioned above. The storm turned slightly outheastward from Edenwold and after crossing a mile or two of open country it devastated an area of the U. S. Government Powder Plant (Old Hickory), wrecking seven iron buildings, either partially or totally, the estimated loss being $25,000. Fortunately, the government stores, consisting of smokeless powder, were not damaged by water as they are contained in water-proof boxes. Had the storm taken a different course through the reservation the loss might have been tremendous, in as much as the buildings are compactly arranged and represent a total outlay of more than $50,000,000. After leaving the powder plant the storm crossed the river again and continued somewhat southeastward into Sumner County, where it is reported that any trees were uprooted.	National Weather Service Forecast Office; Nashville, TN; Tornado Database http://www.srh.noaa.gov/ohx/tornado/davidson.htm

TORNADOES-1

#	Location	Historical Event	Time	Type	Magnitude (knots)	Death (#)	Injury (#)	Path Length (miles)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
14	TN and other states	Nov. 25-26, 1926		Tornado								Chronology of Disasters in TN (Including Natural and Man caused Disasters, Epidemics and Civil Disturbances) Allen P. Coggins, 1991
15	Davidson County	29-Jun-28		Tornado								
	Nashville	29-Jun-28		Tornado	F2	1	38		0	0	A severe weather outbreak produces 5 tornadoes across Middle Tennessee, beginning on the afternoon of the 28th, and continuing into the next morning. All tornadoes are classified as F2. One person is killed in Davidson County. Another 38 injuries are reported overall.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
	Davidson County	29-Jun-28	1:00 AM	Tornado	F2	1	0	8			4 miles north of Nashville to the Cumberland River	
16	Davidson County	21-Mar-32	6:00 PM	Tornado	F2	3	8	50			Skipped from southwest Leiper's Fork to 3 miles west of Brentwood across Wilson County to near Trousdale County border	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle http://www.srh.noaa.gov/ohx/climate/calendar.htm
17	Davidson County	25-Apr-32	1:30 PM	Tornado	F2	0	3	10			4 miles north of Nashville east-northeast for 10 miles	
18	Middle TN	14-Mar-33		Tornado							Davidson, Wilson, Smith, Campbell, Claiborne, Hancock and Sullivan Counties	Chronology of Disasters in TN (Including Natural and Man caused Disasters, Epidemics and Civil Disturbances) Allen P. Coggins, 1989
	Davidson County	14-Mar-33	7:30 PM	Tornado	F3	15	45	45			4 miles west of downtown Nashville for 45 miles east to Bellwood and Lebanon	National Weather Service Forecast Office; Nashville, TN; Tornado Database http://www.srh.noaa.gov/ohx/tornado/davidson.htm
	Nashville	14-Mar-33		Tornado	F3	15	45		0	0	F3 tornado touches down 4 miles west of downtown Nashville, killing 15, injuring 45, and continues for 45 miles, moving through Wilson and Smith Counties.	
19	Davidson County	17-Jun-34	5:00 PM	Tornado	F2	0	0	5			3 miles north of Joelton northwest for 5 miles	
20	Davidson County	28-Mar-35		Tornado								Chronology of Disasters in TN (Including Natural and Man caused Disasters, Epidemics and Civil Disturbances) Allen P. Coggins, 1988
21	TN and other states	Feb. 5-6, 1942		Tornado								
22	Nashville	11-Apr-44	6:30 AM	Tornado	F2	1	14	4			One person is killed, and 14 more injured, as an F2 tornado strikes near Lebanon at 6:30 a.m., cutting a 4 mile path before lifting.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
23	TN and other states	Dec. 31-Jan. 1, 1948-49		Tornado								Chronology of Disasters in TN (Including Natural and Man caused Disasters, Epidemics and Civil Disturbances) Allen P. Coggins, 1988
24	Davidson County	13-Feb-52	7:45 PM	Tornado	F1	0	0	1	25K	0	Between Newsom Station and Linton	National Weather Service Forecast Office; Nashville, TN; Tornado Database http://www.srh.noaa.gov/ohx/tornado/davidson.htm
	statewide	13-Feb-52		Tornado							Giles, Grundy, Benton, Davidson, Lincoln, Moore, and Franklin Counties	Chronology of Disasters in TN (Including Natural and Man caused Disasters, Epidemics and Civil Disturbances) Allen P. Coggins, 1988
	Davidson County	30-Jun-52	6:05 PM	Tornado	F1	0	0		3K	0	Cloverland Acres, near Oak Hill	National Weather Service Forecast Office; Nashville, TN; Tornado Database
25	Davidson County	22-Jan-57	4:30 PM	Tornado	F2	0	4	15	2.5M	0	Belle Meade to Donelson	
26	Davidson County	22-Jan-57		Tornado							Davidson, Wilson, Rutherford, Warren and Coffee counties	Chronology of Disasters in TN (Including Natural and Man caused Disasters, Epidemics and Civil Disturbances) Allen P. Coggins, 1988
	Davidson County	25-Dec-64	10:00 PM	Tornado	F1	0	0	6	2.5M	0	Near Oak Hill to near Antioch	National Weather Service Forecast Office; Nashville, TN; Tornado Database http://www.srh.noaa.gov/ohx/tornado/davidson.htm
27	Davidson County	25-Dec-64		Tornado								Chronology of Disasters in TN (Including Natural and Man caused Disasters, Epidemics and Civil Disturbances) Allen P. Coggins, 1988
	Davidson County	14-May-68	4:15 PM	Tornado	F1	0	0		0K	0	Near Oak Hill	National Weather Service Forecast Office; Nashville, TN; Tornado Database
28	Davidson County	25-May-68	6:40 PM	Tornado	F1	0	0		0K	0	Near Forest Grove	
29	TN and other states	21-Feb-71		Tornado								Chronology of Disasters in TN (Including Natural and Man caused Disasters, Epidemics and Civil Disturbances) Allen P. Coggins, 1988
30	Davidson County	24-May-71	8:55 PM	Tornado	F0	0	3		250K	0	Near Madison	National Weather Service Forecast Office; Nashville, TN; Tornado Database
31	Davidson County	7-Apr-72	4:45 PM	Tornado	F2	0	15	28	250K	0	Skipped ESE for 28 miles from 2 mile north of Ashland City to Donelson	
33	Davidson County	1-Apr-74	7:10 PM	Tornado	F2	1	12	12	3K	0	From Belle Meade to Nashville airport	National Weather Service Forecast Office; Nashville, TN; Tornado Database http://www.srh.noaa.gov/ohx/tornado/davidson.htm
34	Davidson County	1-Apr-74		Tornado								Chronology of Disasters in TN (Including Natural and Man caused Disasters, Epidemics and Civil Disturbances) Allen P. Coggins, 1988
	Davidson County	3-Apr-74	4:18 PM	Tornado	F2	0	0	12	2.5M	0	From the southeast edge of Nashville, traveled northeast for 12 miles	National Weather Service Forecast Office; Nashville, TN; Tornado Database
35	Davidson County	18-May-95	11:30 AM	Tornado	F2	0	26	5			Near Goodlettsville, including the Rivergate Mall	

TORNADOES-2

#	Location	Historical Event	Time	Type	Magnitude (knots)	Death (#)	Injury (#)	Path Length (miles)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
36	This Nashville tornado on April 16, 1998 took a very similar path to another F3 tornado that occurred on March 14, 1933, which killed 11 people in Nashville. The tornado touched down at 330 PM one mile west of Charlotte Pike and I-440. A tree fell on an ROTC student at Centennial Park. He was attending an ROTC picnic. He died later on May 4 from his injuries. The tornado went through downtown Nashville at 340 PM and on toward East Nashville, Donelson and Hermitage. The tornado blew out many windows on office buildings. The Nations Bank Office Towers were one of the hardest hit buildings in Nashville. Tennessee Performance Arts Center (TPAC) and the Tennessee Towers sustained damage. TPAC had over 100 windows blown out. NOAA Weather Radio broadcasts from the Tennessee Towers and was off the air for about 24 hours. 30 private airplanes were damaged at Cornelia Fort Airport. Estimated damage to the airplanes was 3 million dollars. 35 buildings in downtown Nashville were "red tagged", meaning these buildings were structurally unsound. Many signs in Davidson county were blown down or severely damaged. The tornado blew down 3 out of 10 construction cranes on the construction site of the Tennessee Oiler's Football Stadium near the Cumberland River. The tornado continued east and hit the residential section of East Nashville. At least 300 homes were damaged in East Nashville. Many homes lost a good part of their roofs, trees were uprooted, telephone poles were knocked down. St. Ann's Episcopal Church, which is well over 100 years old, received major damage. Uprooted trees, damaged roofs to many homes was the story across Donelson and Hermitage. Numerous windows were blown out from the Gaylord Building in Donelson. About half the trees, that is over a thousand trees, were blown down at Andrew Jackson's home, The Hermitage. The Hermitage is a 600 acre estate of the former President. Some of those trees were well over 200 years old, and a few of those trees that were destroyed were planted by Andrew Jackson himself. Mayor Phil Bredesen closed downtown Nashville of Friday, April 17. Many workers had an unscheduled holiday. The downtown area was reopened Monday, April 20. This gave time for cleanup crews to remove broken glass and repair downed power lines. Nashville Electric Service said 75,000 customers were without power.											
37	Nashville Metro Airport	16-Apr-98	3:20 PM	Tornado	F2	0	0	28	50K	0	Trees were blown down. There was some damage to homes from fallen trees. This tornado was not as strong as the first. It started between downtown and Nashville International Airport and continued into Wilson county.	National Weather Service Forecast Office; Nashville, TN; Tornado Database http://www.srh.noaa.gov/ohx/tornado/davidson.htm
38	Nashville	16-Apr-98	4:15 PM	Tornado	F2	0	0	1	500K	0	EMA official reported a tornado touchdowns at 12th and Charlotte and 6th and Union. Damage was mainly blown out windows and downed trees and power lines.	
39	Nashville	16-Apr-98		Tornado	F2	4	105		0	0	Lawrence County experiences the first F5 tornado in Tennessee's history. Nashville is hit by 3 tornadoes, including an F3, which strikes downtown for the first time in more than 65 years. A total of 10 tornadoes are confirmed across Middle Tennessee. Surprisingly, there are only 4 fatalities across the mid state, with 105 injuries. Baseball-size hail is reported northwest of Ashland City (Cheatham County), damaging 35 to 50 homes. This is the 7th largest tornado outbreak in mid state history.	National Weather Service Forecast Office; Nashville, TN; Tornado Database http://www.srh.noaa.gov/ohx/tornado/davidson.htm
40	Oglesby	30-Jun-98	2:09 AM	Tornado	F1	0	0	1.2	20K	0	The tornado hit south Nashville, in the Oglesby section of town. The tornado began on Hill Road and ended near the intersection of Edmonson Pk and Old Hickory Boulevard. The tornado damaged 2 roofs and snapped trees at the Brentwood Downs Apartments. A lady at the apartment complex saw the tornado.	National Weather Service Forecast Office; Nashville, TN; Tornado Database http://www.srh.noaa.gov/ohx/tornado/davidson.htm
41	Neelys Bend	5-May-99	8:45 PM	Tornado	F1	0	0	0.1	5K	0	A weak tornado caused some roof damage to a few homes at a subdivision in Neely's Bend area of Davidson county.	
42	Nashville	5-May-99		Tornado	F4	3			$4.7 million	0	Severe weather outbreak produces widespread wind damage (at least $4.7 million) across Middle Tennessee. Linden is hit by an F4 tornado, killing 3. FAA wind equipment at Nashville International Airport clocks a 99 mph wind gust. Seventy planes are damaged, and 2 hangars are destroyed. Debris and jet fuel are scattered across the runway, closing the airport for several hours. A total of 6 tornadoes strike, the 9th largest tornado outbreak in mid state history.	
	Lickton	5-May-99	8:58 PM	Tornado	F1	0	0	0.1	1K	0	A weak tornado caused some roof damage to a home on Shaw Rd. in Lickton	
43	Madison	12-Aug-99	4:00 PM	Funnel Cloud	N/A	0	0		0	0	EMA office relayed a public report of a funnel cloud at Gallatin Road and Old Hickory Blvd.	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
44	Nashville	13-Feb-00	6:04 PM	Tornado	F1	0	1	4.3	500K	0	About 50 homes and 20 businesses received damage from this tornado. A 25 foot hackberry tree fell on a house. An oak tree crashed into the side of a building. A school trailer was destroyed at St. Vincent De Paul School. There was 15 rooftop damage at an apartment complex on Delta Street. The hardest hit area of downtown Nashville was the Eight Avenue North and Bordeaux . The tornado started around Scovel Street and 28th Avenue North. Extensive damage occurred from this location and to the eastnortheast for just over a mile in length. Numerous trees were uprooted or snapped. Powerlines were down. A number of homes suffered roof damage. The tornado crossed I-265 , moving eastnortheast reaching Arthur Avenue, 10th Ave. and 9th Ave. North, crossed the Cumberland River and then reaching Dickerson Pike and Ellington Parkway, finally dissipating around Petway Avenue and Gallatin Road. One woman was injured when an interstate sign blew into her car and caused her to wreck.	National Weather Service Forecast Office; Nashville, TN; Tornado Database http://www.srh.noaa.gov/ohx/tornado/davidson.htm
45	Nashville Metro Airport	24-May-00	10:58 PM	Tornado	F1	0	0	0.8	20K	0	Trees blown down on Belmont and Caldwell Ave.	
46	Nashville Metro Airport	24-May-00	11:00 PM	Tornado	F1	0	0		20K	0	Trees blown down on Woodmont Blvd. and Granny White Pike and onto I-440.	
	Nashville Metro Airport	26-May-00	11:45 AM	Tornado	F1	0	0	1.3	20K	0	Numerous trees and power lines down. The tornado started around Overton and Hill Road. It ended at Marchant Drive, near the Ellington Agricultural Center.	
47	Nashville	5-May-03	12:45 AM	Tornado	F1	0	0	0.2	250K	0	Considerable roof damage to homes in Bellshire Terrace Court and Bellshire Terrace Drive. Cars were overturned. This is in the Bellshire area of northern Davidson county. The White House granted Governor Phil Bredesen's request for Presential Disaster Declaration for 20 counties in West and Middle Tennessee for damage as a result of tornadoes, flooding and severe thunderstorms which began on Sunday , May 4, 2003.	National Weather Service Forecast Office; Nashville, TN;

TORNADOES-3

#	Location	Historical Event	Time	Type	Magnitude (knots)	Death (#)	Injury (#)	Path Length (miles)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
48	Nashville	11-May-03	2:12 AM	Tornado	F1	0	0	4.5	500K	0	There was damage to the roofs of homes and businesses. Several businesses had their signs damaged as well. The Davidson County tornado started about 5.3 miles northeast of downtown Nashville near Riverwood Drive. The tornado crossed the Cumberland River and affected the Opryland area and dissipated around Bonnameade Road or about 8.9 miles east northeast of downtown Nashville.	
49	Nashville	11-May-03		Tornado	F3 & F1	0	0		0	0	An pre-dawn severe weather outbreak produces six tornadoes across the Nashville metropolitan area. Two of the tornadoes (Franklin and Walterhill) are rated as F3, and produce considerable damage. The other four twisters are rated F1. Amazingly, there are no injuries. This is the 9th largest tornado outbreak in Middle Tennessee's history.	
50	Nashville	15-Nov-05		Tornado	EF0	0	0	0.2	1K	0	Utility poles were broken at 3205 and 3225 Whites Creek Pike. This was from the storm complex that came from Dickson County. This report was given to the NWS by Nashville Electric Service.	
51	Goodlettsville	7-Apr-06		Tornado	EF3	0	7	5	10M	0	The tornado destroyed many residential homes in Goodlettsville. Significant damage was done to the Metro Baptist Church with part of the roof blown off and front of church blown away. This tornado destroyed 25 homes, 13 homes or businesses with major damage and 31 with moderate damage/.	
52	Scottsboro	6-Feb-08		Tornado	EF0	0	0		0	0	Trees were blown down.The Super Severe Weather Outbreak on Feb. 5, 2008 produced supercelluar thunderstorms, well in advance of a multicell line of thunderstorms. The whole episode lasted about 6 hours. This occurred ironically while many states, including Tennessee, were participating in the Super Tuesday Primary Election. Fortunately, polls had already closed in the mid state when these tornadoes struck.	
53	Nashville	2-Apr-09		Tornado	EF1	0	1	2	500k	0	An EF1 Tornado with maximum estimated wind speed around 90 to 100 mph touched down in the Nashville Metro Area. The tornado touched down south of Briley Parkway and Murfreesboro Pike, where it caused minor damage to houses and downed several trees. As the tornado crossed Murfreesboro Pike and it damaged several businesses, some significantly. The tornado continued north and caused minor damage to houses and downed trees, some very large, then crossed Interstate 40 west of Briley Parkway and lifted near Elm Hill Pike.	
54	Nashville	2-May-10		Tornado	EF1	0	0	3.64	500k	0	The initial touchdown was near the intersection of South Dickerson Pike and Old Dickerson Pike in northeast Davidson county. Trees were snapped, trailers suffered roof and underpinning damage, and an old building had its roof removed.||Damage, which continued to the northeast for over 3.5 miles, consisted of minor roof uplifting along with hundreds of snapped trees. The tornado crossed Rivergate Parkway at the Rivergate Mall. It blew over power poles and business signs. Several large projectiles impacted the Mallâs facade, leaving craters as high as 30 feet off the ground. The last evidence of damage was to business signs just east of Rivergate Mall on Gallatin Pike.||Maximum wind speeds in the tornado were estimated to be around 105 mph.	National Weather Service Forecast Office; Nashville, TN;
55	Nashville	26-Jul-10		Tornado	EF1	0	0	0.5	200k	0	National Weather Service and Metro Nashville Office of Emergency Management Officials surveyed damage in Northern Davidson County. Most of the surveyed damage, including Trail Hollow Lane just west of Interstate 24, and communities along Brick Church Pike from Northbrook Drive south to Briley Parkway, was from microburst winds. A semi-trailer was blown over, dozens of trees were snapped and uprooted, and several roofs suffered minor damage. Maximum winds in these areas were around|80 mph.||Further north, areas along Westchester Drive experienced much more significant damage. Approximately 12 brick homes suffered heavy roof damage, including one which had a large section of the roof removed. Two buildings were impaled by two by fours, and a couple of dozen windows were blown out. The damage pattern in this area was characterized by convergence and obvious rotation consistent with a tornado. Damage that occurred was also consistent with the highest end of the EF-1 range, 105 to 110 mph.	
56	Nashville	24-Feb-11		Tornado	EF2	0	0	4.86	500k	0	Damaged occurred in the Smith Springs Area of southeast Davidson County. Damage began near the intersection of Butler and Smith Springs Road where two churches experienced significant roof damage. Damage continued to the northeast across the Priest Lake Forecast Community where approximately ten homes suffered significant roof damage. A couple of homes had complete roof loss including a two story home which lost most of its second floor. Damage continued northeast across Percy Priest Lake and eventually into Wilson County. The last evidence of damage was near the intersection of Gladieville Circle and Stewarts Ferry Pike.	
56	Nashville	24-Feb-11		Tornado	EF2	0	0	2.59	500k	0	Damaged occurred in the Smith Springs Area of southeast Davidson County. Damage began near the intersection of Butler and Smith Springs Road where two churches experienced significant roof damage. Damage continued to the northeast across the Priest Lake Forecast Community where approximately ten homes suffered significant roof damage. A couple of homes had complete roof loss including a two story home which lost most of its second floor. Damage continued northeast across Percy Priest Lake and eventually into Wilson County. The last evidence of damage was near the intersection of Gladieville Circle and Stewarts Ferry Pike.	

