

# Albany Dougherty Pre-Disaster Mitigation Plan

## Chapter 2 – Local Natural Hazard, Risk and Vulnerability (HRV) Summary

The Albany Dougherty Pre-Disaster Mitigation sub-committee, Identify/Profiling Hazards, evaluated each of the ten natural hazards prevalent to Southern States. The following three natural hazards (drought, flooding, and tornadoes) are regarded as having the greatest likelihood of recurrent impact to our community.

### **Natural Hazards:**

#### **I. Drought**

- A. Drought Identify.** Droughts do not have the immediate effects of floods, but sustained droughts can cause economic stress on the entire State. The word drought has different meanings, depending on a person's perspective. To a farmer, a drought is a period of moisture deficiency that affects the crops under cultivation; even 2 weeks without rainfall can stress many crops during certain periods of the growing season. To a meteorologist, a drought is a prolonged period of moisture deficiency. A drought lasting 1-3 months is considered to be short term; 4-6 months, intermediate; and more than 6 months, long term. To a water manager, a drought is a deficiency in water supply that affects water availability and water quality. To a hydrologist, a drought is a period of decreased precipitation and stream flow. Recent droughts in Georgia have severely affected municipal and industrial water supplies, stream-water quality, recreation at major reservoirs, hydropower generation, and navigation, as well as agricultural and forest resources.
- B. Drought Profile.** Drought is an insidious hazard of nature, often characterized as a "creeping phenomenon," since it is usually difficult to recognize the occurrence of drought before being in the middle of one. Drought analysis is more subjective than that for floods, because droughts do not occur spontaneously. They evolve over time as certain conditions are met and are spread over a large geographical area. Drought severity depends on its duration, intensity, geographic extent, and the regional water supply demands made by human activities and vegetation. This multi-dimensional nature makes it difficult to define a drought and to perform comprehensive risk assessments. This leads to the lack of accurate, reliable, and timely estimates of drought severity and effects, and ultimately slows the development of drought contingency plans. Dougherty County is currently emerging from a lingering drought that has been in effect since September 1997. See Appendix D, Worksheet # 2. The sustained dry period resulted in extensive damage to the County's agricultural crop, losses of yield in excess of \$46.5M. There is a less than 1% chance of Dougherty County experiencing drought conditions during any given year (see Appendix A, Albany Dougherty Hazard Frequency Table).

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- C. Assets Exposed to Drought.** Dougherty County has experienced no documented record of buildings, infrastructure, or critical facilities affected during the drought period.
- D. Estimate Potential Losses to Drought.** Drought affects water levels for use by industry, agriculture, and individual consumers. Although Dougherty County did not sustain structural damages associated to the recent drought, agricultural crop damages and the farmers' loss of revenue has an undetermined domino effect, resulting in economic and environmental impacts and personal hardships to the rest of our community, rather than loss of life or immediate destruction of property.
- E. Land Use and Development Trends related to Drought.** Dougherty County does not at this time have a plan for land use or development trends germane to drought.
- F. Multi-Jurisdictional Drought.** Dougherty County includes the City of Albany. Both Albany and Dougherty County were working partners in the development of the Pre-Disaster Mitigation Plan. Drought concerns of City and County committee members were received, discussed and consolidated into the Plan.
- G. General Summary of Drought.** Drought is a threatening hazard of nature common to virtually all climates. It originates from a deficiency of precipitation over an extended period of time, usually a season or more. This deficiency results in a water shortage for some activity or group(s) within our community. Ample water supply is critical to the economic well being of Dougherty County. During droughts, crops do not mature, wildlife and livestock are undernourished, land values decrease, and unemployment increases. The economic losses sustained during Dougherty County's drought underscored our vulnerability to this natural hazard. Chapter 4 provides the Albany Dougherty Pre-Disaster Mitigation Committees Drought Goals, Objectives, and Tasks.

