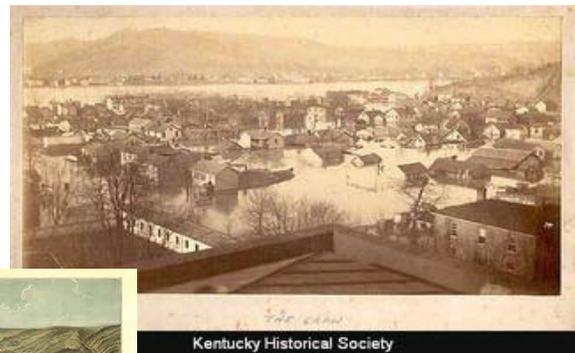




# City of Frankfort Flood Mitigation Plan



FEMA



Prepared By Stantec | One Team Infinite Solutions

**City of Frankfort Flood Mitigation  
Plan**

Franklin County, Kentucky



June 2011

## **Executive Summary**

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Flooding is a major source of concern in some areas of the City of Frankfort. The City was originally founded on the banks of the Kentucky River in the early 19<sup>th</sup> century because the river was the primary means of transportation to the Ohio River and eastward into Kentucky. While it was important to have ready access to the river for shipping of goods and people, that proximity also presented challenges. Frankfort has routinely been impacted by flooding, even after a floodwall and a levee were built to minimize exposure. Flooding is a natural part of the world around us and we cannot stop flooding from occurring. However, as a community and as individuals, we can take steps to minimize the negative consequences of flooding. This plan is intended to identify specific areas of concern in the City to be targeted for mitigation efforts. The Federal Emergency Management Agency (FEMA) defines hazard mitigation as “any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards.” The planning consultant sought input from the public and government officials, conducted research, and completed detailed analysis. The planning process and the results are presented in the following plan.

**Table of Contents**

EXECUTIVE SUMMARY	E.1
<hr/>	
<b>1.0 INTRODUCTION</b>	<b>1</b>
1.1 PLAN ADOPTION	3
1.2 PLANNING PROCESS	3
1.3 EXISTING PLANNING AND REGULATORY DOCUMENTS	4
1.3.1 Franklin County Natural Hazard Mitigation Plan	4
1.3.2 Bluegrass Area Development District Regional Hazard Mitigation Plan	5
1.3.3 Kentucky State Hazard Mitigation Plan	5
1.3.4 City of Frankfort Flood Damage Prevention Ordinance	6
1.3.5 City of Frankfort Planning and Development Ordinances	6
<hr/>	
<b>2.0 FLOOD HAZARD</b>	<b>6</b>
2.1 FLOOD PROFILE	9
2.2 FLOOD HISTORY	10
2.3 FLOOD IMPACTS	11
2.4 EXTENT OF FLOODING	12
2.5 PROBABLE FUTURE OCCURRENCES	12
2.6 FLOODPLAINS	13
2.6.1 Floodplain Development Pattern	13
2.6.2 National Flood Insurance Program	14
2.6.3 Repetitive Loss Properties	15
2.7 RISK ASSESSMENT	16
2.7.1 At-Risk Population	17
2.7.2 Structure Value	17
2.7.3 Critical Facilities	17
2.7.4 Flood Depth Damage Analysis	18
2.8 FUTURE SUSCEPTIBILITY	20
2.9 MITIGATION STRATEGY	20
2.9.1 Definition of Mitigation	20
2.9.2 Mitigation Goals	21
2.9.3 Mitigation Strategies	21
2.9.4 Prioritization of Mitigation Activities	22
2.9.5 Activity Benefit-Cost Review	23
2.9.6 Mitigation Activity Implementation	23
<hr/>	
<b>3.0 OTHER HAZARDS</b>	<b>24</b>
3.1 DAM FAILURE	24
3.1.1 Potential Impacts	23
3.2 DROUGHT	23
3.2.1 Drought Impacts	24
3.3 EARTHQUAKE	25

**Table of Contents**

3.3.1 Earthquake Magnitude.....26

3.3.2 Earthquake Impacts .....27

3.4 EXTREME HEAT .....28

3.4.1 Extreme Heat Impacts .....30

3.5 HAILSTORM.....31

3.5.1 Hail Impacts .....31

3.6 SEVERE STORMS (THUNDERSTORMS).....31

3.6.1 Severe Storm Impacts .....32

3.7 SEVERE WINTER STORMS.....33

3.7.1 Severe Winter Storm Impacts .....33

3.8 TORNADOES .....34

3.8.1 Tornado Impacts .....36

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**4.0 PLAN MAINTENANCE.....36**