#	Location	Historical Event	Time	Type	Magnitude (knots)	Death (#)	Injury (#)	Path Length (miles)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
58	Nashville	4-Apr-11		Tornado	EF1	0	1	2.67	250k	0	The EEF1 tornado began along the Davidson and Williamson County line, along Kidd Road. The damage path extended east across Battle Road, Waldron Road, along Blair Road, and ending near Interstate 24 and Sam Ridley Parkway. The damage path ranged from 50 to 100 yards wide. Damage was very consistent along the path, which was just over 4 miles long. ||The debris pattern showed clear convergent patterns, and eyewitness accounts support the determination that a tornado caused the damage. Numerous power poles were snapped. Hundreds of trees were snapped or uprooted. Some of these had large root systems. Some small storage buildings were destroyed. Numerous homes had roof|and siding damage. Several fences were blown down. Debris was scattered hundreds of yards. A tractor trailer was blown over on Interstate 24. Several cargo trailers were overturned on Interstate 24 also.	
59	Joelton	30-Jan-13	300 AM	Tornado	EF0	0	0	5.55	10	15	An EF0 tornado began in Joelton along Harper Road between I-24 and Highway 41 where 3 large oak trees were uprooted and fell in a convergent pattern. The damage path continued east northeast with mostly tree damage. Along Bidwell Road, damage to a roof and barn was observed along with 10 to 15 downed trees. The path of damage crossed Wilkinson Road, Ridgewood Road, and Ivy Point Road where numerous trees were snapped and uprooted before the tornado lifted.	
60	Ivy Point	30-Jan-13	310 AM	Tornado	EFO	0	0	2.33	70	20	An EF0 tornado touched down west of Freeman Hollow Road at Freeman Hollow Court where numerous trees were snapped and uprooted. Additional trees were blown down with a few homes receiving minor roof damage to the east along Baker Road, Old Springfield Pike, and Highway 11. An old barn was also destroyed east of Highway 11. The tornado then crossed into Sumner County.	
61	Inglewood	30-Jan-13	312 AM	Tornado	EF0	0	1	3.2	150	10	An EF0 tornado touched down just northeast of the I-65 and Trinity Lane interchange and moved eastward along a narrow intermittent path through East Nashville before ending around McGavock Pike in Inglewood just to the west of the Cumberland River. Several mobile homes were heavily damaged by falling trees along Dickerson Pike, with one woman receiving a minor injury in the Ranchwood Mobile Home Park. Numerous homes had minor roof and exterior damage along Donald Street, Gordon Terrace, Woodyhill Drive, and Jones Avenue, and several large trees were blown down. Some roof damage was noted to health department buildings on RS Gass drive south of Hart Lane. Dozens of more homes suffered minor roof and exterior damage from the Gillock Street and Gallatin Pike area eastward to near McGavock Pike, with numerous trees and fences blown down.	National Weather Service Forecast Office; Nashville, TN;
62	Hopewell	7/2/2015	1615	Tornado	EF0	0	0	0.87	20000	0	An EF0 tornado touched down briefly in the Brandywine Farms subdivision along Rolling Mill Road then moved east before lifting east of Rachel Way in the Brandywine Pointe subdivision. Several trees were blown down with minor roof damage to a few homes on Hale Place, Eastover Place and Rachel Way. Max winds were estimated at 70 mph.	
63	Four Corners	3/1/2017	717	Tornado	EF0	0	0	1.89	50000	0	An EF-0 tornado touched down in extreme southeast Davidson County near Murfreesboro Pike and Old Hickory Blvd around 717am CST. The tornado caused sporadic damage mainly to trees as it raced to the northeast, although a few homes suffered minor roof damage on Lavergne Couchville Pike, Pepperwood Drive, and Chutney Drive. It then hit the Four Corners Marina around 719am CST and caused extensive damage to docks, boats and shelters. The tornado crossed the Hurricane Creek inlet of Percy Priest Lake into Rutherford County, then blew down a few trees and deposited debris from the marina on the eastern shore of the lake. The tornado then lifted near the northern end of Stones River Road.	
64	(BNA) Nashville Metro	5/24/2017	1103	Funnel Cloud		0	0		0	0	Multiple social media photos and videos showed an apparent gustnado briefly touched down near the east runway of Nashville International Airport. No damage was reported.	
65	Bordeaux	8/31/2017	2221	Tornado	EF1	0	0	0.62	25000	0	A brief EF-1 tornado associated with Tropical Depression Harvey touched down in the Bordeaux area of northwest Nashville and moved to the northwest for over one-half mile. The tornado snapped or uprooted nearly 100 large mature hardwood trees on Hydesdale Lane, Drakes Branch Road, Setters Road, Enchanted Drive, and Queens Lane. A small portion of the roof was blown off a home on Setters Road north of Drakes Branch Road, and the carport of a home was destroyed on Queens Lane. The worst damage was to a wood frame home at 133 Queens Lane where a large portion of the roof was blown off. Maximum winds were estimated to be around 95 mph.	
66	Nashville Cornelia F	8/31/2017	2247	Tornado	EF0	0	0	0.94	15000	0	A brief, weak EF0 tornado touched down in southeast Nashville just north of Lebanon Pike near Omohundro Drive and moved north-northwest. Several trees were uprooted in all directions along Dahlia Drive and a small garage building was blown inwards. A few more trees were snapped and uprooted and a carport had minor sheet metal damage on Dahlia Circle. The most significant damage occurred at a warehouse on River Hills Drive where a large section of a wall was blown out and an 18 wheeler was flipped over. Several more trees were snapped along both sides of the Cumberland River and in the Shelby Bottoms Park before the tornado lifted.	

TORNADOES-5

#	Location	Historical Event	Time	Type	Magnitude (knots)	Death (#)	Injury (#)	Path Length (miles)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
67	Joelton	11/18/2017	1630	Tornado	EF1	0	0	2.34	50000	0	An EF-1 tornado started along Stagner Road just north of Interstate 24 around 1.2 miles northwest of Joelton, blowing down several trees as it moved eastward to Whites Creek Pike. More trees and power lines were blown down on Millken Drive and Margie Drive before the tornado intensified and caused significant roof damage to two homes on Gary Road just south of Union Hill Road. Several power poles were also snapped and trees uprooted in this area. The tornado continued eastward through inaccessible forests blowing down numerous trees before rapidly dissipating about one half mile north of the Clay Lick Road bridge over Interstate 24. The beginning point, start time, end point, and path length of this tornado were updated in July 2018 based on newly available high resolution satellite imagery in Google Earth.	National Weather Service Forecast Office; Nashville, TN;
68	Four Corners	11/18/2017	1653	Tornado	EF0	0	0	3.19	5000	0	An EF-1 tornado began in far southeast Davidson County where weak tree and roof damage (EF-0) was noted on Hampton Blvd in the Villages of Long Hunter subdivision of Antioch. The tornado then crossed Percy Priest Lake into far northwest Rutherford County where numerous trees were blown down and the roofs of a few homes suffered minor damage. Moving into Wilson County, the tornado intensified to EF-1, snapping or uprooting dozens of trees and destroying several outbuildings on Fellowship Road and Underwood Road. The worst damage was in Gladeville where a few homes suffered roof damage on Cobblestone Way and Stonefield Drive, several fences were blown down, and a few outbuildings were destroyed. The steeple of a church on McCreary Road collapsed into the sanctuary, and part of an exterior brick wall was blown down. An RV carport across the street from the church was also destroyed. Another outbuilding was destroyed on Odum Lane and several more trees were blown down before the tornado lifted in inaccessible areas south of Highway 265. The ending point, ending time, and path length of the Wilson County portion of this tornado were updated in July 2018 based on newly available high resolution satellite imagery in Google Earth, giving an updated total path length across Davidson, Rutherford, and Wilson Counties of 10.93 miles.	
The most widespread damaging wind event to affect Middle Tennessee in at least 15 years struck the area during the evening hours on Friday, June 21, 2019. A long line of severe thunderstorms known as a MCS (mesoscale convective system) formed across southeast Missouri during the day, then moved southeast across Middle Tennessee between 6-10pm. With ample instability and unusually strong wind shear for late June in place, these storms produced widespread damaging winds in every Middle Tennessee County. Thousands of trees were blown down across the region, including some that had been standing since the Civil War. Damage to power lines and poles resulted in an estimated 100,000+ power outages, with some people without electricity for up to 1 week. In addition to the damaging winds, large hail up to quarter size was reported, and several mesocyclones within the line of storms spawned 4 tornadoes and several funnel clouds. Due to the long path and severity of the wind damage with this MCS, the Storm Prediction Center classified this event as a derecho.											
69	Donelson	6/21/2019	2000	Tornado	EF0	0	0	2			A brief EF0 tornado touched down in the Stones River Bend Park and moved southeast, snapping several trees along the river. Moving through the Standford Estates subdivision, the tornado blew down numerous large trees in a convergent pattern on Edgemont Drive, Myrick Drive, Stanford Drive, Belding Drive, and Jenry Drive, with some trees falling onto and heavily damaging homes. Many of these same homes were also damaged in a severe microburst on April 18, 2017. The tornado continued southeast and blew down many more trees on Wellington Square, Lebanon Pike, and along the Stones River Greenway before lifting.	National Weather Service https://www.weather.gov/ohx/20190621
70	Antioch	6/21/2019	2004	Tornado	EF0	0	0	1.25			A small, brief EF0 tornado touched down in Antioch near the intersection of Anderson Road and Country Way Road. The tornado took a U-shaped path and moved southeast across Oak Trees Court, Country Meadow Drive, Country Meadow Court, Country Lawn Drive, Towne Village Road, Fall Court, Dove Creek Road, and Huntingboro Trail, snapping and uprooting numerous trees in a narrow, convergent path. A few trees fell onto homes causing minor damage. Turning more eastward, the tornado strengthened and caused significant roof and siding damage to many homes along Leatherbury Court, Seasons Lake Court, and Seasons Drive. The tornado appears to have lifted north of the intersection of Smith Springs Parkway and Mt View Road.	

TORNADOES-6

#	Location	Historical Event	Time	Type	Magnitude (inches)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
1	Nashville	Dec-Jan 1779-80		severe winter							Chronology of Disasters in TN (Including Natural and Man caused Disasters, Epidemics and Civil Disturbances) Allen P. Coggins, 1996
2	Nashville	1787-88		severe winter							
3	Statewide	Feb 1823		severe winter							
4	Middle Tennessee	Dec-Jan 1831-32		severe winter							
5	Statewide	Mid April 1849		severe cold/snow							
6	Middle Tennessee	22-Jan-1873		blizzard	0.0	0	0	0	0		
7	Nashville	08-Jan-1886		snow	3.7	0	0	0	0	A winter storm ushers in one of the worst cold outbreakes in mid state history. A strong cold front 3.7" of snow to Nashville, and drops the temperature from a high of 35 degrees to -8 the following morning. For the next 3 days, the temperature does not rise above 8 degrees, and the low temperature drops to 0 or below for five consecutive mornings, falling to -9 degrees on the morning of January 11.	
8	Nashville	2-Feb-1886		snow	6.5	0	0	0	0	Nashville receives 6½" of snow.	
9	Nashville	3-Feb-1886		snow	9.8	0	0	0	0	Nashville records greatest one-day snowfall for February, measuring 9.8".	
10	Nashville	21-Jan-1888		snow	6.1	0	0	0	0	Nashville receives 6.1" of snow.	
11	Nashville	17-Mar-1892		snow	17.0	0	0	0	0	Nashville records its greatest one-day snowfall ever, measuring 17". The snow starts after midnight, and continues until noon. No street cars are running. Morning trains are delayed. And the "arteries of trade" are clogged. Suburban workers have to walk to town. Mailmen don't leave the post office on their rounds until 10:00 a.m. A freight train from Chattanooga slides off the track at the Winton community, near Murfreesboro, and a passenger train from Memphis due at 7:00 a.m. doesn't arrives until 2:00 p.m. Riddleton, a few miles northwest of Carthage, receives 18.7" in what is believed to be the greatest single-day snowfall in Middle Tennessee's history.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
12	Nashville	11-Feb-1895		snow	6.0	0	0	0	0	Nashville receives 6" of snow.	
13	Nashville	14-Feb-02		snow	8.0	0	0	0	0	Nashville receives 8.0" of snow.	
14	Nashville	29-Jan-05		snow	8.5	0	0	0	0	Nashville records greatest one-day snowfall for January, measuring 8.5"	
15	Nashville	8-Feb-10		snow	8.8	0	0	0	0	Nashville receives 8.8" of snow.	
16	Nashville	25-Apr-10		snow/ice	1.5	0	0	0	0	Temperature at Nashville drops to 32 -- the latest freeze ever. Snowfall measuring 1½" also represents the greatest one-day snowfall for April, and is the latest date for measurable snowfall.	
17	Nashville	18-Dec-16		snow	6.0	0	0	0	0	Nashville records greatest one-day snowfall for December, measuring 6".	
18	Nashville	4-Mar-17		snow	7.5	0	0	0	0	Nashville receives 7½" of snow.	
19	Nashville	11-Jan-18		snow	6.5	0	0	0	0	Nashville receives 6½" of snow.	
20	statewide	Winter 1917-18		winter storm							Chronology of Disasters in TN (Including Natural and Man caused Disasters, Epidemics and Civil Disturbances) Allen P. Coggins, 1990
21	Nashville	30-Oct-25		snow	1.0	0	0	0	0	Nashville records earliest measurable snowfall, with 1".	
22	Nashville	20-Feb-29		snow	7.0	0	0	0	0	Nashville receives 7" of snow.	
23	Nashville	21-Feb-29		snow	8.0	0	0	0	0	Nashville receives 8" of snow, for a two-day total of 15". The entire event occurs during a 13-hour period.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
24	Nashville	22-Nov-29		snow	5.0	0	0	0	0	Five inches of snow fall at Nashville, the most ever measured on this date.	
25	Nashville	19-Jan-36		snow	6.2	0	0	0	0	Nashville receives 6.2" of snow.	

WINTER STORMS-1

#	Location	Historical Event	Time	Type	Magnitude (inches)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
26	Nashville	16-Jan-48		snow	7.0	0	0	0	0	Nashville receives 7" of snow.	
27	Nashville	24-Nov-50		snow	7.2	0	0	0	0	Nashville records greatest one-day snowfall for November, measuring 7.2".	
28	Nashville	29-Jan-51		snow/ice	1.6	0	0	0	0	The worst ice storm in Nashville's history begins, causing a complete stalemate of transportation in Nashville for two days. Frozen precipitation starts during the evening, with 1.6" of snow and ice accumulating by midnight.	
29	Nashville	31-Jan-51		snow	5.0	0	0	0	0	Five inches of snow and ice fall, much of it during the evening, producing a water equivalent of 3.83". This is the greatest one-day precipitation event for January in Nashville's history.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
30	Nashville	1-Feb-51		snow	5.2	0	0	0	0	Precipitation continues at Nashville through the morning, most of it as snow, and finally ends around noon. An additional 5.2" are measured, leaving the city buried under 8" of ice and snow.	
31	Nashville	2-Apr-51		snow	1.0	0	0	0	0	A rare late-season winter weather event produces an inch of snow at Nashville. The high of 43 is the lowest high temperature ever recorded on this date.	
32	Davidson County	7-Jun-55	11:30 AM	hail	1.0	0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-
33	Davidson County	14-Aug-56	4:10 PM	hail	0.8	0	0	0	0	None Reported	
34	Davidson County	27-Aug-56	7:30 PM	hail	0.8	0	0	0	0	None Reported	
35	TN and other states	23-31-Jan-1957		ice storm							Chronology of Disasters in TN (Including Natural and Man caused Disasters, Epidemics and Civil Disturbances) Allen P. Coggins, 1989
36	Davidson County	17-May-57	11:10 AM	hail	1.8	0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
37	Nashville	5-Jan-60		snow	7.3	0	0	0	0	A winter storm brings heavy snowfall to much of Middle TN.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN
38	Nashville	8-Feb-60		snow	7.4	0	0	0	0	Nashville receives 7.4" of snow.	
39	statewide	2-Mar-60		ice storm							Chronology of Disasters in TN (Including Natural and Man caused Disasters, Epidemics and Civil Disturbances) Allen P. Coggins, 1988
40	Nashville	26-Feb-62		snow	9.7	0	0	0	0	Nashville gets 9.7" of snow	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
41	Davidson County	30-Apr-62	3:45 PM	hail	0.8	0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
42	Nashville	11-Dec-62		snow/cold	2.8	0	0	0	0	It's the beginning of a record cold outbreak in Middle Tennessee. Nashville's temperature drops to 3 degrees after a snowfall of 2.8".	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
43	Davidson County	10-Jan-63	9:00 PM	hail	0.8	0	0	0	0	None Reported	National Climatic Data Center, NCDC / Climate Resources / Climate Data / Events / Storm Events, http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
44	Davidson County	10-Jan-63	11:35 PM	hail	0.8	0	0	0	0	None Reported	
45	Nashville	23-Jan-63		snow	6.2	0	0	0	0	The strongest cold front in mid state history brings heavy snow and an unprecedented drop in temperature. Nashville receives 6.2" of snow. In addition, the high temperature reaches 48 degrees, but plummets to -13 degrees by midnight, for a range of 61 degrees. This is the greatest daily range of temperatures in Nashville's history.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm

WINTER STORMS-2

#	Location	Historical Event	Time	Type	Magnitude (inches)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
46	Davidson County	7-Jul-63	10:30 AM	hail	0.8	0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
47	Davidson County	20-Mar-64	5:08 PM	hail	0.8	0	0	0	0	None Reported	
48	Davidson County	24-Dec-64	4:30 PM	hail	1.0	0	0	0	0	None Reported	
49	Davidson County	11-Apr-65	6:56 PM	hail	0.8	0	0	0	0	None Reported	
50	Nashville	22-Jan-66		snow	7.5	0	0	0	0	Nashville receives 7.5" of snow.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
51	Davidson County	12-Apr-66	6:15 PM	hail	1.0	0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events
52	Davidson County	12-Apr-66	7:05 PM	hail	3.0	0	0	0	0	None Reported	
53	Nashville	2-Nov-66		snow	7.2	0	0	0	0	A rare, early-season snowstorm strikes the mid state, as Nashville ties its record for greatest one-day snowfall for November, measuring 7.2".	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
54	Davidson County	23-Apr-67	1:10 PM	hail	0.8	0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events
55	Davidson County	19-May-67	4:30 PM	hail	0.8	0	0	0	0	None Reported	
56	Nashville	20-Mar-68		snow	8.2	0	0	0	0	Nashville measures 8.2" of snow in a rare late-season winter weather event.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
57	Davidson County	23-Apr-68	12:15 PM	hail	1.8	0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events
58	Davidson County	21-Apr-69	9:35 PM	hail	0.8	0	0	0	0	None Reported	
59	Nashville	25-Dec-69		snow	2.7	0	0	0	0	Nashville records greatest Christmas Day snowfall ever, measuring 2.7".	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
60	Davidson County	4-Mar-70	6:15 PM	hail	0.8	0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events; http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
61	Nashville	6-Apr-71		snow	1.1	0	0	0	0	A rare late-season winter weather event produces 1.1" of snow at Nashville. The high temperature of 42 is the lowest high temperature ever recorded on this date	National Weather Service Forecast Office; Nashville, TN. Calendar of Significant Weather Events in Middle TN ttp://www.srh.noaa.gov/ohx/climate/calendar.htm
62	Davidson County	27-Apr-71	7:35 PM	hail	1.0	0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events. http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
63	Davidson County	27-Jun-71	4:15 PM	hail	0.8	0	0	0	0	None Reported	
64	Davidson County	7-Apr-72	5:17 PM	hail	0.8	0	0	0	0	None Reported	
65	Davidson County	10-May-73	12:45 PM	hail	1.0	0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
66	Davidson County	19-May-73	12:30 PM	hail	1.0	0	0	0	0	None Reported	
67	Davidson County	3-Apr-74	4:09 PM	hail	0.8	0	0	0	0	None Reported	
68	Davidson County	15-May-76	1:47 PM	hail	0.8	0	0	0	0	None Reported	
69	Davidson County	15-May-76	2:00 PM	hail	0.8	0	0	0	0	None Reported	
70	Davidson County	17-Jul-77	5:54 PM	hail	1.8	0	0	0	0	None Reported	
71	Davidson County	6-May-84	12:15 PM	hail	1.8	0	0	0	0	None Reported	
72	Davidson County	6-May-84	1:10 PM	hail	1.8	0	0	0	0	None Reported	
73	Nashville	1-Feb-85		snow	6.7	0	0	0	0	Nashville receives 6.7" of snow	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
74	Davidson County	4-Jun-85	4:10 PM	hail	4.5	0	0	0	0	None Reported	National Climatic Data Center; NCDC / Climate Resources / Climate Data / Events / Storm Events. http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
75	Davidson County	4-Jun-85	4:25 PM	hail	1.8	0	0	0	0	None Reported	
76	Davidson County	6-Jun-85	7:25 PM	hail	1.8	0	0	0	0	None Reported	
77	Nashville	7-Jan-88		snow	8.1	0	0	0	0	A snowstorm brings widespread accumulation to the midstate.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
78	Davidson County	2-Aug-88	2:15 PM	hail	0.8	0	0	0	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events
79	Davidson County	6-May-89	4:40 AM	hail	0.8	0	0	0	0	None Reported	
80	Davidson County	20-May-89	2:11 AM	hail	0.8	0	0	0	0	None Reported	
81	Nashville	7-Dec-89		snow		0	0	0	0	A winter storm leaves 40,000 homes around Nashville without electricity for several hours.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm

WINTER STORMS-3

#	Location	Historical Event	Time	Type	Magnitude (inches)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
82	Hermitage	15-Apr-93	1:30 PM	hail	1.3	0	0	0K	0	Ping-Pong ball-size hail was reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
83	South Nashville	25-Aug-93	2:15 PM	hail	0.9	0	0	0	0	Some trees were blown down.	
84	Northeast Tennessee	4-Jan-94	1200	snow	N/A	0	0	1K	0	A winter storm dumped four to six inches of snow on Northeast Tennessee. Numerous roads were closed by the snow.	
85	Northeast Tennessee	14-Jan-94	1800	snow	N/A	0	0	0K	0	Up to two inches of snow fell on parts of Northeast Tennessee.	
86	Nashville	9-Feb-94		snow/ice	1.0	0	0	0	0	A major winter weather event strikes the mid state. Temperature at Nashville at midnight is 70 degrees, but a strong cold front sweeps through, with temperatures falling throughout the day. By noon, snow begins as the temperature falls to 32 degrees, and changes to freezing rain by evening. At midnight, the temperature is 23 degrees. By the following morning, the ground is covered by an inch of snow and ice.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle TN http://www.srh.noaa.gov/ohx/climate/calendar.htm
87	Tennessee	9-Feb-94	2000	ice storm	N/A	0	0	500K	0	A major ice storm hit much of Tennessee. Numerous trees were knocked down. Many of these trees took down power lines as well. About 770,000 people in the state lost power for some period of time. One person was killed in Memphis when a tree fell upon his car while he was driving.	
88	Nashville	27-Apr-94	9:00 AM	hail	0.8	0	0	0K	0	None Reported	
89	Goodlettsville	29-Apr-94	1:40 PM	hail	1.8	0	0	1K	0	A few trees were blown down	
90	Middle and East Tennessee	17-Jan-95	400	heavy snow	N/A	0	0	0	0	A mix of sleet and freezing rain fell on parts of Middle and East Tennessee. Numerous roads were closed because of the icy conditions. Numerous auto accidents occurred with one death reported from an accident near Knoxville. Numerous trees and power lines fell as well.	
91	Middle and East Tennessee	17-Jan-95	1700	ice	N/A	0	0	500K	0		
92	Percy Priest Lake	20-Mar-95	6:10 PM	hail	0.8	0	0	0K	0	None Reported	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
93	Middle Tennessee	6-Jan-96	5:00 PM	winter storm	N/A	0	0	10K	0	The snow started Saturday evening and did not let up until Monday morning. As a result, church services were cancelled Sunday, schools were closed for several days across middle Tennessee. There were several fender benders as a result of the snow storm across middle Tennessee. Snow totals for this storm were 4 to 5 inches across Davidson county, 1-3 inches for the southern part of middle Tennessee, and as much as 8 inches for Gainsboro in Jackson county and 6-8 inches for Clay county. Jackson and Clay counties are located in the Cumberland Plateau.	
94	Middle Tennessee	6-Jan-96	5:50 AM	winter storm	N/A	0	0	0	0	Freezing rain started across middle Tennessee during the early morning hours. The freezing rain caused slippery roadways Saturday morning, especially on bridges and overpasses. The freezing rain changed to sleet in the afternoon and then to all snow around evening.	
95	Nashville	19-Mar-96		snow	8.7	0	0	0	0	Nashville receives 8.7" of snow.	National Weather Service Forecast Office; Nashville, TN; Calendar of Significant Weather Events in Middle
96	Joelton	20-Apr-96	2:00 AM	hail	1.8	0	0	0	0	Golf ball size hail covered the ground 1.5 inches to 2.0 inches deep from Joelton to Pleasant View.	
97	Millersville	20-Apr-96	2:20 AM	hail	1.3	0	0	0	0	Half dollar size hail near the Sumner County-Davidson County line.	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events
98	Nashville	29-Apr-96	2:25 PM	hail	0.8	0	0	0	0	Dime size hail reported at Long Hunter State Park.	