## II. Flooding

- A. Flooding Identify.** Susceptibility of a stream to flooding is dependent upon several different variables. Among these are topography, ground saturation, previous rainfall amounts, soil types, drainage, basin size, drainage patterns of streams, and vegetative cover. Most floods occur because the ground is already saturated with moisture and cannot absorb any further runoff. Georgia's infamous red clay soil contributes to the problem in the piedmont area of the state because the particles of the clay are flat and lie in a dense, compact matrix which leaves little inter-particle space for water. As a result, the clay soil has poor "percolation" capability, and quickly becomes saturated. Additional rainfall results in more runoff.

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Urbanization and development also contributes to flash flooding in that the vegetative ground cover is removed and replaced with extensive amounts of asphalt, concrete, and buildings. Water is no longer absorbed and quickly runs off into adjacent streams. Flooding may occur relatively slowly or become a flash flood.

**B. Flooding Profile.** Throughout history, people have settled next to waterways because of the advantages in transportation, commerce, and water supply. Floods have caused a greater loss of life and property, and have disrupted more families and communities in the United States, than all other natural hazards combined. Dougherty County contains five principle bodies of water: the Flint River, Kinchafoonee Creek, Kiokee Creek, Muckalee Creek and Lake Chehaw. The worst hazard events experienced in Dougherty County were incidences of flooding.

In a county of approximately 334 square miles, almost 27% is designated floodway or flood plain by FEMA's Flood Insurance Rate Map, effective October 5, 2001. The Flint River Basin, the Kinchafoonee and Muckalee Creek drainages have become more responsive and have a slightly increased risk potential of minor flooding this spring. Major flood-prone areas are found along the Flint River which flows west across the northern portion of the county, then south through the city of Albany to the Mitchell County line. Property along Kinchafoonee and Muckalee Creeks and on the shores of Lake Worth is also vulnerable. Areas in and near the river corridor are affected by over-bank flow, while discharges from sinkholes fed by high river levels affect some neighborhoods before the river overflows its banks. Localized drainage problems away from the river may cause flooding at times of heavy rainfall. Relatively flat topography necessitates the installation of drainage canals, retention and detention ponds, and stormwater discharge systems throughout the city and county. Upgrades to this system are undertaken on a regular basis as funding is made available.

Western Dougherty County contains large areas of designated flood plains. However, these areas are sparsely populated and represent limited damage vulnerability. Much of the property is in large agricultural and timber holdings, some publicly owned and protected from development.

Since 1994 Dougherty County, survived two major (94/98) and one minor (00) floodings, suffering six dead and six injured. Loss of property and crops surpassed \$666M. Appendix D Worksheet # 2 addresses hazard events since 1951. There is a less than 1% chance of Dougherty County experiencing flood conditions during any given year (see Appendix A, Albany Dougherty Hazard Frequency Table).

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- C. Assets Exposed to Flooding.** The Albany Dougherty Pre-Disaster Mitigation Committee established a list with location of all critical facilities within the County. Planning and Community Development prepared maps of the County showing the boundaries of the 1994 flood. Next, the critical facilities were overlaid onto the map. The resulting map verified most of the County's critical facilities are located outside floodplain. The Planning Committee is not aware at this time of any future building in the floodplain area. A list of critical facilities is located in Appendix D, Worksheet # 5, and the maps are available in Appendix A.
- D. Estimated Potential Losses to Flooding.** All flooding would be preceded by ample warning time. It requires a severe weather event and substantial rain to produce a flood condition, allowing time for Dougherty County to prepare for the event. Again estimating loss is a guess depending on the severity of the flooding. Planning and Community Development's methodology to estimate potential losses was to make use of the GEMA provided Excel worksheet with embedded loss estimate formula, and has prepared an inventory of potential flooding losses in Appendix D, Worksheet # 4. Appendix D Worksheet # 5 provides Dougherty County critical facilities, with potential loss estimates.
- E. Land Use and Development Trends Related to Flooding.** Albany and Dougherty County Land Use and Development Ordinances do not prohibit building in flood prone areas, but require adherence to applicable codes.
- F. Multi-Jurisdictional Flooding.** Dougherty County includes the City of Albany. Both Albany and Dougherty County were working partners in the development of the Pre-Disaster Mitigation Plan. Flooding concerns of City and County committee members were received, discussed and consolidated into the Plan.
- G. General Summary Flooding.** The worst hazard events experienced by Dougherty County were incidences of flooding. Over the next several years, the County will be implementing the identified hazard mitigation strategies to ensure that the public benefits from this planning effort. Through the implementation of this plan, all City/County leaders will be promoting the public health, safety, and welfare. Chapter 4 provides the Albany Dougherty Pre-Disaster Mitigation Committees Flood Goals, Objectives, and Tasks.