4.1 MONITORING, EVALUATING, AND UPDATING THE PLAN .....37

4.1.1 Monitoring .....37

4.1.2 Evaluating .....37

4.1.3 Updating.....37

4.2 IMPLEMENTATION THROUGH EXISTING PROGRAMS .....37

4.3 CONTINUED PUBLIC PARTICIPATION .....38

4.4 GRANT OPPORTUNITIES .....38

---

**5.0 CONCLUSION.....41**

## **Table of Contents**

### **List of Tables**

Table 1.	Summary of Flood Risk Factors.....	9
Table 2.	NCDC Flood Events in the City of Frankfort .....	10
Table 3.	City of Frankfort Declarations - Floods .....	11
Table 4.	Flooding Probability in the 100-year Floodplain.....	13
Table 5.	Landcover Classifications in the Floodplain.....	14
Table 6.	Summary of NFIP Insurance Policies and Claims .....	14
Table 7.	Repetitive Loss Property Summary .....	16
Table 8.	Impacts from a 10 year (10% Annual Probability) Flood Event .....	19
Table 9.	Impacts from a 50 year (2% Annual Probability) Flood Event .....	19
Table 10.	Impacts from a 100 year (1% Annual Probability) Flood Event .....	19
Table 11.	Impacts from a 500 year (0.2% Annual Probability) Flood Event .....	20
Table 12.	Activity Prioritization.....	22
Table 13.	Palmer Classification System .....	24
Table 14.	Modified Mercalli Intensity Scale for Earthquakes .....	27
Table 15.	Heat Index/Heat Disorders Impacts .....	30
Table 16.	Fujita Scale for Tornadoes.....	36

### **List of Figures**

Figure 1.	Location Map of Frankfort.....	1
Figure 2.	Flood Elevations at the Kentucky River Lock and Dam 4 .....	2
Figure 3.	Map Showing the DFIRM Streams in the City of Frankfort with the 100- and 500-year Floodplains.....	8
Figure 4.	Temperature versus Relative Humidity Scale.....	29
Figure 5.	Wind Zones in the United States .....	35

### **List of Appendices**

Appendix A	Plan Adoption Ordinance
Appendix B	Public Meeting Documentation
Appendix C	Survey
Appendix D	Survey Results
Appendix E	Maps
Appendix F	Mitigation Activities
Appendix G	Crosswalk

## Table of Contents

### List of Acronyms

BGADD	Bluegrass Area Development District
CDBG	Community Development Block Grant
CERF	Community Emergency Relief Funds
CRS	Community Rating System
DFIRM	Digital Flood Insurance Rate Map
EMPG	Emergency Management Performance Grant
FDPO	Flood Damage Prevention Ordinance
FEMA	Federal Emergency Management Agency
FIS	Flood Insurance Study
FMA	Flood Mitigation Assistance
HAZUS	Hazards U.S.
HMGP	Hazard Mitigation Grant Program
KDOW	Kentucky Division of Water
KSHMP	Kentucky State Hazard Mitigation Plan
KYDEM	Kentucky Division of Emergency Management
LIDAR	Light Detection and Ranging
MMI	Modified Mercalli Intensity
NCDC	National Climatic Data Center
NRCS	Natural Resources Conservation Service
NFIP	National Flood Insurance Program
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service
PA	Public Assistance Grant
PDM	Pre-Disaster Mitigation Program
PDSI	Palmer Drought Severity Index
PVA	Property Valuation Administration
RHMP	Regional Hazard Mitigation Plan
RL	Repetitive Loss
SMART	Specific, Measurable, Achievable, Relevant, Timed
SRL	Severe Repetitive Loss
STAPLEE	Social, Technical, Administrative, Political, Legal, Environmental, and Economic
USACE	United States Army Corps of Engineers
WRDA	Water Resources Development Act

## 1.0 Introduction

This plan is intended for use by the City of Frankfort, Kentucky. The objective of this flood mitigation plan is to minimize the City's exposure to flooding and minimize the property damage, loss of life, and impact on economic vitality commonly associated with flooding. This planning effort was funded through a Federal Emergency Management Agency (FEMA) Flood Mitigation Assistance planning grant.

The City of Frankfort, Kentucky is located in the Bluegrass Region of central Kentucky (**Figure 1**). Frankfort has been the state capitol of Kentucky since 1792, shortly after Kentucky achieved statehood. The city developed on the banks of the Kentucky River, which was a major shipping corridor via the Ohio River. The Kentucky River bisects Frankfort, which is predominately located in the river valley around the river. The city is divided into five districts by the river: Downtown and South Frankfort on opposite sides of the river, Bellepoint on the west side of the river and north of Benson Creek; and West and East Frankfort, the suburban areas located on either side of the river.



**Figure 1. Location Map of Frankfort.**

Five bridges cross the river in Frankfort. The St. Clair Street bridge (known locally as the "Singing Bridge" from the sound of tires on its grated roadway) was completed in 1894, replacing a previous wooden covered bridge. The Capitol Avenue bridge (officially the "War Mothers Memorial Bridge") was completed in 1938. The two newest bridges, which cross the North Frankfort levee, were built in the late 1980s. The fifth bridge, the so-called "Blue Bridge" at the foot of Broadway, is now limited to railroad use.