WINTER STORMS-4

#	Location	Historical Event	Time	Type	Magnitude (inches)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
99		19-May-96	1:00 AM	heavy snow	N/A	0	0	5K	0	A heavy wet snow hit portions of middle Tennessee, especially the northern portions close to the Kentucky border. The weight of the snow brought large tree branches and power lines down across middle Tennessee. As a result, thousands were left without power. On Tuesday afternoon, March 19, the snow accumulated up to 12 inches in northern Sumner County with drifts up to 10 feet reported at the Tennessee Christian Medical Center at Portland. Also, many areas in the city of Portland lost power at 12:45 PM Tuesday. Around 11:00 AM Wednesday March 20, a Lear Jet slid off the runway at Portland Municipal airport. There were no injuries and only slight damage to the aircraft. Problems started with the snow at 4:30 AM on March 19, with 3 inches of snow across Williamson county. Reports of downed trees and power lines were being received across the county and also from Bellevue in southwest Davidson County. By 6:00 AM, the snow had accumulated to 3 to 4 inches across Williamson county and also at Bellevue. Specifically, there were 4 inches at Franklin in Williamson county and 3 inches at the Nashville airport. By 9:00 AM, Nashville received 4 inches of snow. The snow continued to accumulate. Snow reports by 1:00 PM were: 4-8 inches across Montgomery and Robertson counties, 5-6 feet drifts were common across Sumner county. The snow had settled to 3 inches at Nashville at 1:00 PM. There were 12,000 people without power in Fairview in Williamson county at 2:30 PM. On Wednesday March 20, 4:30 AM these were the following snow totals received by the National Weather Service: Lafayette in Macon county had 8 inches with 3 to 5 feet drifts. Many roads were closed across Macon county. Putnam and Overton counties had 3-4 inches of snow.	
100	Goodlettsville	21-Jul-96	8:40 PM	hail	1.8	0	0	0	0	Dime to golf ball size hail reported.	
101	Nashville	28-Mar-97	7:55 PM	hail	0.9	0	0	0	0	Amateur radio operator relayed report of nickel size hail at Opryland Park.	
102	Goodlettsville	28-Mar-97	8:00 PM	hail	0.9	0	0	0	0	Emergency management official reported nickel size hail.	
103	Madison	28-Mar-97	8:04 PM	hail	1.8	0	0	0	0	SKYWARN Spotter reported golf ball size hail.	
104	Nashville	26-May-97	8:49 PM	hail	1.0	0	0	0	0	Quarter size hail reported at I-40/440 junction.	
105	Nashville Metro Airport	13-Jun-97	1:55 PM	hail	1.8	0	0	0	0	Golf ball size hail at the airport.	
106	Nashville	25-Oct-97	6:17 AM	hail	0.9	0	0	0	0	METRO EOC reported nickel size hail near I-65 in the southern part of the county.	
107	Antioch	30-Nov-97	2:35 PM	hail	1.0	0	0	0	0	Quarter size hail reported by local law enforcement.	
108	Nashville	3-Apr-98	3:18 PM	hail	0.8	0	0	0	0	Local EMA official reported dime size hail.	
109	Nashville	3-Apr-98	3:37 PM	hail	0.8	0	0	0	0	Metro police reported dime size hail in south Nashville.	
110	Nashville	16-Apr-98	2:15 PM	hail	1.8	0	0	0	0	Sheriff reported golf ball size hail in west Nashville on Charlotte Pike.	
111	Nashville	16-Apr-98	2:34 PM	hail	0.8	0	0	0	0	NWS employee reported dime size hail on Delta Queen Drive near Opryland.	
112	Madison	16-Apr-98	2:36 PM	hail	0.8	0	0	0	0	Sheriff reported dime size hail.	
113	Inglewood	16-Apr-98	2:43 PM	hail	1.0	0	0	0	0	NWS employee reported quarter size hail.	
114	Nashville	16-Apr-98	3:20 PM	hail	0.9	0	0	0	0	County sheriff reported nickel size hail in the Green Hills area.	
115	Madison	16-Apr-98	4:20 PM	hail	1.0	0	0	0	0	Ham radio operator reported quarter size hail.	
116	Hermitage	16-Apr-98	5:25 AM	hail	0.9	0	0	0	0	NWS employee reported nickel size hail.	
117	Hermitage	16-Apr-98	5:30 AM	hail	1.8	0	0	0	0	NWS employee reported golf ball size hail.	
118	Nashville	21-May-98	6:10 PM	hail	0.8	0	0	0	0	County EMA official reported dime size hail downtown.	
119	Nashville	25-May-98	7:39 PM	hail	0.8	0	0	0	0	Metro EOC reported dime size hail in the western part of the city.	
120	Goodlettsville	10-Jun-98	8:40 AM	hail	1.8	0	0	0	0	Golf ball size hail was reported.	

WINTER STORMS-5

#	Location	Historical Event	Time	Type	Magnitude (inches)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
121	Middle and East Tennessee	23-Dec-98	7:30 AM	winter storm	N/A	0	11	1.5M	0	1/4 inch of ice on the ground at Clarksville. Newspaper accounts reported trecherous driving conditions across Franklin County. 1/2 to 3/4 inch of ice was observed at 105 PM on December 24 and there was one injury. In Fentress County, 40 percent of the county was without power and numerous trees were down. 1/2 to 3/4 inch of ice reported as of 1200 PM over Pickett County. Trees were down and power outages along with 11/2 inch of ice reported at 1200 PM over DeKalb County. The Cookville NOAA Weather Radio was knocked off the air, due to ice on power lines in Putnam County. In Overton County there was a car accident with 2 injuries near Alpine. 1/2 inch of ice at 1200 PM at Alpine and 1 inch of ice at Livingston in Overton County. 3 to 4 inches of sleet and ice with 2000 homes without power reported in Cannon County. There was a 1/2 inch of ice at 1110 AM CST in Murfreesboro with several fender benders. Also, 1/2 to 3/4 inch of ice on the ground by 1100 AM CST in Hartsville along with numerous car wrecks. Widespread trees and power lines were down in Warren County. Warren and Coffee Counties were the hardest hit counties in this winter storm. Caney Fork Electric estimated it cost 1.5 million dollars to restore downed utility poles and power lines. Most of the cost was for labor especially over the Christmas holiday. The damage was worst than the February Ice Storm of 1994 by three fold for Warren County. Cataclysmic tree and power line damage with one inch of ice in Coffee County. 80 percent of the residents were without power. Most of the damage was done when trees and power lines were coated with an inch of ice. The weight of the ice caused tree limbs and power lines to fall. This storm was considered worse than the February Ice Storm in 1994 for Coffee County. The NWS office at Old Hickory had 0.7 inch of ice at 1100 AM CST. Nashville had 1/2 inch of ice from the storm. Centerville 1 inch and Ashland City received 1 to 2 inches of ice. Major tractor trailer pileup on I-40 eastbound at Mt. Eagle Mountain with 3 injuries in Overton county.	
122	Bellevue	17-Jan-99	7:55 PM	hail	0.8	0	0	0	0	Dime size hail reported.	
123	Nashville	17-Jan-99	8:10 PM	hail	0.8	0	0	0	0	Dime size hail reported at South Nashville at the intersection of Old Hickory Boulevard and Franklin Road.	
124	Nashville	19-Apr-99	9:42 PM	hail	2.8	0	0	0	0	Spotter reported baseball size hail at Whites Creek Pike.	
125	Donelson	19-Apr-99	9:55 PM	hail	1.8	0	0	0	0	Spotter reported golf ball size hail near Opryland on Briley Parkway.	
126	Hermitage	19-Apr-99	10:05 PM	hail	0.8	0	0	0	0	Public reported dime size hail in north Hermitage.	
127	Madison	19-Apr-99	10:15 PM	hail	1.0	0	0	0	0	Spotter reported quarter size hail.	
128	Nashville	9-May-99	5:25 PM	hail	0.9	0	0	0	0	WTVF-TV Channel 5 reported nickel size hail.	
129	Nashville	9-May-99	5:30 PM	hail	0.8	0	0	0	0	Public reported dime size hail at Thompson Lane and Murfreesboro Road.	
130	Goodlettsville	13-May-99	2:30 PM	hail	0.8	0	0	0	0	SKYWARN Spotter reported dime size hail.	
131	Goodlettsville	13-May-99	2:35 PM	hail	0.9	0	0	0	0	EMA reported nickel size hail.	
132	Donelson	12-Aug-99	3:55 PM	hail	1.8	0	0	0	0	Golf ball size hail covering the ground.	
133	Goodlettsville	12-Aug-99	4:26 PM	hail	0.9	0	0	0	0	SKYWARN Spotter reported nickel size hail.	
134	Nashville	12-Aug-99	5:30 PM	hail	1.0	0	0	0	0	Quarter size hail reported near Briley Parkway and Ellington Pkwy.	
135	Middle Tennessee	22-Jan-00	2:30 PM	winter storm	N/A	0	0	0	0	These were some snow depths as of 230 PM Sat. Jan. 22, 2000 City snowfall in Nashville Metro 3-4, Dickson 2-3, Clarksville 3-4 Crossville 2-3, Cookeville 2-3, Monterey 3.0, Springfield 3-4, Livingston 2-3, Centerville 4.0. More snow continued to fall Saturday evening resulting in many school closures by Monday morning.	National Climatic Data Center NCDC / Climate Resources / Climate Data / Events / Storm Events http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
136	Bellevue	25-Mar-00	4:34 PM	hail	0.9	0	0	0	0	Nickel size hail reported at the intersection of Highways 100 and 96.	
137	Nashville	20-Apr-00	12:40 PM	hail	1.0	0	0	0	0	Ham radio report of quarter size hail.	
138	Nashville	20-Apr-00	12:48 PM	hail	0.8	0	0	0	0	Spotter reported dime size hail at Hermitage Landing on Percy Priest Lake.	

WINTER STORMS-6

#	Location	Historical Event	Time	Type	Magnitude (inches)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
139	Nashville	15-Apr-01	5:30 AM	hail	0.8	0	0	0	0	EMA official reported dime size hail at his home.	
140	Nashville Metro Airport	15-Apr-01	6:23 AM	hail	0.8	0	0	0	0	Dime size hail reported at the airport.	
141	Southwest Davidson County	27-Jun-01	3:05 PM	hail	0.9	0	0	0	0	Public reported nickel size hail in southwest Davidson County. Dime size hail was reported at Hermitage.	
142	Goodlettsville	27-Jun-01	3:55 PM	hail	0.8	0	0	0	0	Spotter reported dime size hail.	
143	Nashville	5-Jul-01	3:35 PM	hail	0.8	0	0	0	0	Spotter reported dime size hail in the Whites Creek area of Nashville.	
144	Goodlettsville	5-Jul-01	8:59 AM	hail	0.8	0	0	0	0	Dime size hail reported.	
145	Nashville	23-Sep-01	8:00 PM	hail	0.8	0	0	0	0	Dime size hail reported.	
146	Goodlettsville	17-Apr-02	4:00 PM	hail	0.8	0	0	0	0	Public reported dime size hail.	
147	Nashville	28-Apr-02	1:00 PM	hail	1.8	0	0	0	0	Spotter reported golf ball size hail.	
148	Nashville	28-Apr-02	1:28 PM	hail	1.8	0	0	0	0	Spotter reported golf ball size hail.	
149	Nashville	28-Apr-02	1:35 PM	hail	1.8	0	0	0	0	Spotter reported hail from the size of peas to golf balls in the Antioch area.	
150	Goodlettsville	28-Apr-02	4:30 AM	hail	0.9	0	0	0	0	Spotter reported nickel size hail.	
151	Nashville Metro Airport	17-May-02	12:45 PM	hail	0.8	0	0	0	0	SKYWARN Spotter reported dime size hail.	
152	Middle Tennessee	16-Jan-03	11:00 AM	heavy snow	N/A	0	0	0	0	Heavy snow moved into Middle Tennessee faster and heavier than forecasters thought. There was as much as 8 inches of snow in Gallatin and 7 inches at the NWS Office at Old Hickory. Specific amounts as of 4 pm were: Gallatin 8 in. (Spotter) Gainsboro 5 in. (Spotter) Clarksville 4 in. (Spotter) Crossville 3-5 in. with a few 5-6 in.. (law enforcement) Allarot 2.8 INCHES (CO-OP observer) Dickson 5.0 in. (CO-OP observer) Sparta 2.8 in. (CO-OP observer) NWS Old Hickory 7.0 in. This amount at NWS Old Hickory ties the record snowfall for January 16. Downtown Nashville had 7 inches of snow by 1345 CST. 7 inches of snowfall was recorded in Nashville on January 16, 1948. The snow began to fall in the Metro Nashville area around 8 AM. The snow shut down the city with schools, businesses and government agencies shutting down early. Motorists were stranded in slow-moving or non-moving traffic. It took hours to get cross town. Tracker trailer trucks could not move on the interstates or jack-knifed, which resulted in grid lock. Since schools let out early, parents rushed to pick them up. Schools closed at 9 AM, right in the middle of the storm. Many school buses were stranded in the snow and some students didn't get home until 10 PM. At one point, 60 busues were stranded throughout the city. Also, some students were kept in schools with food, heat and water. Other students were sent home with teachers or school officials with 4 wheel drive vehicles. Parents were angry because students were either kept at school or because their children had to ride in 4 wheel drive vehicles with strangers. I-65 was backed up for 5 hours from Nashville to the Kentucky border. A newspaper story stated that many motorists had to relieve themselves in their vehicles because of the grid lock.	
153	Middle Tennessee	9-Feb-03	9:00 PM	heavy snow		0	0	0	0	3 to 5 inches of wet snow was common across the area.	
154	Goodlettsville	6-Apr-03	1:55 PM	hail	0.8	0	0	0	0	NWS employee reported penny size hail.	
155	Lakewood	6-Apr-03	12:30 PM	hail	0.8	0	0	0	0	NWS employee reported penny size hail.	
156	Belle Meade	25-Apr-03	2:58 PM	hail	0.8	0	0	0	0	Nashville Metro EOC reported penny size hail.	
157	Antioch	25-Apr-03	3:15 PM	hail	0.8	0	0	0	0	Spotter observed penny size hail.	
158	Nashville	5-May-03	11:33 AM	hail	1.0	0	0	0	0	Spotter reported quarter size hail at the intersection of Harding Place and Nolensville Roads. The White House granted Governor Phil Bredesen's request for Presidential Disaster Declaration for 20 counties in West and Middle Tennessee for damage as a result of tornadoes, flooding and severe thunderstorms which began on Sunday , May 4, 2003.	
159	Hermitage	13-Jul-03	1:10 PM	hail	0.9	0	0	0	0	Nickel size hail reported by Spotter at intersection of Lebanon Road and Andrew Jackson Parkway.	
160	Joelton	13-Jul-03	4:01 PM	hail	1.0	0	0	0	0	Spotter reported quarter size hail on I-24 near the Davidson County and Cheatham county line.	
161	Nashville Metro Airport	4-Aug-03	9:20 PM	hail	1.0	0	0	0	0	Quarter size hail was observed at BNA airport.	
162	Hermitage	4-Aug-03	9:30 PM	hail	1.0	0	0	0	0	Quarter size hail reported by Spotter located on I-40 and Stewarts Ferry Pike.	
163	Donelson	27-Aug-03	2:12 PM	hail	0.8	0	0	0	0	Penny size hail was reported near BNA airport.	

WINTER STORMS-7

#	Location	Historical Event	Time	Type	Magnitude (inches)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
164	Middle Tennessee	4-Dec-03	6:00 AM	winter storm	N/A	0	0	0	0	The winter storm peaked around 11 AM CST. Some of the problems noted by TDOT were: Counties and Conditions Stewart- Icing on some roadways. Montgomery- Many roads icy. Ice on trees and power lines. About an inch of snow and sleet on ground. Dickson- 1/4 inch of ice on trees. Cheatham- Icy roads in many spots. Benton- Ice on trees and roads. Houston- Ice on trees and roads. Humphreys- Icing on trees and power lines. There were trees on some roads. Roberston- Numerous roads iced over. Trees and power lines were down. Ice was 1/4 to 1/2 inch thick by 6:30 AM CST. Davidson - Icing on trees and power lines caused scattered outages in the Belmont, Centennial Park and Nolensville Road area. Sumner- About 2 inches of slushy ice and snow on roads mainly north of Gallatin. Wilson- Ice on trees and power lines, mainly in the northern part of county. Macon- About a 1/4 inch of ice on all surfaces. Roads were slick and trecherous. About an inch of snow was on the ground. Clay- Roads were slick and icy. Ice on trees and power lines. Highway 52 east was in very bad shape. Pickett- 1/4 inch of ice on all surfaces. 2 inches of snow on the ground. Roads were in very bad shape. Smith- About 1/4 inch of ice on trees and power lines. Northern section had very icy roads. Trousdale- 1/4 inch of ice on surfaces. Roads in northern sections were in very bad shape. Jackson- About 1/4 inch of ice on power lines and trees. Secondary roads were icy. Overton - 3 inches of ice and snow on roads. Ice accumulations were about an inch on all surfaces. Putnam - Icing on trees. Fentress- Roads were icy. An inch of snow was on the ground. Dekalb- Some icing on trees and back roads.	National Weather Service Forecast Office; Nashville, TN;
165	Nashville	22-Dec-04	9:00 PM	winter storm	0.5	0	0	0	0	Snow, sleet and freezing rain made an icy mix that brought down tree limbs and power lines. 22,000 NES customers were without power.	
166	Nashville	7-Mar-08	9:00 PM	winter storm	2.0	0	0	5	0	A mixture of sleet, snow and freezing rain hit the county. Snow accumulations were about 2 inches across the county by 10 AM CST Sat. March 8. Driving was treacherous due to the snow and ice.	
167	Nashville	29-Jan-10	9:00 PM	winter storm	7.0	0	0	250k	0	Total snowfall accumulation, measured at seven inches, was reported in the southern part of town in Crieve Hall. Multiple roads across this area became snow covered, causing hazardous driving conditions and several car accidents. Newspaper reported that Tennessee Department of Transportation trucks worked 125 incidents by 4:30 PM, with no serious injuries. Nashville Metro Police reported that they responded to about 105 minor accidents and 26 injuries by 5 PM. Tennessee Department of Transportation crews responded to nearly 300 wrecks by 2 AM Saturday. Details on any damage amounts or extent of injuries associated with these accidents were unknown. Newspaper also reported that Tennessee Governor Phil Bredesen declared a state of emergency and state offices closed at 12 PM, along with many other business across the county closing during the afternoon hours. The Nashville International Airport experienced dozens of flight cancellations and flight delays stacked up throughout the day.	National Weather Service Forecast Office; Nashville, TN;
168	Nashville	12-Dec-10	9:00 PM	winter storm	3.0	0	0	0	0	Three inches of total snowfall accumulation occurred in Joelton. Law enforcement officials reported that other locations across the county received between two and two and a half inches of total snowfall accumulation. This total snowfall accumulation resulted in public and some private primary, secondary, and higher education school closures across the county, along with closures or postponement of other civic engagements across the county for the remainder of that day into the early morning hours on Monday, December 13th, as travel across roads throughout the county became hazardous due to the accumulating snowfall.	National Weather Service Forecast Office; Nashville, TN;