### III. Tornadoes

- A. Tornadoes Identify.** A tornado is a violently rotating column of air in contact with the ground. The air column can be seen when it contains condensation in the form of a cloud or when it contains surface dust and debris. Usually, a combination of both is present. When the column of air

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is aloft, it is called a funnel cloud. A waterspout is a tornado in contact with a water surface. The classic “funnel” shape may not be present in exceptionally large tornadoes. The tornado may appear to be a large, turbulent cloud near the ground, a large rain shaft, or even a non-weather event such as a fire.

Except for weak tornadoes and coastal water spouts, tornadoes usually develop from strong or severe thunderstorms. Most significant tornadoes have their origin within the right rear quadrant of the thunderstorm where a circulation develops at heights between 15,000 and 30,000 feet. A tornado or funnel cloud is observed when this circulation develops further downward toward the surface. Tornado development can also occur along the leading edge of a single thunderstorm or line of thunderstorms. While dangerous, such tornadoes are usually weak and short-lived.

Tornadoes can topple buildings, roll mobile homes, uproot trees, hurl people and animals through the air for hundreds of yards, and fill the air with lethal wind-borne debris. Tornadoes do their destructive work through the combined action of their strong rotary winds and the impact of wind-borne debris. Contrary to popular opinion, buildings do not “explode” as a result of reduced atmospheric pressure associated with the tornado. Instead, the force of the winds pushes the windward wall of the building inward. The roof is lifted up and the other walls fall outward. Opening a window, once thought to be a way to minimize damage by allowing inside and outside atmospheric pressure to equalize, is not recommended. Research during the 1970’s discovered that the pressure drop was responsible for only a small fraction of the destructive force within a tornado. All buildings have some ventilation and it is believed that this ventilation is enough to overcome the difference in pressure in all except the most violent storms.

Most tornadoes generate winds that are less than 120 miles per hour. Even though most buildings will be damaged to some extent by either the wind or windblown debris, there is nearly always a safe area, within a well-constructed building, that will provide adequate shelter from tornadic winds.

Tornadoes travel at an average speed of 30 miles per hour but speeds ranging from 0 to 70 miles per hour have been reported. Most tornadoes move from the southwest to the northeast but the direction may be erratic and subject to sudden change.

Forecasters and researchers use a wind damage scale created by Dr. T. Theodore Fujita to classify tornadoes and sometimes the damage done by other wind storms. The F - for Fujita - scale uses numbers from 0 through 5. The ratings are based on the amount and type of wind damage. The ratings are:

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- **F0** Gale tornado (40-72) **Light:** Damage to chimneys, tree branches, shallow-root trees, sign boards
- **F1** Moderate tornado (73-112) **Moderate:** Lower limit is beginning of hurricane wind speed—surfaces peeled off roofs, mobile homes pushed off foundations or overturned, cars pushed off roads
- **F2** Significant tornado (113-157) **Considerable:** Roofs torn off frame houses, mobile homes demolished, boxcars pushed over, large trees snapped or uprooted, light-object missiles generated
- **F3** Severe tornado (158-206) **Severe:** Roofs and some walls torn off well-constructed houses, trains overturned, most trees in forest uprooted, cars lifted off the ground and thrown
- **F4** Devastating tornado (207-260) **Devastating:** Well-constructed houses leveled, structures with weak foundations blown off some distance, cars thrown and large missiles generated
- **F5** Incredible tornado (261-318) **Incredible:** Strong frame houses lifted off foundations and carried considerable distance to disintegrate, automobile-sized missiles fly through the air in excess of 100 yards, trees debarked