WINTER STORMS-8

#	Location	Historical Event	Time	Type	Magnitude (inches)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
169	Nashville	10-Jan-11	9:00 PM	winter storm	4.0	0	0	0	0	Four inches of total snowfall accumulation occurred at the Nashville International Airport.|Other locations across the county had total snowfall accumulations ranging on average from two to three inches. A newspaper reported that a private snow removal company reported road conditions as being terrible, with multiple cars spun out on the ice and abandoned on the side of county roadways. Details concerning any injuries or damage cost amounts to individual cars was unknown. This total snowfall accumulation resulted in public and some private primary, secondary, and higher education school closures across the county on Monday, January 10th, along with closures or postponement of other civic engagements across the county for the remainder of that day, as travel across roads throughout the county became hazardous due to the accumulating snowfall.	
170	Nashville	26-Jan-11	9:00 PM	winter storm	4.0	0	0	0	0	Total snowfall accumulations of between three and one half and four inches occurred on average across the county. This total snowfall accumulation resulted in public and some private primary, secondary, and higher education school closures across the county on Wednesday, January 26th, along with closures or postponement of other civic engagements across the county for the remainder of that day, as travel across roads throughout the county became hazardous due to the accumulating snowfall.	
171	Nashville	12-Jan-12	4:00 PM	snowfall	1.0	0	0	0	0	As a broad upper level trough with an associated embedded upper level low moved across Middle Tennessee during the afternoon hours on Thursday, January 12 to the early morning hours on Friday, January 13th, a significant snowfall event occurred across multiple counties in the mid state, resulting in hazardous driving conditions and the cancellations or postponements of civic engagements across these counties. One inch of total snowfall accumulation occurred just northeast of Brentwood in southern Davidson County. This total snowfall accumulation resulted in the closures or postponement of some civic engagements across southern Davidson County for the late afternoon through evening hours, as travel on roads across this area became hazardous due to the accumulating snowfall.	National Weather Service Forecast Office; Nashville, TN;
172	Nashville	29-Dec-12		snow/ice		0	0	0	0	Light snow showers fell across much of Middle Tennessee on December 29 as a fast moving upper level disturbance moved across the region. Light snow accumulations were reported generally along and east of the I-65 corridor, with significant impacts on roadways including road closures and numerous vehicle accidents. Light snow with accumulations up to two tenths of an inch fell during the afternoon hours and froze onto some area roadways by evening. Numerous vehicle accidents were reported due to the icy roadways, including at the Old Hickory Boulevard exit on I-65 in Brentwood.	
172	Nashville	19-Feb-12	8:00 AM	snowfall	2.0	0	0	0	0	A strong surface low pressure system moving from the Gulf Coast states into the Carolinas spread widespread rainfall across Middle Tennessee from February 18 into the early morning hours on February 19. The rain changed over to a wet snow across during the morning and afternoon hours on February 19 before ending during the evening. The heaviest snow fell across the northern Cumberland Plateau, where accumulations reached up to 5 inches. Davidson County emergency management reported up to 2 inches of total snow accumulation in the higher elevations of the county such as Oak Hill.	
173	Nashville	2-Mar-12	5:00 PM	hail	2.0	0	0	25m	0	Large hail up to 2 inches in diamter fell across much of central and southern Davidson County. Numerous rooms and cars were damaged by the up to 2 inch diameter hail stones.	

WINTER STORMS-9

#	Location	Historical Event	Time	Type	Magnitude (inches)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
174	Nashville	14-Jan-13								As a plume of moisture from the Gulf of Mexico streamed into Middle Tennessee during the afternoon through evening hours on Monday, January 14th, with sub-freezing temperatures near the surface across the mid state, ice accumulations due to freezing rainfall occurred, resulting in numerous automobile accidents and also a significant impact to commerce and transportation across the counties affected. Automobile accident reported at bridge near mile marker one on Interstate 440 East due to ice accumulation from freezing rain. This location was also near West End Avenue.	
175	Nashville	15-Jan-13	7:00 PM	ice storm	0.5	0	0	5	0	As a plume of moisture from the Gulf of Mexico continued streaming northeastward into Middle Tennessee during the afternoon hours on Tuesday, January 15th through the early morning hours on Wednesday, January 16th, and with surface temperatures near freezing, freezing rain that fell resulted in significant ice accumulations of between eight hundreths to one quarter of an inch for locations generally around and west of Interstate 65 through the Tennessee River Valley Region of Middle Tennessee. This resulted in a significant impact to commerce and transportation across this portion of the mid state, including several automobile accidents. Around five miles south of Nashville, about 0.25 of an inch of ice accumulation due to freezing rain occurred on trees and roads signs around the Oak Hill Area of the county. Large tree limbs were downed as well. This resulted in a significant impact to commerce and transportation in and around this area from the evening hours on Tuesday, January 15th through the early morning hours on Wednesday, January 16th. Also reported was that the road over Percy Priest Dam located in eastern Davidson County was also frozen over.	
176	Nashville	25-Jan-13		winter storm	0.2	0	0	25	0	As a surface trough developed across Middle Tennessee during the morning hours on Friday, January 25th, it became a focusing mechanism for feezing rain development. This precipitation intially began as freezing rain, transitioning to rain from southern portions of the mid state to northern portions as the mid morning hours progressed. Freezing rain left ice accumulations generally around one to two tenths of an inch, resulting in numerous automobile accidents along with several trees and power poles being downed. Vehicle accidents scattered around the county, primarily in northern and western parts, including Joelton, Goodlettsville, and a multiple vehicle pile up on Bull Run Rd, Total injury and property damage amounts unknown.	National Weather Service Forecast Office: Nashville, TN;
177	Nashville	31-Jan-13	9:00 PM	winter storm	0.5	0	0	0	0	As a low pressure system swept rapidly southeastward from the Ohio River Valley across the Tennessee Valley during the late evening hours on Thursday, January 31st, a band of snow showers quickly entered western and central portions of Middle Tennessee, as temperatures began falling into the 20s. This resulted in a significant impact to commerce and transportation across central portions of the mid state during the late evening hours. This event continued into the mid morning hours on Friday, February 1st. Total snowfall acumulation amounts of 0.25 to 0.50 inches across the Nashville Metropolitian area. This resulted in a significant impact to commerce and transportation across the Nashville Metropolitian area through the late evening hours.	
178	Nashville	2-Feb-13	4:00 AM	snow	1.0	0	0	0	0	Another round of snowfall moved into Middle Tennessee during the early morning hours of February 2 and spread across the area into the morning hours on February 3. Temperatures warmed above freezing and changed the snow over to rain across much of Middle Tennessee during the day on February 2, but the Cumberland Plateau area remained below freezing and no changeover occurred. Snowfall amounts up to 2 inches were reported in several area, with significant impacts to travel due to snow on roadways. NWS employees reported up to 1 inch of snow accumulation across Davidson County. This snow resulted in significant impacts to travel, with some roadways closed due to being snow covered and icy.	

WINTER STORMS-10

#	Location	Historical Event	Time	Type	Magnitude (inches)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
179	Nashville	7-Dec-13	9:00 PM	winter storm	.1-.5	0	1	10	0	Moisture overrunning a stalled frontal boundary created widespread freezing rain across the northwestern half of Middle Tennessee from the late evening hours on December 7 into the morning of December 8. Since much of the ice accumulation that occurred on December 6 did not melt, these additional ice accumulations resulted in widespread tree damage and power outages across parts of northwest Middle Tennessee. Davidson County Emergency Management estimated around 0.10 inches of ice accumulation across most of the county, with 0.25 to 0.50 inches of ice accumulation at elevations above 900 feet. Ice formed on several bridges and overpasses across the county, resulting in several vehicle accidents. Ice on the 3rd Avenue Bridge over Interstate 65 just north of downtown Nashville contributed to a one vehicle accident with one fatality. Several trees and power lines were also knocked down in areas above 900 feet across the county.	
180	Nashville	9-Dec-13	9:00 PM	winter storm	1.1	0	0	0	0	The third winter weather event in as many days affected Middle Tennessee from late evening on December 9 into the morning of December 10. Much of the southeastern half of Middle Tennessee experienced rain and some freezing rain, while parts of the northwestern half received a mix of rain, freezing rain, sleet, and snow. A narrow band of up to 1 inch of snow fell along a line from Lobelville to Nashville to Lafayette, causing numerous travel problems. Snowfall of 0.5 to 1.1 inches fell across Davidson County. CoCoRaHS snow measurements included 1.1 inches 5.2 miles west-southwest of Nashville, and 1.0 inches of snow 5.3 miles west-southwest of Belle Meade. Twitter reports indicated 0.5 inches of snow fell between Brentwood and Antioch. Snowfall combined with low temperatures in the 20s on the morning of December 10 to cause severe traffic congestion and numerous accidents throughout the Nashville metro area, with several interstates closed due to icy conditions.	National Weather Service Forecast Office: Nashville, TN;
181	Nashville	7-Feb-14	9:00 PM	winter storm	1.2	0	0	0	0	Light snow fell across much of northern Middle Tennessee from the late evening hours on February 7 into the morning hours on February 8. Up to 2 inches of snow was measured in northwest Middle Tennessee. CoCoRaHS and social media reports indicated up to one inch of snow fell in parts of Davidson County, especially the northern portions of the county and in higher elevations. CoCoRaHS station Joelton 1.6 N measured 1.0 inch of snow, and CoCoRaHS station Madison 1.2 WSW measured 0.5 inches of snow. 0.5 inches of snow was also reported in Whites Creek via Facebook.	
182	Nashville	2-Mar-14	7:00 PM	winter storm	0.3	0	0	0	0	As a low pressure system approached and moved across Middle Tennessee from Friday, March 1st through Saturday, March 2nd, significant accumulating snowfalls amounts occurred across several counties. These snowfall accumulations resulted in a significant impact to commerce and transportation across these counties. One half of an inch of total snowfall accumulation occurred in Belle Meade. Up to a quarter inch of ice accumulation was reported across Davidson County. Around 9000 customers were without power due to the ice.	
183	Nashville	1/23/2015	1800	Winter Weather	1	0	0	0	0	Snow amounts up to 1.0 inch were reported across Davidson County. 1.0 inch of snow was measured 4.2 miles southeast of Hermitage, and 0.7 inches of snow was measured 1.5 miles west of Goodlettsville.	

WINTER STORMS-11

#	Location	Historical Event	Time	Type	Magnitude (inches)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
184	Nashville	2/16/2015	0	Winter Storm	2	0	0	250000	0	Precipitation totals across Davidson County ranged from 1 of combined ice and sleet in southern portions of the county to 2 of combined ice, sleet, and snow in northern areas. A CoCoRaHS observer 2.8 miles NE of Brentwood measured 1.5 of combined ice and sleet, and another CoCoRaHS observer 4.2 miles N of Belle Meade measured 1 of combined ice and sleet. Numerous trees and power lines were knocked down across the county, and many roads and schools were closed.	National Weather Service Forecast Office: Nashville, TN;
185	Nashville	2/18/2015	100	Winter Weather	1.8	0	0	0	0	Snow amounts up to 2 inches were reported across Davidson County. A CoCoRaHS observer measured 1.8 inches of snow 6.4 miles E of Nashville, and another CoCoRaHS observer measured 0.4 inches of snow 1.6 miles WNW of Berry Hill.	
186	Nashville	2/20/2015	1200	Winter Storm	0.5	0	0	50000	0	Snow and sleet accumulations up to 0.5 fell during the late afternoon on February 20, followed by freezing rain with ice accumulations around 0.25 from the evening on February 20 into the early morning hours on February 21. The ASOS at Nashville International Airport measured 0.12 of ice accumulation before precipitation changed to rain. A few trees and power lines were knocked down across the county.	
187	Nashville	2/25/2015	1200	Winter Weather	1	0	0	0	0	Snow amounts up to 1 inch were reported across Davidson County. A CoCoRaHS observer measured 1.0 inches of snow 1.5 miles W of Goodlettsville, and another CoCoRaHS observer measured 0.5 inches of snow 1.2 miles ESE of Belle Meade.	
188	Nashville	3/4/2015	1500	Winter Storm	3.5	0	0	0	0	Precipitation totals across Davidson County ranged from 2 to 4 of combined sleet and snow. A CoCoRaHS observer measured 3.5 inches of snow 4.2 miles N of Belle Meade, and another CoCoRaHS observer measured 2.0 inches of combined sleet and snow 4.2 miles SE of Hermitage.	
189	Nashville	1/20/2016	0	Winter Weather	1	0	0	0	0	A mix of light sleet, freezing rain, and snow fell across Davidson County. Media reports indicated 1/5 of an inch of ice accumulated on elevated surfaces and roads in Forest Hills. A COOP station 7 miles WNW of Goodlettsville measured 1 inch of combined snow, sleet, and freezing rain, while CoCoRaHS station Goodlettsville 1.5 W measured 0.5 inches of snow.	
190	Nashville	1/21/2016	2100	Winter Storm	10	0	0	0	0	Snow totals between 5 and 10 inches were measured across Davidson County. A COOP observer in Joelton measured 10 inches of snow, while the official observer at Nashville International Airport measured 8 inches of snow. An NWS employee 1 mile east of Hermitage measured 6.1 inches of snow, CoCoRaHS station Antioch 4.3 ENE measured 6 inches of snow, and CoCoRaHS station Belle Meade 5.3 WSW measured 5.5 inches of snow.	
191	Nashville	2/8/2016	1200	Winter Weather	2.7	0	0	0	0	Snow amounts of 1 to 3 inches were measured across Davidson County. Nashville International Airport measured 2.7 inches of snow. CoCoRaHS station Belle Meade 1.2 ESE measured 2.2 inches of snow, while CoCoRaHS station Antioch 4.3 ENE measured 1.2 inches of snow.	
192	Nashville	2/10/2016	1900	Winter Weather	1	0	0	0	0	Snow amounts up to 1 inch were measured across Davidson County. CoCoRaHS station Hermitage 2.6 E measured 0.7 inches of snow. Nashville International Airport measured 0.4 inches of snow.	
193	Nashville	2/14/2016	700	Winter Weather	0.25	0	0	0	0	Sleet amounts of up to 1/4 inch fell across northern and eastern Davidson County. TV media and social media reports indicated numerous wrecks on I-24, I-65, I-40, and Briley Parkway in the northern and eastern parts of Davidson County.	
194	Nashville	1/6/2017	600	Winter Weather	1.5	0	0	0	0	Several reports across the county indicated that 0.5 to 1.5 inches of snow fell with highest amounts in the southwest part of the county.	
195	Nashville	3/11/2017	0	Winter Weather	2.5	0	0	0	0	Total snow amounts across Davidson County ranged from 1.0 to 2.5 inches. A tSpotter Twitter report indicated 2.5 inches of snow fell in Bellevue, and another tSpotter Twitter report indicated 2.5 inches of snow fell in Berry Hill. A NWS employee measured 1.6 inches of snow 1 mile east of Hermitage, and another tSpotter Twitter report indicated 1.0 inch of snow fell in Goodlettsville.	

WINTER STORMS-12

#	Location	Historical Event	Time	Type	Magnitude (inches)	Death (#)	Injury (#)	Property Damage (in $1000)	Crop Damage (in $1000)	Comment	Source of Information
196	Nashville	1/12/2018	0	Winter Weather	2	0	0	0	0	CoCoRaHS, COOP, and ASOS reported indicated up to 2 inches of snow fell across Davidson County. 1.6 inches of snow was measured 1 mile west of Goodlettsville, 1 inch of snow was reported 1 mile northeast of Forest Hills, 0.8 inches of snow was measured in Belle Meade, 0.6 inches of snow was measured at the Nashville International Airport, and 0.5 inches of snow was reported 6 miles south of Lakewood.	National Weather Service Forecast Office: Nashville, TN;
197	Nashville	1/15/2018	2100	Winter Weather	3	0	0	0	0	NWS employees, airport reports, CoCoRaHS measurements and social media indicated 1.5 to around 3 inches of snow fell across Davidson County. An NWS employee measured 3.0 inches of snow 2.5 miles southeast of Hermitage, and the Nashville International Airport officially reported 1.8 inches of snow. CoCoRaHS station Belle Meade 1.2 ESE measured 3.3 inches of snow, CoCoRaHS station Brentwood 2.8 NNE measured 3.0 inches of snow, CoCoRaHS station Antioch 4.3 ENE measured 2.5 inches of snow, CoCoRaHS station Madison 1.2 WSW measured 2.2 inches of snow, and CoCoRaHS station Goodlettsville 1.5 W measured 2.0 inches of snow.	
198	Nashville	3/8/2018	0	Winter Weather	0.5	0	0	0	0	Up to one half inch of snow was measured across Davidson County. CoCoRaHS station Belle Meade 0.4 W measured 0.5 inches of snow.	
199	Nashville	3/12/2018	0	Winter Weather	1.5	0	0	0	0	Up to one and a half inches of snow fell across Davidson County. A Facebook report estimated 1.5 inches of snow fell in Joelton, and CoCoRaHS station Goodlettsville 1.5 W measured 0.8 inches of snow.	
200	Nashville	12/8/2018	1900	Winter Weather	0.1	0	0	0	0	Ice accumulations up to one-tenth of an inch were estimated across extreme northern Davidson County. Social media reports indicated light icing occurred on trees and other elevated surfaces in the Joelton area.	
201	Nashville	1/19/2019	1800	Winter Weather	0.5	0	0	0	0	Social media and CoCoRaHS reports indicated up to 0.5 inches of snow fell across Davidson County. Facebook and Twitter reports indicated 1 inch of snow fell in Joelton. CoCoRaHS station Goodlettsville 1.5 W measured 0.5 inches of snow, and CoCoRaHS station Belle Meade 0.4 W measured 0.5 inches of snow.	
202	Nashville	1/30/2019	200	Winter Weather	0.5	0	0	0	0	CoCoRaHS reports indicated up to 0.5 inches of snow fell across Davidson County. CoCoRaHS station Nashville 5.2 S measured 0.5 inches of snow, and the Nashville International Airport ASOS measured 0.3 inches of snow.	

Note: Hail is reported under Winter Storms since the National Weather Service records hail as part of their annual snowfall totals.

WINTER STORMS-13

Multi-Hazard Mitigation Plan
Appendix C - Maps

This appendix contains maps of various areas. The main maps are for the repetitive loss areas identified and investigated in the Metropolitan Nashville-Davidson County area located on the corresponding streams.

Flooding – Repetitive Loss Maps

Miscellaneous Maps

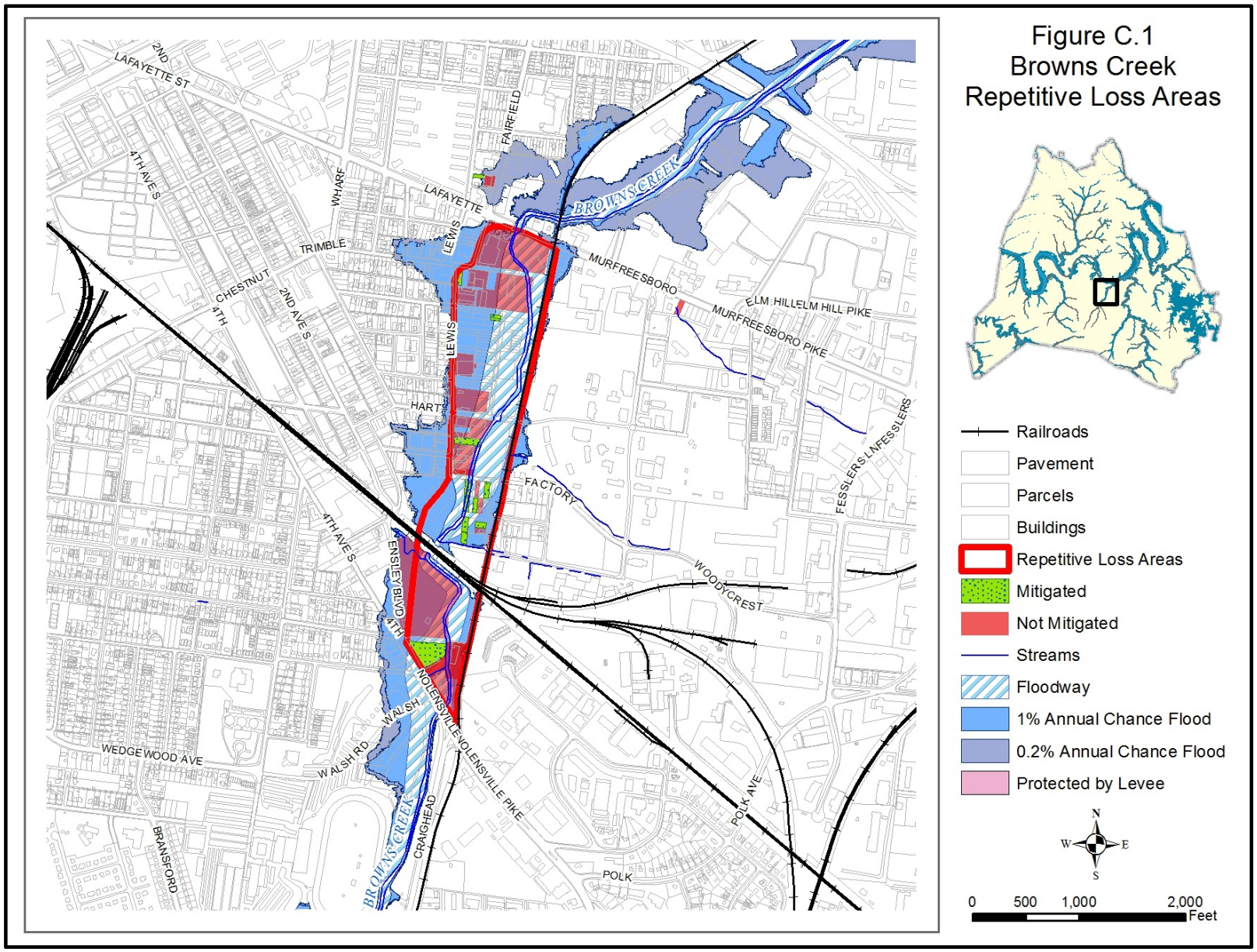


Figure C.1
Browns Creek
Repetitive Loss Areas
2ND
LAFAYETTE ST
4TH AVE S
WHARF
FAIRFIELD
LAFAYETTE
BROWNS CREEK
LEWIS
TRIMBLE
MURFREESBORO
ELM HILL
ELM HILL PIKE
MURFREESBORO PIKE
CHESTNUT
4TH
2ND AVE S
LEWIS
HART
FESSLERS LN
FESSLERS
FACTORY
4TH AVE S
ENSLEY BLVD
WOODYCREST
4TH
WALSH
NOLENSVILLE
NOLENSVILLE PIKE
WEDGEWOOD AVE
WALSH RD
POLK AVE
BRANSFORD
BROWNS CREEK
CRAIGHEAD
POLK
Railroads
Pavement
Parcels
Buildings
Repetitive Loss Areas
Mitigated
Not Mitigated
Streams
Floodway
1% Annual Chance Flood
0.2% Annual Chance Flood
Protected by Levee
N
W
E
S
0
500
1,000
2,000
Feet

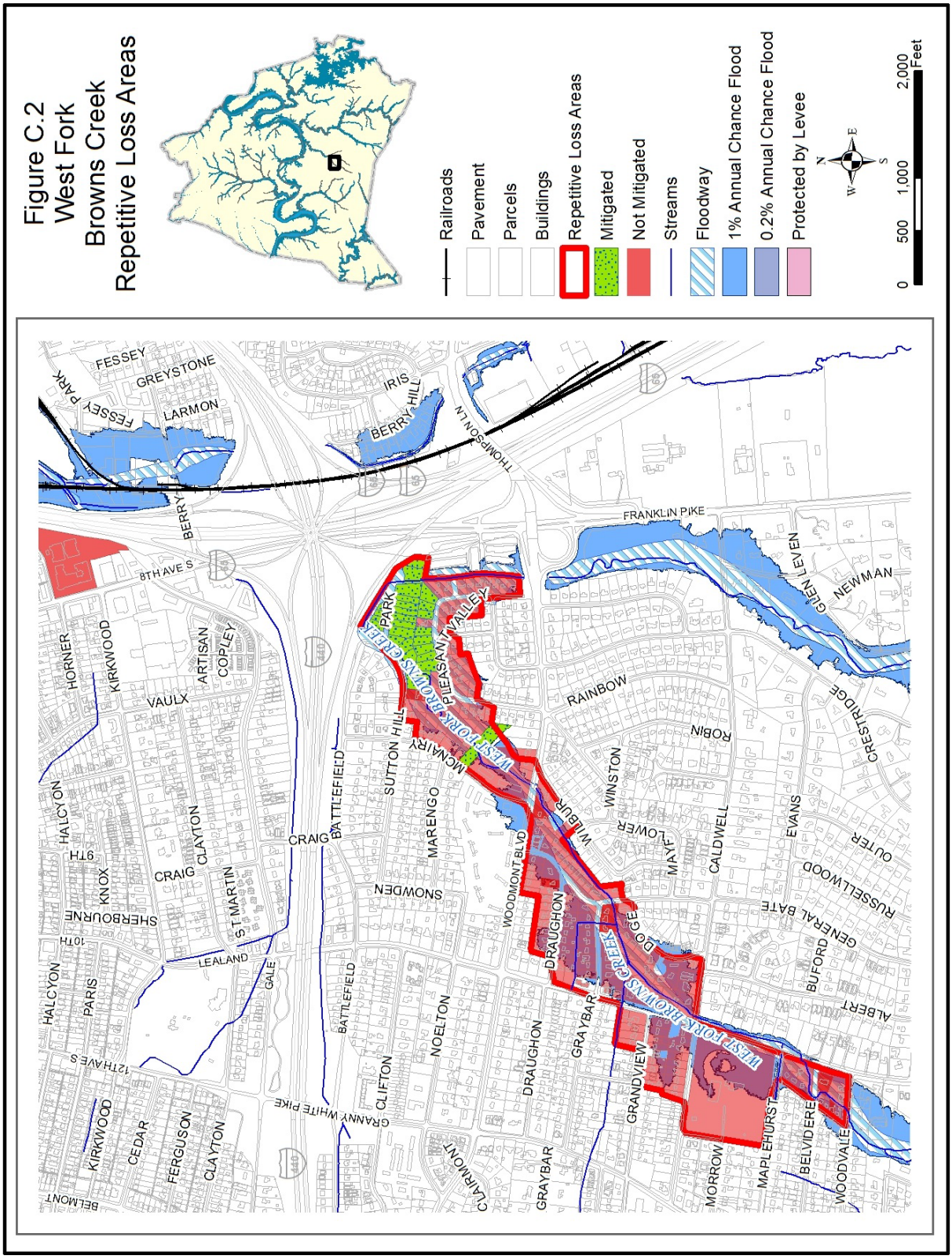


Figure C.2
West Fork
Browns Creek
Repetitive Loss Areas
Railroads
Pavement
Parcels
Buildings
Repetitive Loss Areas
Mitigated
Not Mitigated
Streams
Floodway
1% Annual Chance Flood
0.2% Annual Chance Flood
Protected by Levee
0
500
1,000
2,000
Feet
FESSEY
GREYSTONE
FESSEY PARK
LARMON
IRIS
BERRY HILL
THOMPSON LN
BERRY
FRANKLIN PIKE
8TH AVE S
PARK
PLEASANT VALLEY
GLENELEVEN
NEWMAN
HORNER
KIRKWOOD
ARTISAN
COPLEY
VAULX
RAINBOW
ROBIN
CRESTRIDGE
HALCYON
CRAIG
BATTLEFIELD
SUTTON HILL
MCNAIRY
WINSTON
LOWER
MAYF
CALDWELL
EVANS
OUTER
RUSSELLWOOD
GENERAL BATE
BUFORD
ALBERT
9TH
KNOX
SHERBOURNE
ST MARTIN
CLAYTON
MARENGO
SNOWDEN
WOODMONT BLVD
DRAUGHON
WILBUR
10TH
LEALAND
GALE
PARIS
HALCYON
NOELTON
CLIFTON
GRANNY WHITE PIKE
GRAYBAR
GRANDVIEW
MORROW
MAPLEHURST
BELVIDERE
WOODVALE
12TH AVE S
KIRKWOOD
CEDAR
FERGUSON
CLAYTON
BELMONT
LAURIMONT
WEST FORK BROWNS CREEK

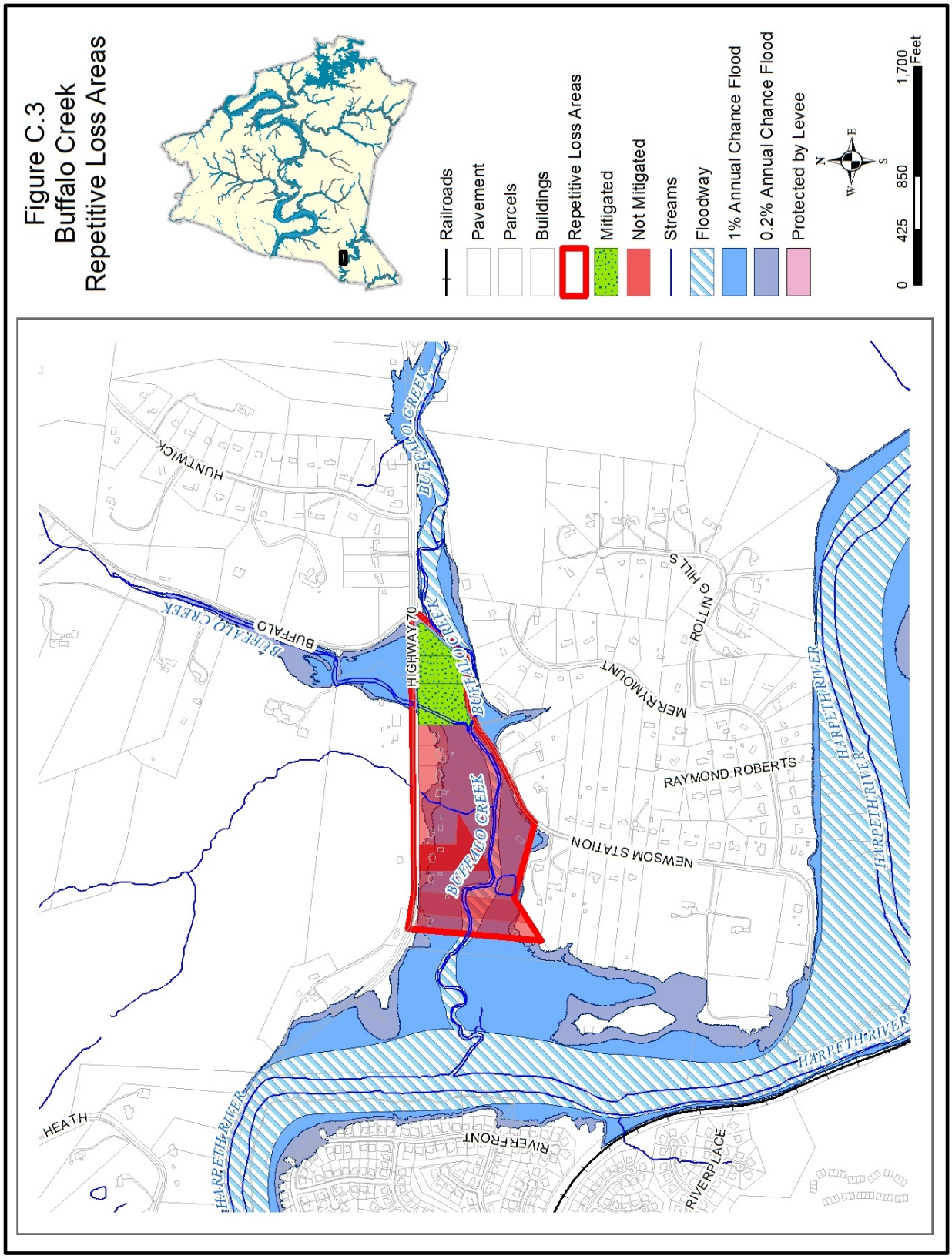
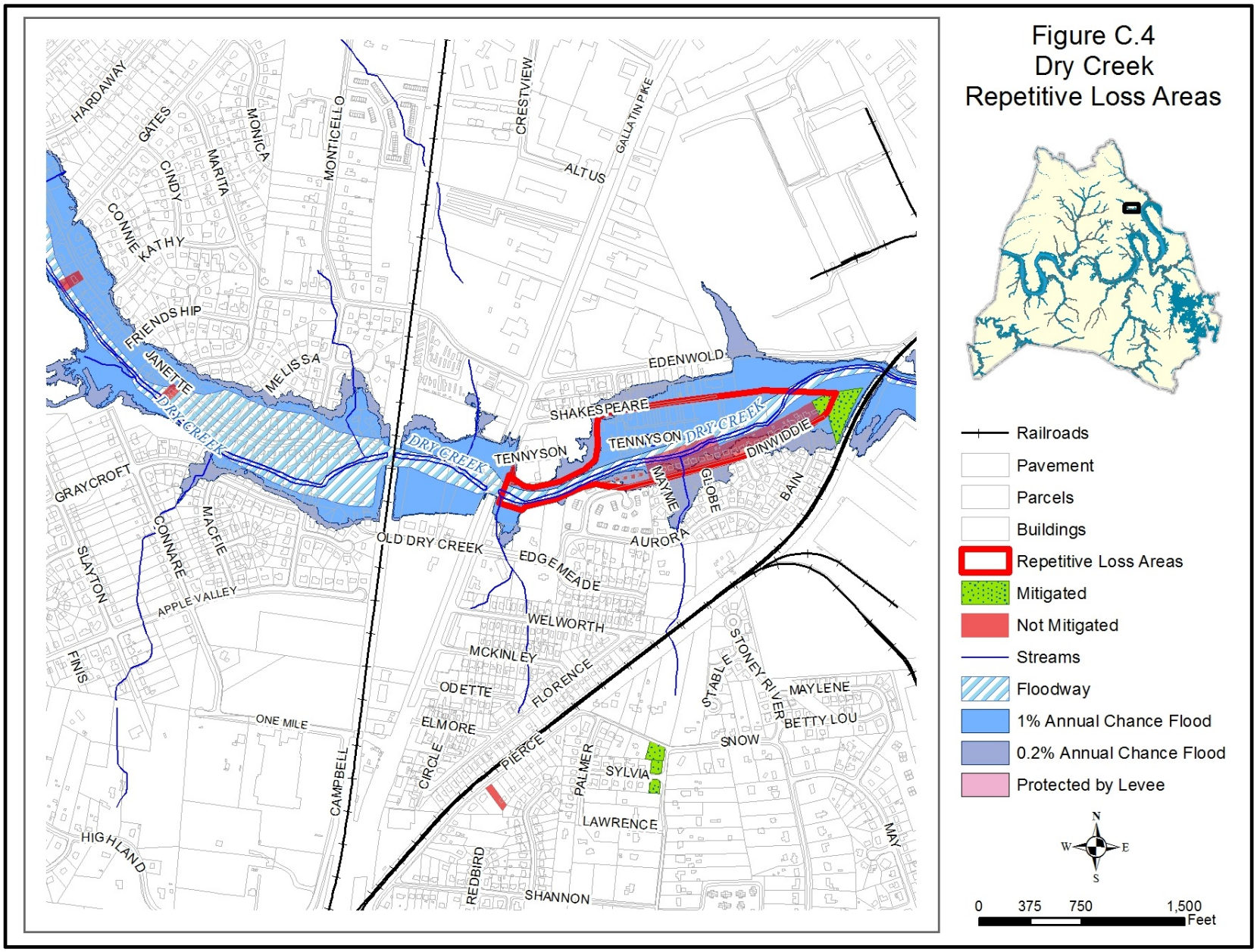


Figure C.3
Buffalo Creek
Repetitive Loss Areas
Railroads
Pavement
Parcels
Buildings
Repetitive Loss Areas
Mitigated
Not Mitigated
Streams
Floodway
1% Annual Chance Flood
0.2% Annual Chance Flood
Protected by Levee
0
425
850
1,700
Feet
N
E
S
W
HUNTWICK
BUFFALO CREEK
BUFFALO
HIGHWAY 70
ROLLING HILLS
MERRYMOUNT
RAYMOND ROBERTS
NEWSOM STATION
HARPETH RIVER
HEATH
RIVERFRONT
RIVERPLACE


HARDAWAY
GATES
CINDY
MARITA
MONICA
MONTICELLO
CRESTVIEW
ALTUS
GALLATIN PIKE
CONNIE
KATHY
FRIENDSHIP
JANETTE
DRY CREEK
MELISSA
EDENWOLD
SHAKESPEARE
TENNYSON
DRY CREEK
DINWIDDIE
GRAYCROFT
MACFIE
CONNARE
SLAYTON
APPLE VALLEY
OLD DRY CREEK
EDGEMEADE
AURORA
MAYME
GLOBE
BAIN
WELWORTH
MCKINLEY
FLORENCE
ODETTE
ELMORE
FINIS
ONE MILE
CAMPBELL
CIRCLE
PIERCE
PALMER
SYLVIA
STONEY RIVER
STABLE
MAYLENE
BETTY LOU
SNOW
LAWRENCE
HIGHLAND
REDBIRD
SHANNON
MAY
Figure C.4
Dry Creek
Repetitive Loss Areas
Railroads
Pavement
Parcels
Buildings
Repetitive Loss Areas
Mitigated
Not Mitigated
Streams
Floodway
1% Annual Chance Flood
0.2% Annual Chance Flood
Protected by Levee
N
W
E
S
0
375
750
1,500
Feet

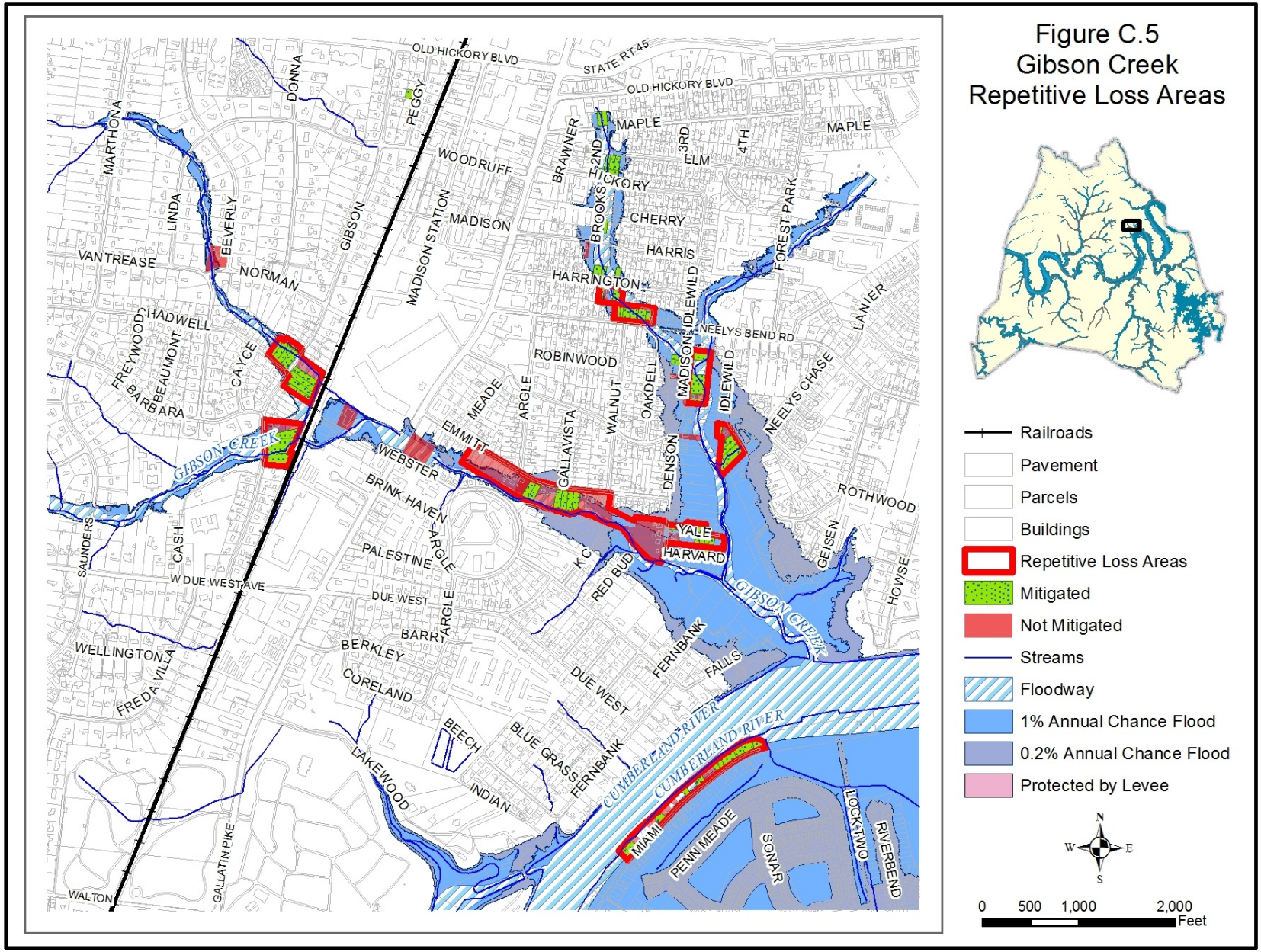


Figure C.5
Gibson Creek
Repetitive Loss Areas

- Railroads
- Pavement
- Parcels
- Buildings
- Repetitive Loss Areas
- Mitigated
- Not Mitigated
- Streams
- Floodway
- 1% Annual Chance Flood
- 0.2% Annual Chance Flood
- Protected by Levee