**B. Tornadoes Profile.** Severe thunderstorms produce about 1,000 tornadoes each year in the United States. FEMA reports that 106 federal disaster declarations over the past 20 years have included tornado damage. The path width of a tornado averages about 200 yards and therefore can have a substantial impact on human life and property. Damage from the average tornado includes roof surfaces, mobile homes pushed off of their foundations, and automobiles pushed off of the road. More severe tornadoes can lift 300-ton objects and toss homes more than 300 feet. Dougherty County has rebounded from the destructive aftermath of 15 tornadoes since 1951. Statistically, Dougherty County experiences a tornado once every three years; or a .31% chance of experiencing a tornado during any given year (see Appendix A Albany Dougherty Hazard Frequency Table). The most likely period is March through May. See Appendix D, Worksheet # 2. The tornadoes ranged in magnitude of F0 (40-72mph) to F2 (113-157mph). Damages surmounted \$11, 395, 000 with 40 citizens receiving injuries. Fortunately there were no recorded deaths.

**C. Assets Expose to Tornadoes.** All Dougherty County buildings, infrastructure, and critical facilities are vulnerable to the indiscriminate path of a tornado. The National Weather Service advises that tornadoes strike at random, and therefore all areas within the community are equally at risk. Damage is a factor of both storm or wind severity and what is in the path of the tornado. An F4 tornado in a densely populated area will do enormous damage.

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The characteristics of a structure can make it more or less vulnerable to tornado damage and its occupants more or less safe from injury if the building is hit. For example, mobile homes can be more easily damaged than permanent structures, buildings with crawl spaces are more susceptible to lift, and foundation and roof type can increase or decrease the structure's vulnerability.

- D. Estimate Potential Losses to Tornadoes.** Predicting the potential losses from a tornado is similar to predicting where a tornado will touchdown. If the tornado is confined to a remote rural area the losses would be minimal; however, if the touchdown is a manufacturing plant, hospital, college, or downtown Albany, the damage to infrastructure and critical facilities would be in the millions of dollars. Planning and Community Development's methodology to estimate potential losses was to make use of the GEMA provided Excel worksheet with embedded loss estimate formula, and has prepared an inventory of potential losses in Appendix D, Worksheet # 4. Appendix D Worksheet # 5 provides Dougherty County critical facilities, with potential loss estimates.
- E. Land Use and Development Trends Related to Tornadoes.** Dougherty County design wind is 90 -100mph (Appendix D Worksheet # 3). However the County has no land use or development plan addressing tornadoes.
- F. Multi-Jurisdictional Tornadoes.** Dougherty County includes the City of Albany. Both Albany and Dougherty County were working partners in the development of the Pre-Disaster Mitigation Plan. Tornado concerns of City and County committee members were received, discussed and consolidated into the Plan.
- G. General Summary Tornadoes.** Tornadoes are a fact of life in Georgia; the question is not whether the event will happen, but when and where. Tornadoes tend to strike in somewhat random fashion, making the task of calculating a recurrence interval difficult. Depending on the severity of the tornado, damage can range from light damage to trees and roofs (Fujita Category F0) to destruction of well-built houses (Fujita Category F4 and F5). Mobile homes and houses with crawl spaces are more susceptible to lift and therefore at the greatest risk of damage. While Dougherty County has not been hit by the most violent storms, tornadoes have injured 40 people since 1951. Preparedness planning involves those efforts undertaken before a tornado to prepare for, or improve capability to respond to the event. Chapter 4 provides the Albany Dougherty Pre-Disaster Mitigation Committees Tornado Goals, Objectives, and Tasks.