N
W E
S

0 500 1,000 2,000
Feet

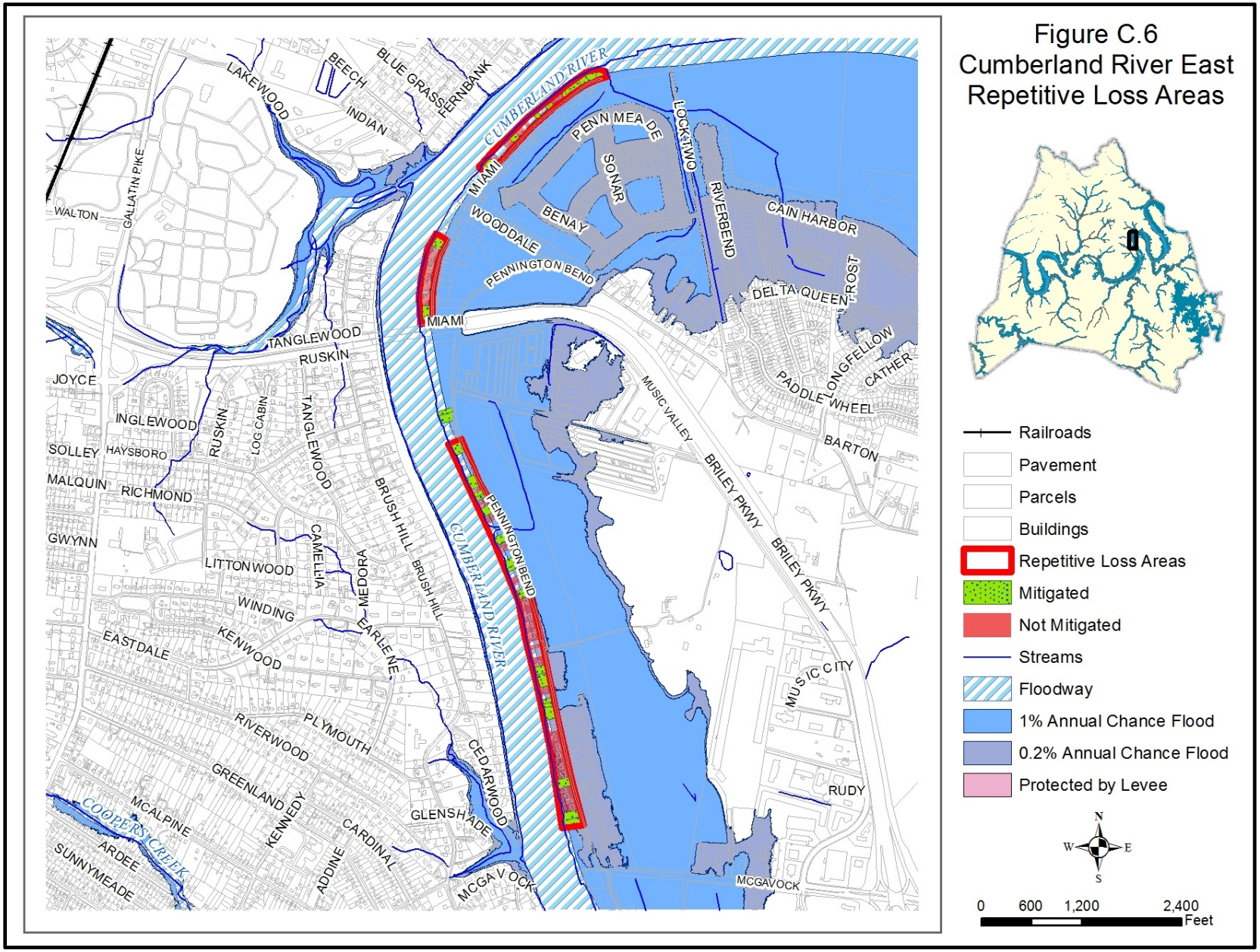


Figure C.6
Cumberland River East
Repetitive Loss Areas

- Railroads
- Pavement
- Parcels
- Buildings
- Repetitive Loss Areas
- Mitigated
- Not Mitigated
- Streams
- Floodway
- 1% Annual Chance Flood
- 0.2% Annual Chance Flood
- Protected by Levee

N
W E
S

0 600 1,200 2,400
Feet

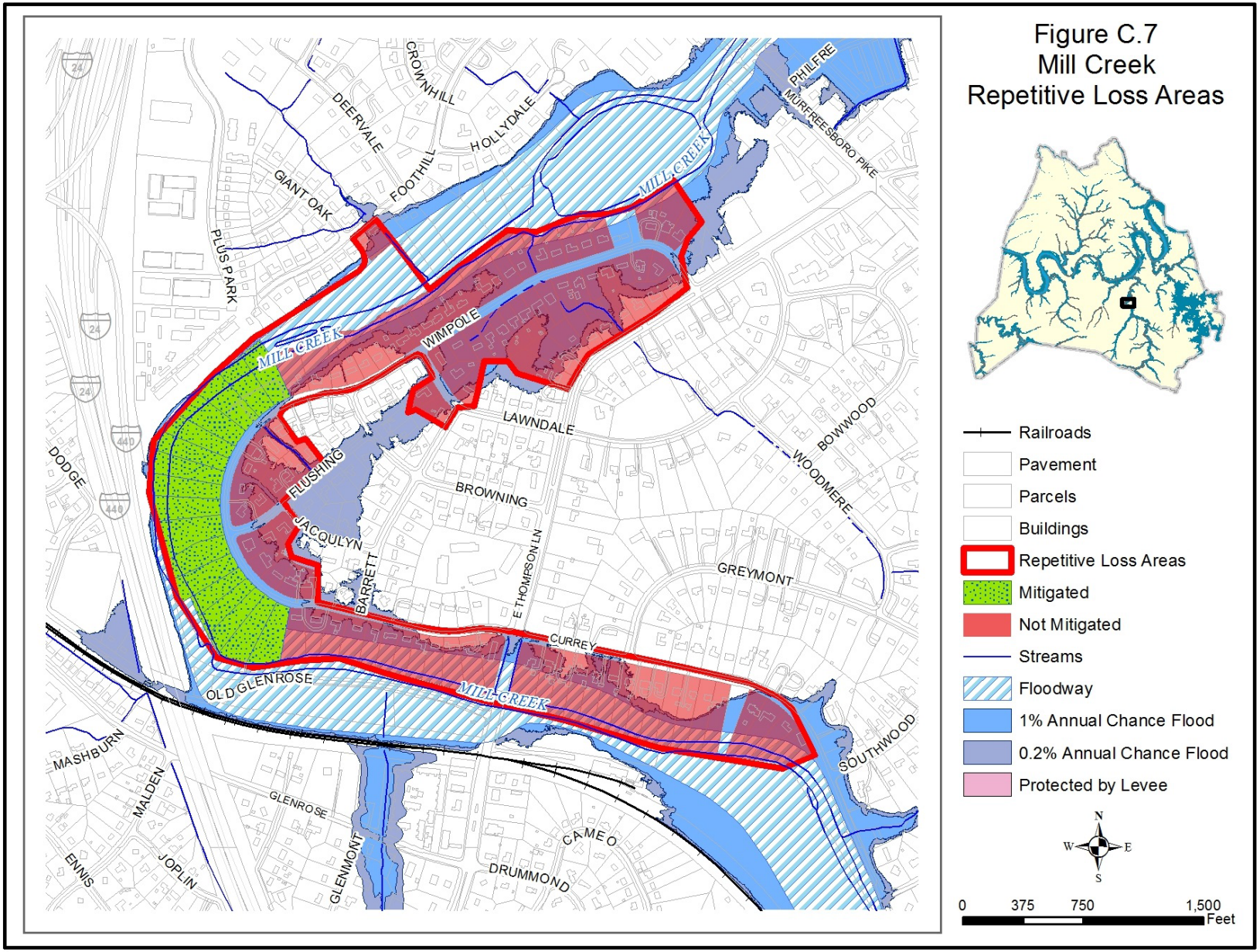
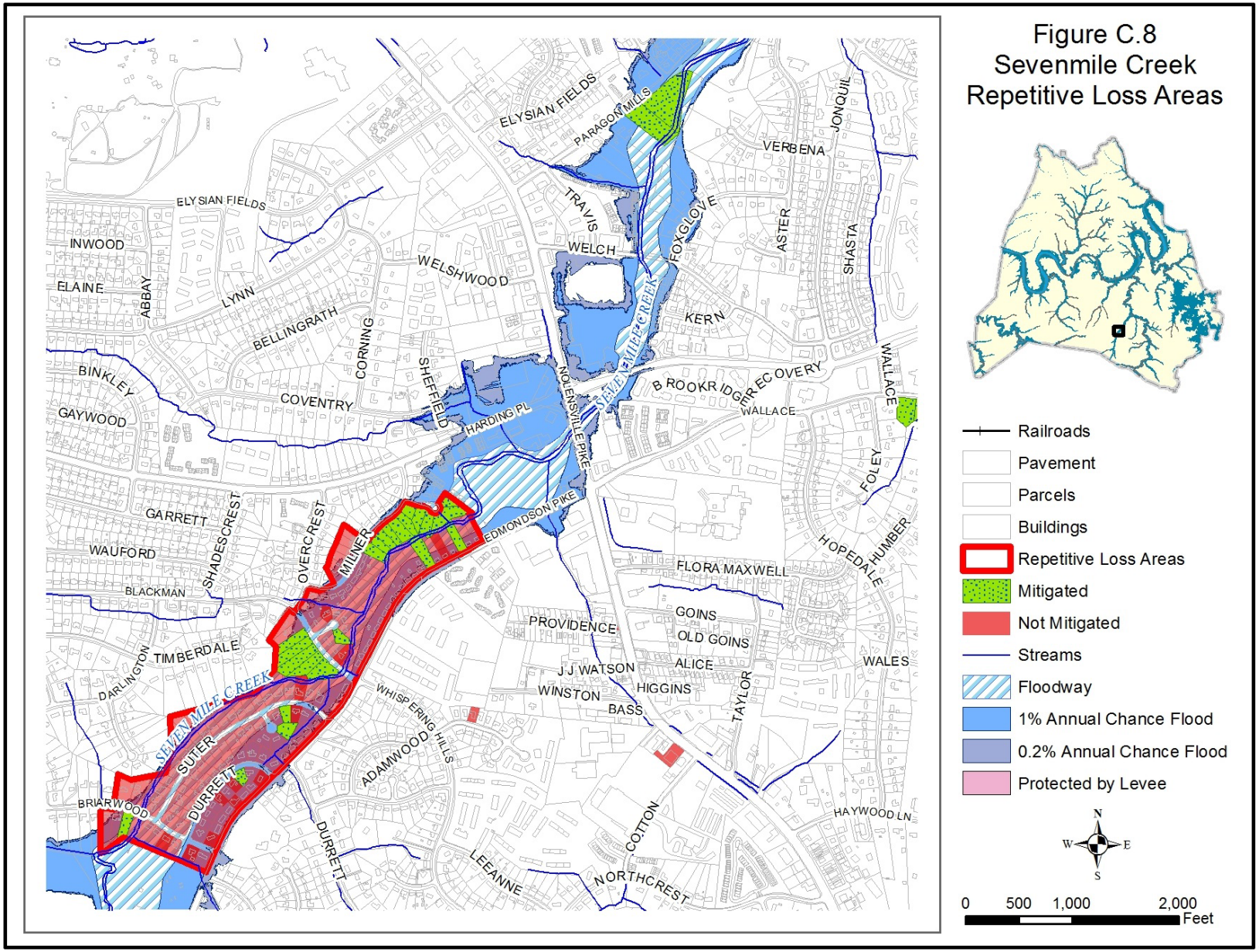


Figure C.7
Mill Creek
Repetitive Loss Areas
MILL CREEK
WIMPOLE
LAWNDALE
BROWNING
FLUSHING
JACQULYN
BARRETT
E THOMPSON LN
CURREY
GREYMONT
BOWWOOD
WOODMERE
SOUTHWOOD
OLD GLENROSE
GLENROSE
MASHBURN
MALDEN
ENNIS
JOPLIN
GLENMONT
DRUMMOND
CAMEO
DODGE
PLUS PARK
GIANT OAK
DEERVALE
FOOTHILL
CROWNHILL
HOLLYDALE
MURFREESBORO PIKE
PHILFRE
Railroads
Pavement
Parcels
Buildings
Repetitive Loss Areas
Mitigated
Not Mitigated
Streams
Floodway
1% Annual Chance Flood
0.2% Annual Chance Flood
Protected by Levee
N
W
E
S
0
375
750
1,500
Feet


ELYSIAN FIELDS
PARAGON MILLS
JONQUIL
VERBENA
TRAVIS
FOXGLOVE
ASTER
SHASTA
WELCH
INWOOD
ELAINE
ABBAY
LYNN
WELSHWOOD
BELLINGRATH
CORNING
KERN
SEVENMILE CREEK
BINKLEY
SHEFFIELD
NOLENSVILLE PIKE
B ROOKR IDGE RECOVERY
WALLACE
COVENTRY
GAYWOOD
HARDING PL
FOLEY
GARRETT
SHADESCREST
OVERCREST
MILLNER
EDMONDSON PIKE
HOPEDALE
HUMBER
WAUFORD
FLORA MAXWELL
BLACKMAN
PROVIDENCE
GOINS
OLD GOINS
TIMBERDALE
DARLINGTON
ALICE
WALES
J J WATSON
WINSTON
HIGGINS
BASS
TAYLOR
WHISPERING HILLS
SEVENMILE CREEK
SUTER
DURRETT
ADAMWOOD HILLS
BRIARWOOD
COTTON
HAYWOOD LN
LEEANNE
NORTHCREST
Figure C.8
Sevenmile Creek
Repetitive Loss Areas
Railroads
Pavement
Parcels
Buildings
Repetitive Loss Areas
Mitigated
Not Mitigated
Streams
Floodway
1% Annual Chance Flood
0.2% Annual Chance Flood
Protected by Levee
N
W
E
S
0
500
1,000
2,000
Feet

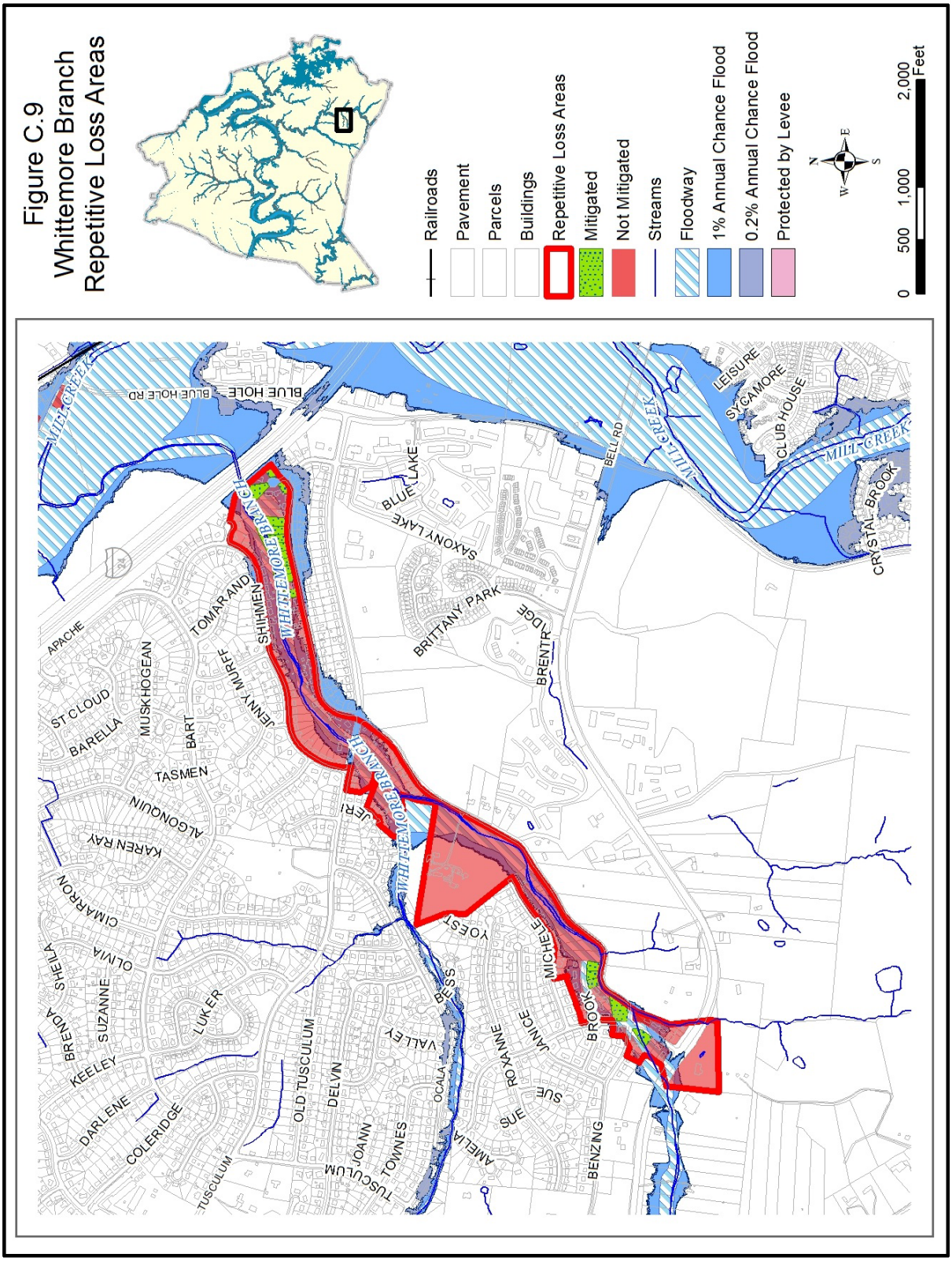


Figure C.9
Whittemore Branch
Repetitive Loss Areas
Railroads
Pavement
Parcels
Buildings
Repetitive Loss Areas
Mitigated
Not Mitigated
Streams
Floodway
1% Annual Chance Flood
0.2% Annual Chance Flood
Protected by Levee
0
500
1,000
2,000
Feet
N
E
S
W
MILL CREEK
BLUE HOLE
BLUE HOLE RD
BELL RD
LEISURE
SYCAMORE
CLUB HOUSE
CRYSTAL BROOK
BLUE LAKE
SAXONY LAKE
BRITTANY PARK
BRENTRIDGE
WHITTEMORE BRANCH
APACHE
TOMARAND
SHIHMEN
JENNY WIURFF
ST CLOUD
BARELLA
MUSKHOGEAN
BART
TASMEN
ALGONQUIN
KAREN RAY
CIMARRON
OLIVIA
SHEILA
BRENDA
SUZANNE
KEELEY
DARLENE
COLERIDGE
TUSCULUM
LUKER
OLD TUSCULUM
DELVIN
JOANN
TOWNES
TUSCULUM
OCALA
VALLEY
BESS
YOEST
MICHELE
ROXANNE
VANCE
SUE
AMELIA
BROOK
BENZING

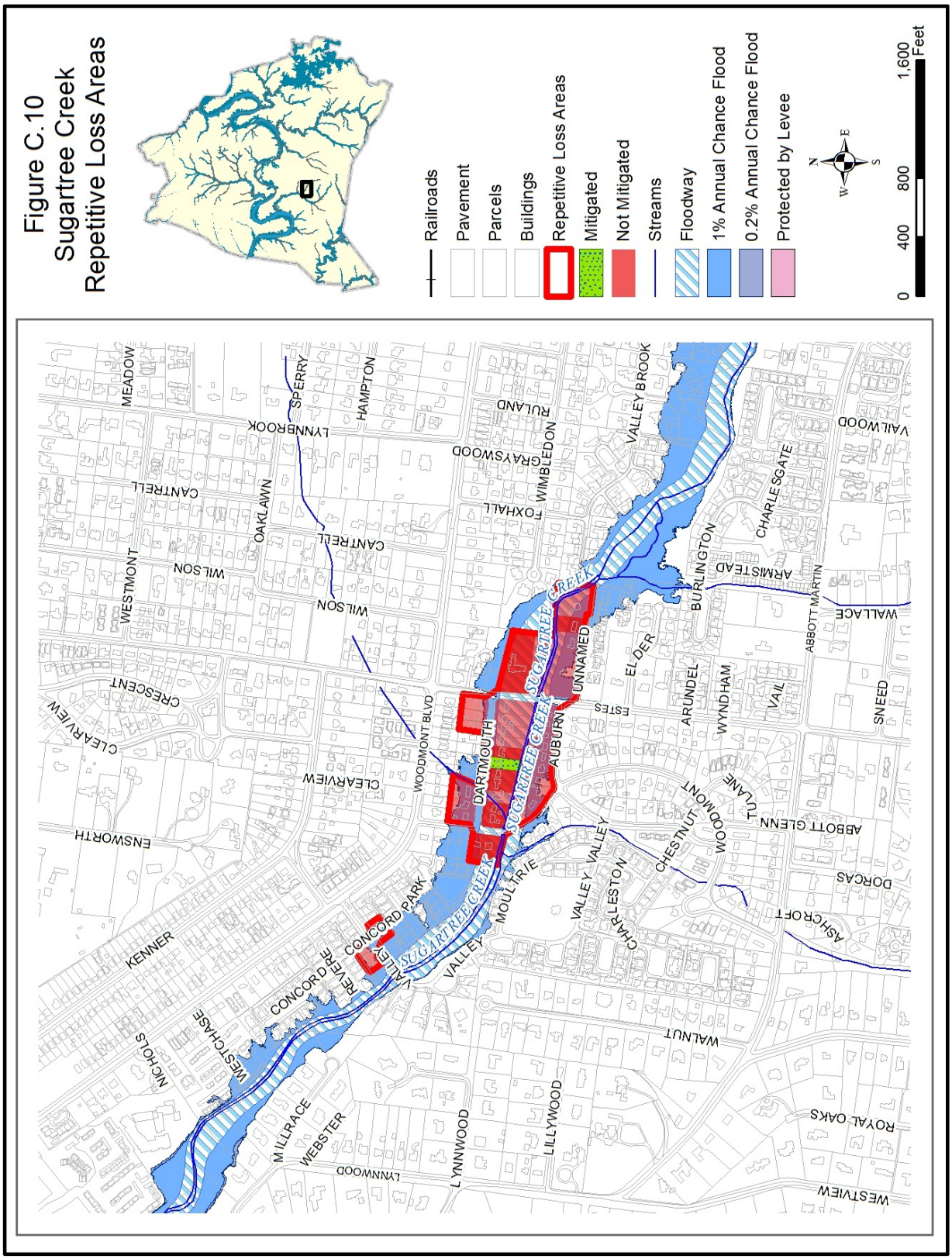


Figure C.10
Sugartree Creek
Repetitive Loss Areas
Railroads
Pavement
Parcels
Buildings
Repetitive Loss Areas
Mitigated
Not Mitigated
Streams
Floodway
1% Annual Chance Flood
0.2% Annual Chance Flood
Protected by Levee
0
400
800
1,600
Feet
SUGARTREE CREEK
MEADOW
SPERRY
HAMPTON
LYNNBROOK
RULAND
VALLEY BROOK
VAILWOOD
GRAYSWOOD
WIMBLEDON
CANTRELL
OAKLAWN
FOXHALL
CHARLESGATE
WESTMONT
WILSON
BURLINGTON
ARMISTEAD
WALLACE
ABBOTT MARTIN
CRESCENT
CLEARVIEW
WOODMONT BLVD
DARTMOUTH
AUBURN
UNNAMED
ELDER
ESTES
ARUNDEL
WYNDHAM
VAIL
SNEED
ENSWORTH
CHESTNUT
WOODMONT
TULANE
ABBOTT GLENN
DORCAS
ASHCROFT
KENNER
CONCORD PARK
CONCORD RD
VALLEY
MOULTRIE
CHARLESTON
NICHOLS
WESTCHASE
WALNUT
ROYAL OAKS
MILLRACE
WEBSTER
LYNNWOOD
LILLYWOOD
WESTVIEW

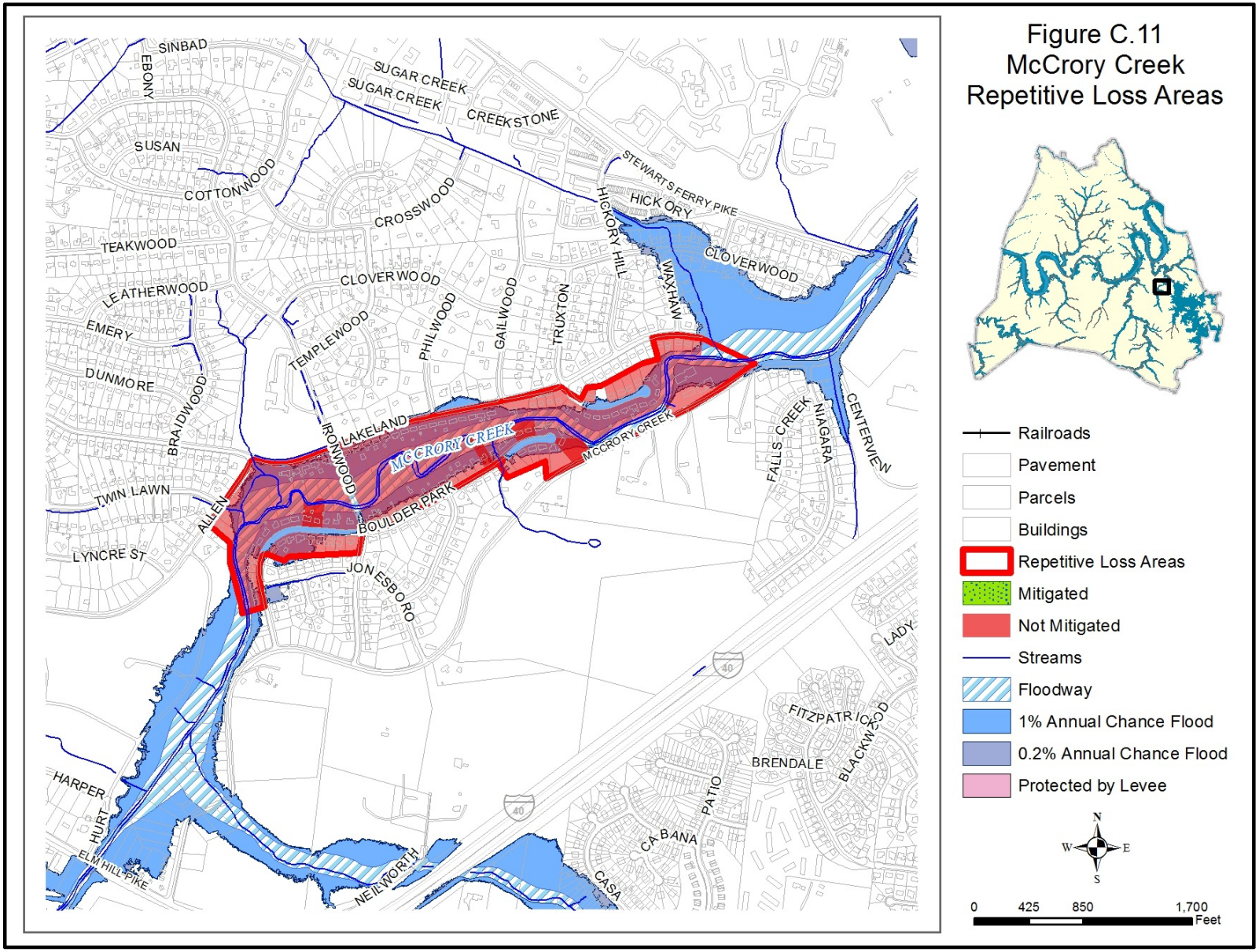


Figure C.11
McCrory Creek
Repetitive Loss Areas

- Railroads
- Pavement
- Parcels
- Buildings
- Repetitive Loss Areas
- Mitigated
- Not Mitigated
- Streams
- Floodway
- 1% Annual Chance Flood
- 0.2% Annual Chance Flood
- Protected by Levee

N
W E
S

0 425 850 1,700
Feet

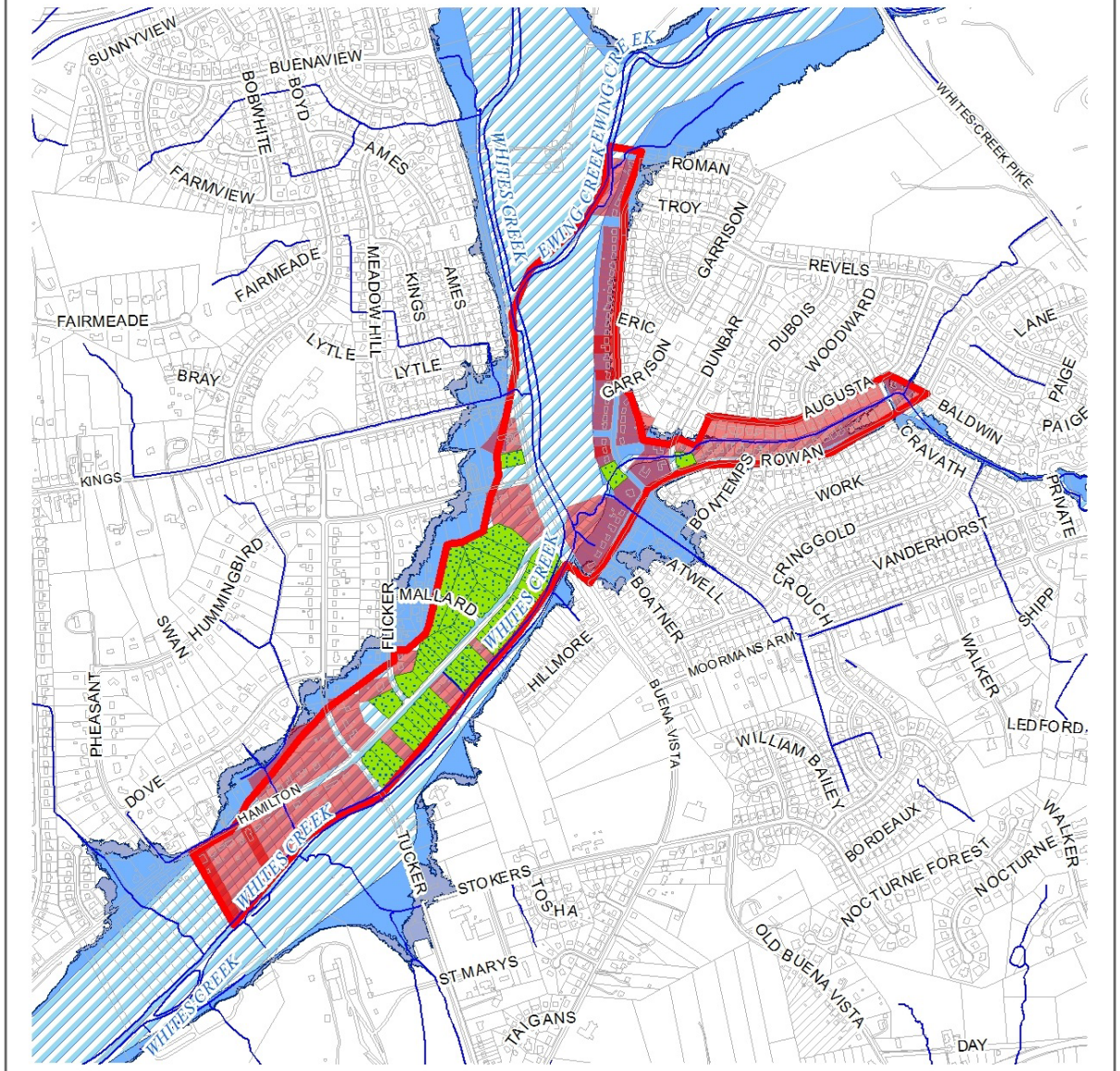
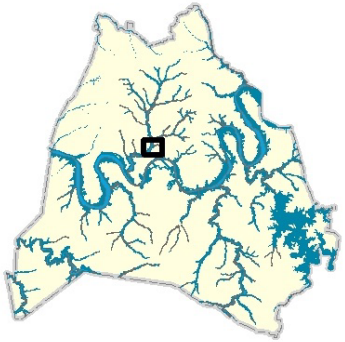


Figure C.12
Whites Creek
Repetitive Loss Area



- Railroads
- Pavement
- Parcels
- Buildings
- Repetitive Loss Areas
- Mitigated
- Not Mitigated
- Streams
- Floodway
- 1% Annual Chance Flood
- 0.2% Annual Chance Flood
- Protected by Levee

N
W E
S

0 500 1,000 2,000
Feet

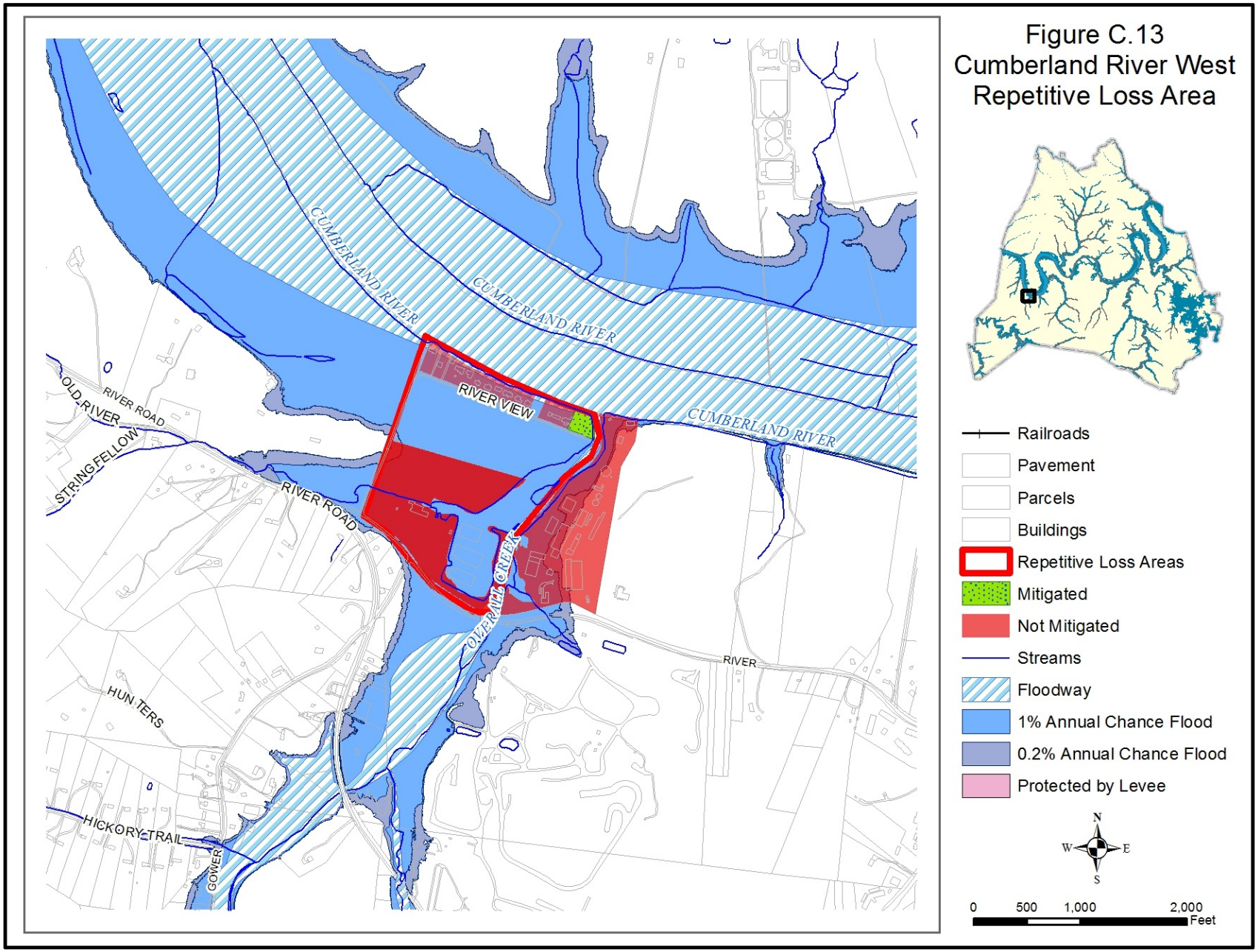


Figure C.13
Cumberland River West
Repetitive Loss Area

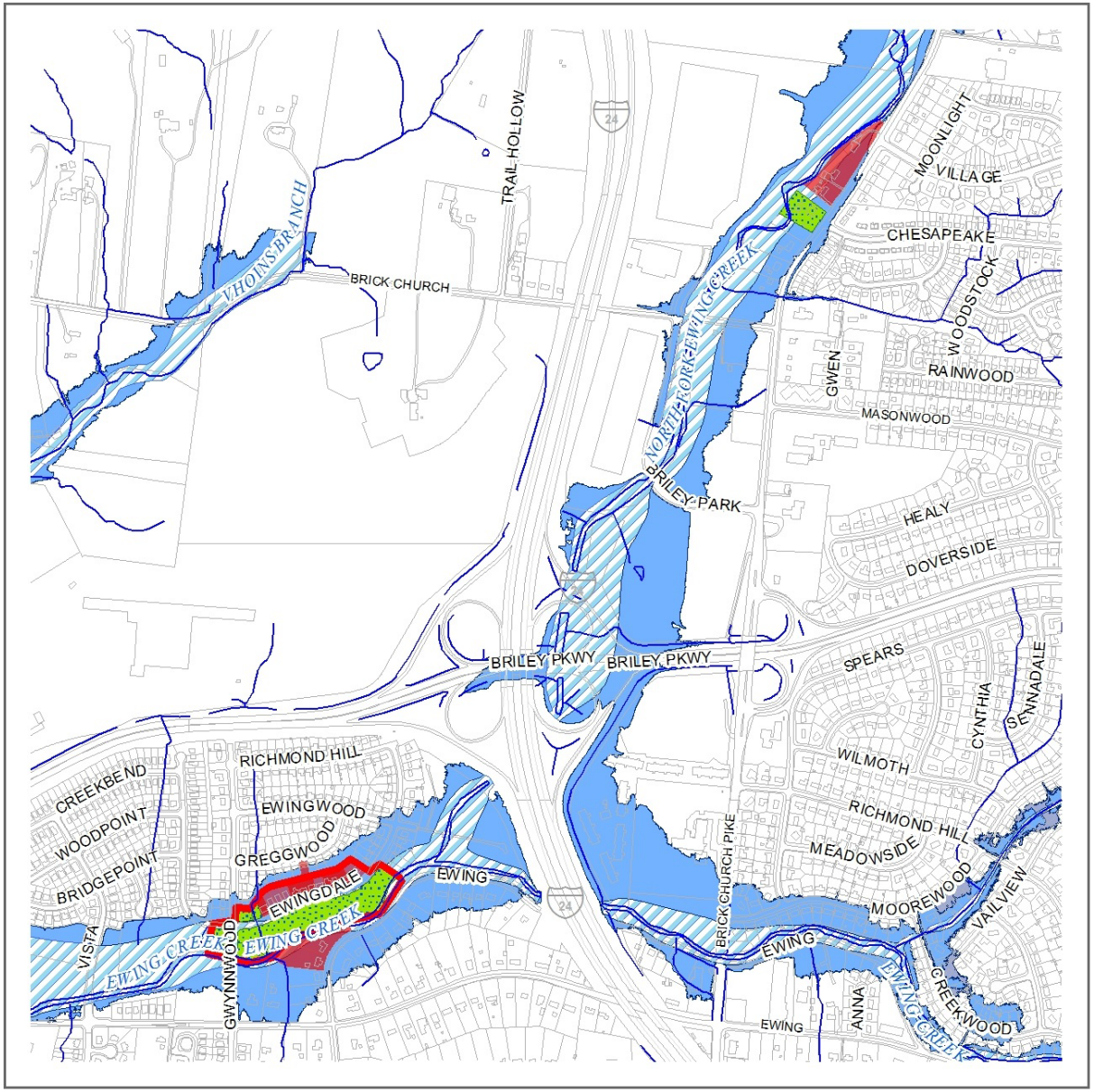
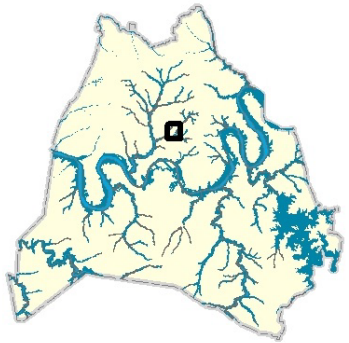


Figure C.14
Ewing Creek
Repetitive Loss Area



- Railroads
- Pavement
- Parcels
- Buildings
- Repetitive Loss Areas
- Mitigated
- Not Mitigated
- Streams
- Floodway
- 1% Annual Chance Flood
- 0.2% Annual Chance Flood
- Protected by Levee

N
W E
S

0 425 850 1,700
Feet

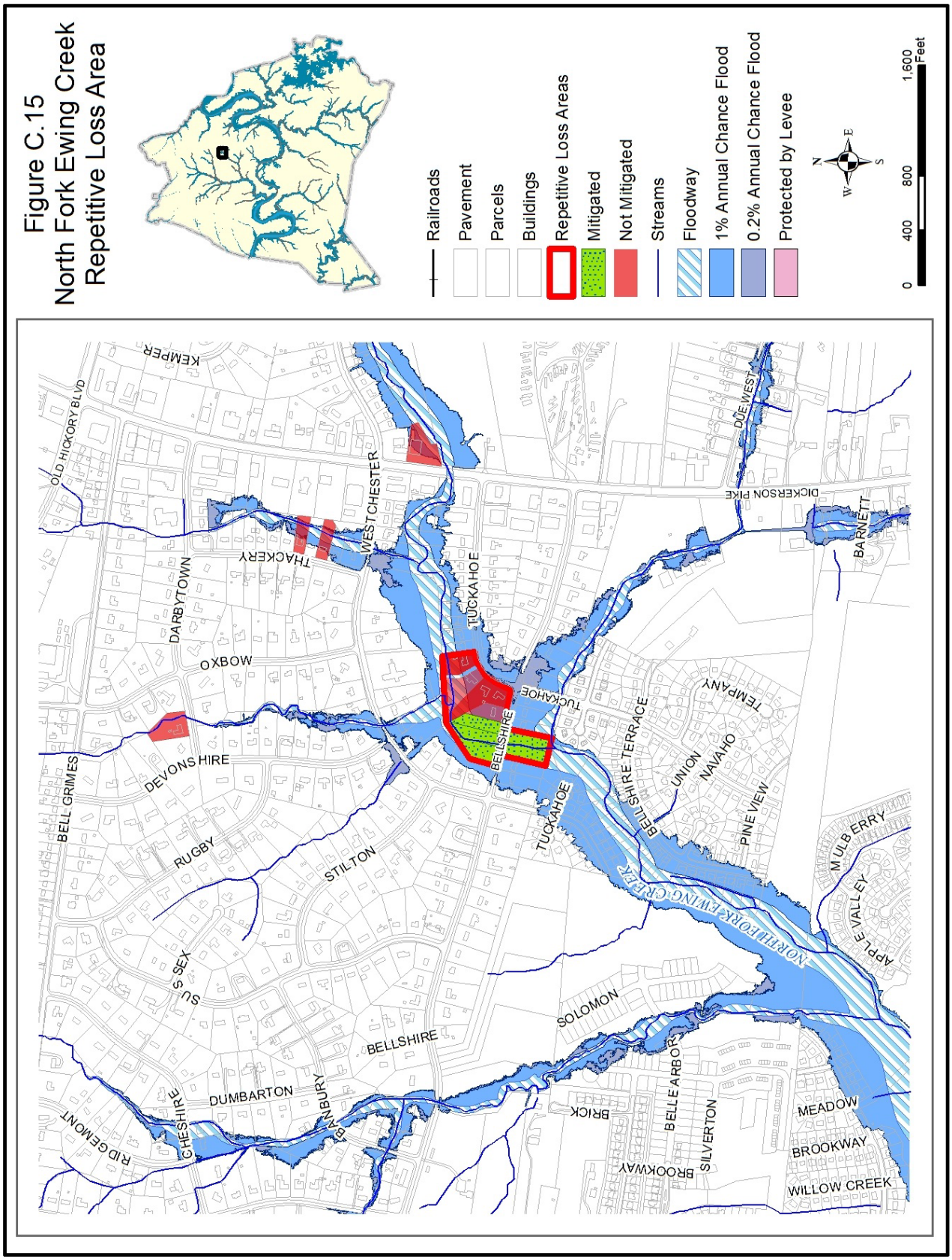
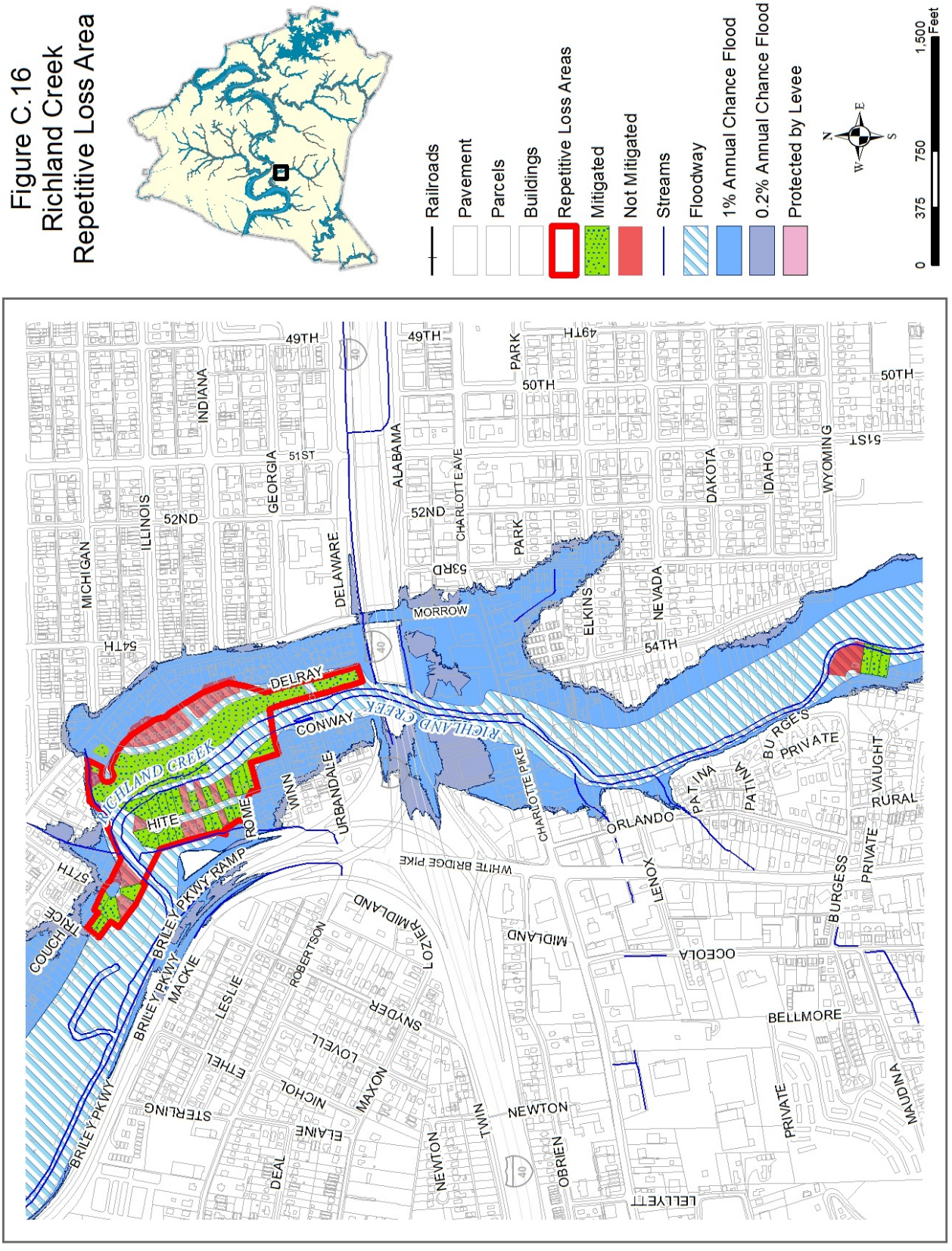


Figure C.15
North Fork Ewing Creek
Repetitive Loss Area
Railroads
Pavement
Parcels
Buildings
Repetitive Loss Areas
Mitigated
Not Mitigated
Streams
Floodway
1% Annual Chance Flood
0.2% Annual Chance Flood
Protected by Levee
0
400
800
1,600
Feet
KEMPER
OLD HICKORY BLVD
WESTCHESTER
DUE WEST
DICKERSON PIKE
BARNETT
THACKERY
DARBYTOWN
OXBOW
TUCKAHOE
TEMPANY
BELLSHIRE
DEVONSHIRE
BELL GRIMES
RUGBY
STILTON
BELLSHIRE TERRACE
UNION
NAVAHO
PINE VIEW
MULBERRY
APPLE VALLEY
NORTH FORK EWING CREEK
SUSSEX
SOLOMON
BELLSHIRE
DUMBARTON
CHESHIRE
RIDGEMONT
BRICK
BELLE ARBOR
SILVERTON
BROOKWAY
MEADOW
BROOKWAY
WILLOW CREEK

Figure C.16
Richland Creek
Repetitive Loss Area



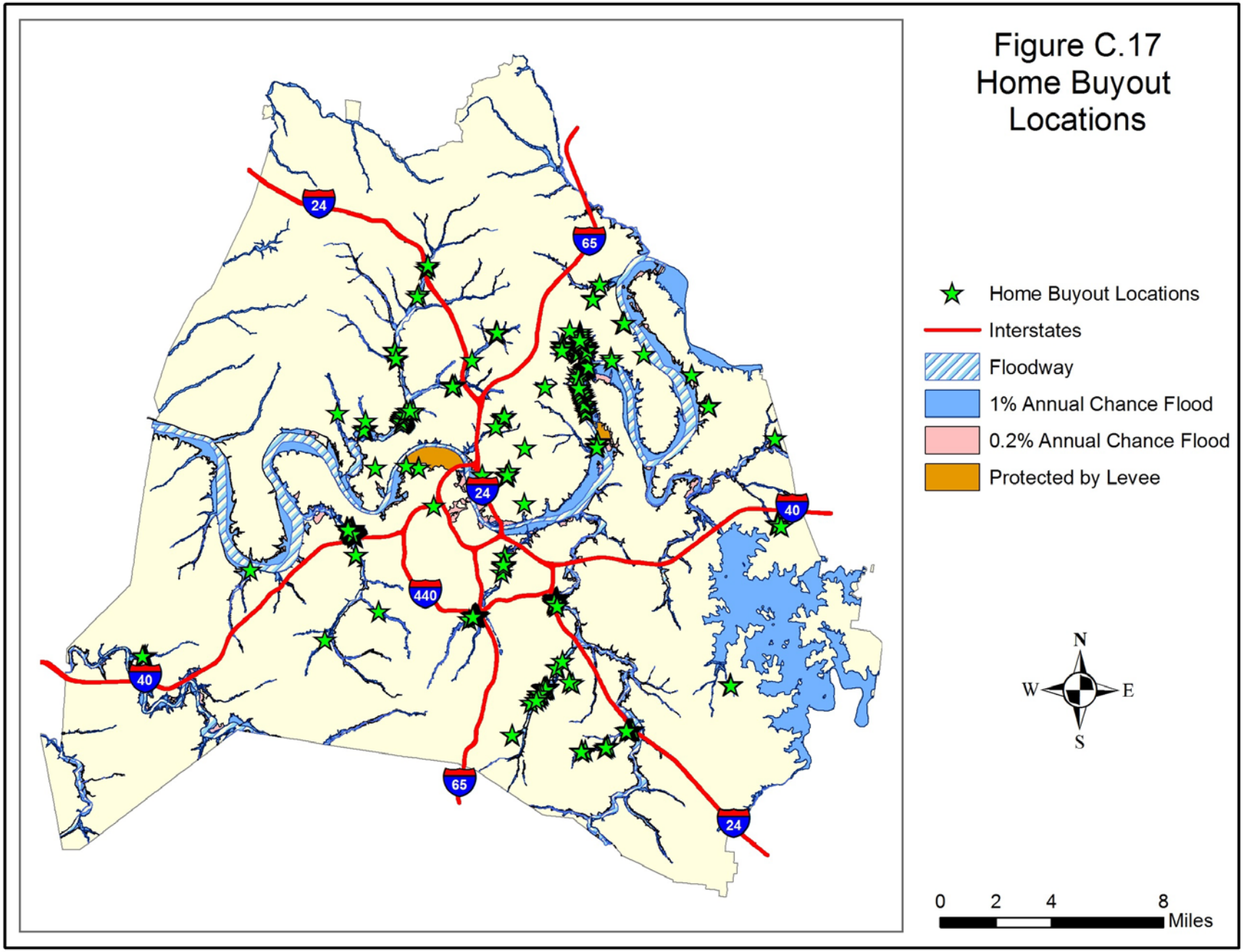


Figure C.17
Home Buyout Locations
Home Buyout Locations
Interstates
Floodway
1% Annual Chance Flood
0.2% Annual Chance Flood
Protected by Levee
N
W
E
S
0
2
4
8
Miles
24
65
40
440

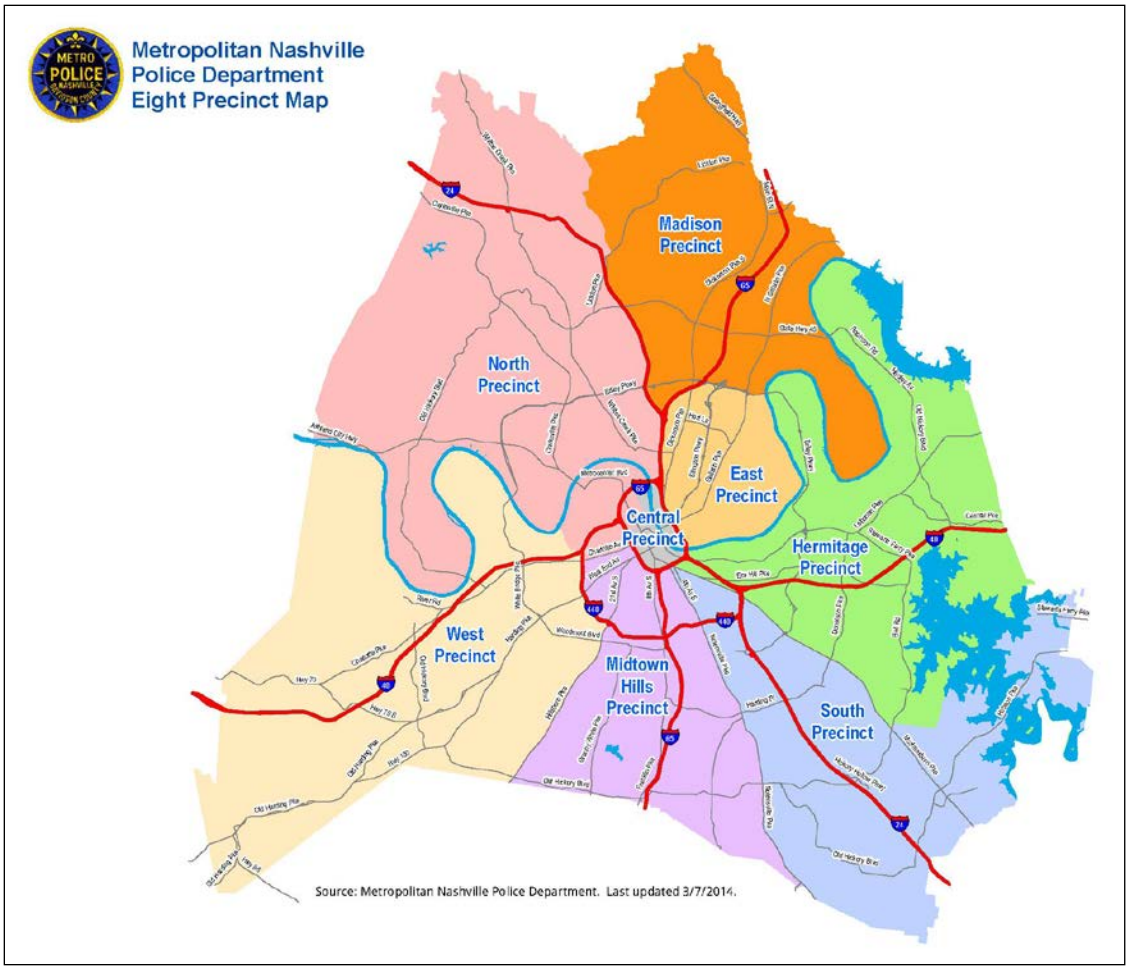


Figure C.18: Metro Nashville Police Department Precinct Map

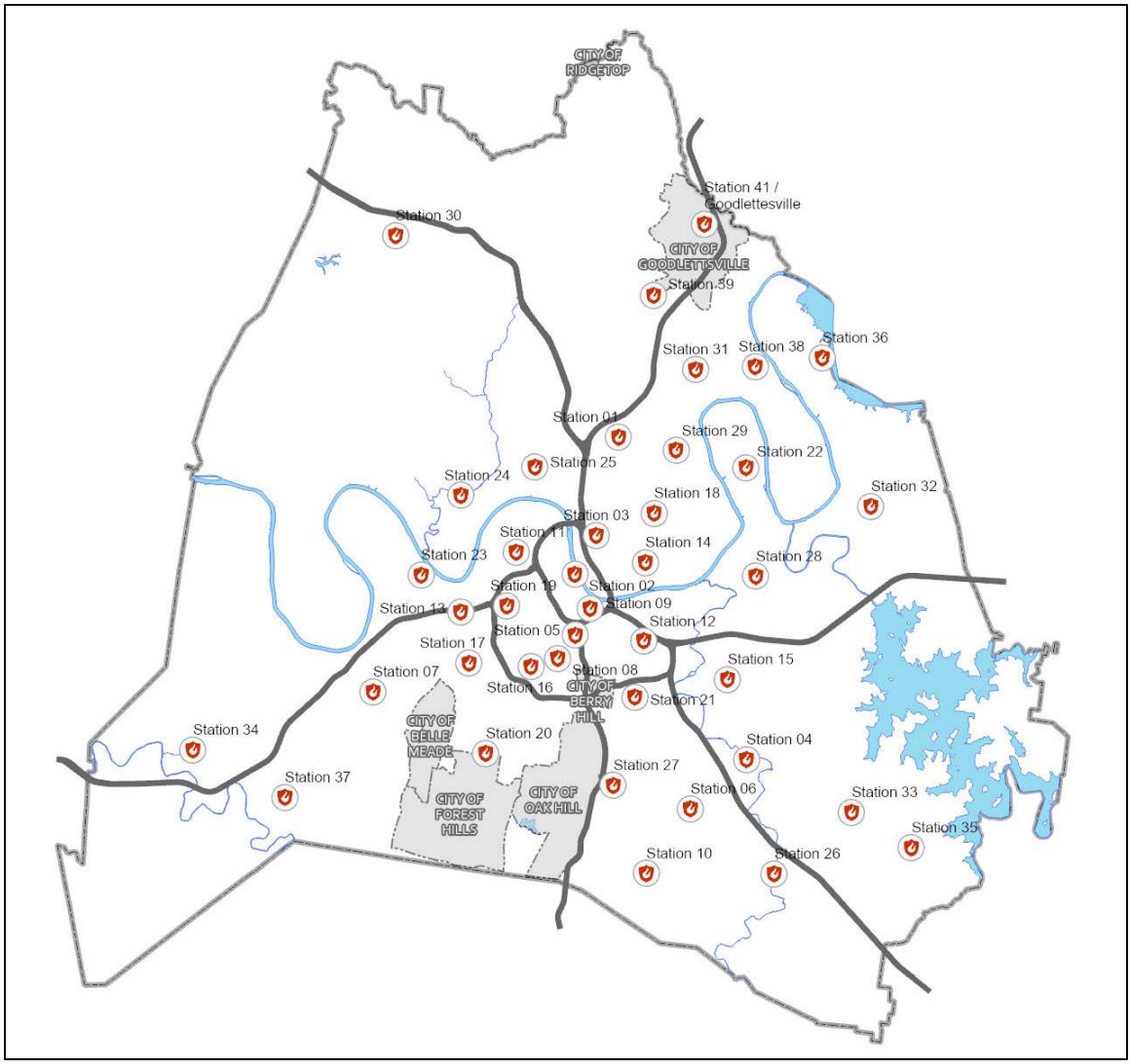


Figure C.19: Nashville Fire Department Fire Hall Map

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Code of Federal Regulations
Title 44, Emergency Management and Assistance

44 CFR § 201.6 Local Mitigation Plans

The local mitigation plan is the representation of the jurisdiction's commitment to reduce risks from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards. Local plans will also serve as the basis for the State to provide technical assistance and to prioritize project funding.

(a) ***Plan requirements.***
(1) A local government must have a mitigation plan approved pursuant to this section in order to receive HMGP project grants. The Administrator may, at his discretion, require a local mitigation plan for the Repetitive Flood Claims Program. A local government must have a mitigation plan approved pursuant to this section in order to apply for and receive mitigation project grants under all other mitigation grant programs.
(2) Plans prepared for the FMA program, described at part 79 of this chapter, need only address these requirements as they relate to flood hazards in order to be eligible for FMA project grants. However, these plans must be clearly identified as being flood mitigation plans, and they will not meet the eligibility criteria for other mitigation grant programs, unless flooding is the only natural hazard the jurisdiction faces.
(3) Regional Administrator's may grant an exception to the plan requirement in extraordinary circumstances, such as in a small and impoverished community, when justification is provided. In these cases, a plan will be completed within 12 months of the award of the project grant. If a plan is not provided within this timeframe, the project grant will be terminated, and any costs incurred after notice of grant's termination will not be reimbursed by FEMA.
(4) Multi-jurisdictional plans (*e.g.* watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan. State-wide plans will not be accepted as multi-jurisdictional plans.

(b) ***Planning process.*** An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:
(1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
(2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and
(3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

(c) ***Plan content.*** The plan shall include the following:
(1) Documentation of the *planning process* used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

(2) A *risk assessment* that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards. The risk assessment shall include:
(i) A description of the type, location, and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.
(ii) A description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. All plans approved after October 1, 2008 must also address NFIP insured structures that have been repetitively damaged by floods. The plan should describe vulnerability in terms of:
(A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas;
(B) An estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate;
(C) Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.
(iii) For multi-jurisdictional plans, the risk assessment section must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

(3) *A mitigation strategy* that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools. This section shall include:
(i) A description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.
(ii) A section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure. All plans approved by FEMA after October 1, 2008, must also address the jurisdiction's participation in the NFIP, and continued compliance with NFIP requirements, as appropriate.
(iii) An action plan describing how the actions identified in paragraph (c)(3)(ii) of this section will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.
(iv) For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.

(4) A *plan maintenance process* that includes:
(i) A section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

(ii) A process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.
(iii) Discussion on how the community will continue public participation in the plan maintenance process.

(5) *Documentation* that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council). For multi-jurisdictional plans, each jurisdiction requesting approval of the plan must document that it has been formally adopted.

(d) ***Plan review.***
(1) Plans must be submitted to the State Hazard Mitigation Officer (SHMO) for initial review and coordination. The State will then send the plan to the appropriate FEMA Regional Office for formal review and approval. Where the State point of contact for the FMA program is different from the SHMO, the SHMO will be responsible for coordinating the local plan reviews between the FMA point of contact and FEMA.
(2) The Regional review will be completed within 45 days after receipt from the State, whenever possible.
(3) A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within 5 years in order to continue to be eligible for mitigation project grant funding.
(4) Managing States that have been approved under the criteria established by FEMA pursuant to 42 U.S.C. 5170c(c) will be delegated approval authority for local mitigation plans, and the review will be based on the criteria in this part. Managing States will review the plans within 45 days of receipt of the plans, whenever possible, and provide a copy of the approved plans to the Regional Office.