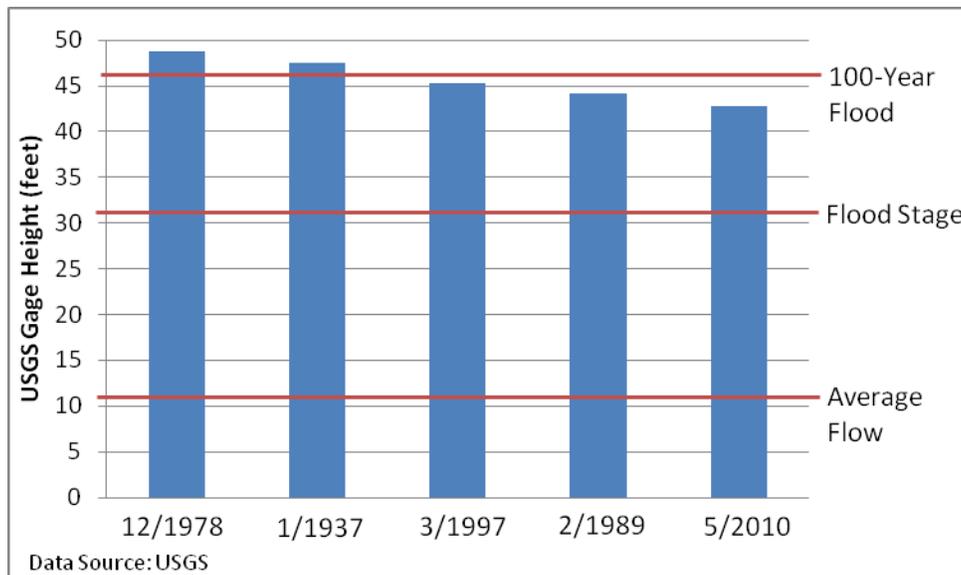
Interstate 64 traverses Franklin County near the southern outskirts of Frankfort, providing Frankfort with significant challenges and opportunities. In addition, both U.S. 60 and U.S. 127 pass through Frankfort.

Frankfort receives approximately 45 inches of precipitation throughout the average year, the majority of which is rain. Spring is generally the wettest season of the year; however, summer thunderstorms account for a substantial amount of rain and generally the most intense rainfalls. Rainfall rates often exceed one inch per hour, with 24-hour totals exceeding five inches

occurring about once in ten years. Consequently, the Kentucky River has repeatedly flooded parts of Frankfort in the 200 years since the city was established. Flood stage on the Kentucky River at Frankfort is 31 feet, and the five highest floods to date have been:

1. 48.47 feet in December, 1978
2. 47.46 feet in January, 1937
3. 45.22 feet in March, 1997
4. 44.17 feet in February, 1989
5. 42.84 feet in May, 2010

**Figure 2**, below, shows the flood elevations in relation to the 100-year flood (45.8 feet), flood stage (31.0 feet), and the average water elevation since 1926 (10.6 feet). The river's level can be monitored at <http://water.weather.gov/ahps2/hydrograph.php?wfo=lmk&gage=fftk2>. The City is protected from flooding by the North Frankfort levee, completed in 1969, and the South Frankfort floodwall, which was completed in 1996, only months before the 1997 flood. There are 30 streams identified in the FEMA Digital Flood Insurance Rate Maps (DFIRM), with a total length of 24.5 miles in the city limits.



**Figure 2. Flood Elevations at the Kentucky River Lock and Dam 4**

The 2000 census reported that Frankfort had a population of 27,741. Approximately 82% of the population is Caucasian, with 14.7% of the population African-American. Median household income is 83% of that of the U.S. and per capita income is 95% of the U.S. average; consequently, the incidence of poverty in Frankfort is slightly higher than the nation (13.9% and 12.4%, respectively).

Frankfort participates in the National Flood Insurance Program (NFIP), which provides flood insurance to landowners in participating jurisdictions and the Community Rating System (CRS).

Both the NFIP and CRS are voluntary programs, intended to minimize the public exposure to flooding and provide incentives for governments and individuals to reduce flood risks. The NFIP requires a baseline regulatory control of floodplains for all participating communities intended to minimize future flood susceptibility. Should a community fail to maintain or enforce floodplain management, the community may be suspended or removed from the NFIP. The CRS provides discounts to flood insurance policy holders based on actions taken by the community to increase awareness and decrease exposure. Discounts range from 0-50%. Frankfort is currently a Class 8 CRS community, which means policy holders have a 10% discount off of their premiums.

## **1.1 PLAN ADOPTION**

The plan has been formally recognized by FEMA and by the Kentucky Emergency Management Agency. Frankfort formally adopted the plan on DATE with the resolution attached to the plan as **Appendix A**.

## **1.2 PLANNING PROCESS**

The primary goals of this plan are to enhance the understanding of Frankfort's flood risks and areas of most significant impact, foster relationships between stakeholders, and develop ideas and goals for mitigating impacts to the city's infrastructure and citizens.

The City of Frankfort Department of Planning and Building Codes served as the Plan's administrator and is the primary point of contact for the plan. Stantec Consulting Services Inc. was hired as a contractor to facilitate development of the plan, including public participation, the risk assessment, and development of mitigation strategies.

The process used to develop the plan was based upon FEMA's Flood Mitigation Assistance. Specifically, the planning process focused upon soliciting comprehensive feedback from stakeholders and the general public through meetings, interactive questionnaires, and document comment forms. Several announcements, meeting bulletins, and the slides used in the meetings are included in **Appendix B**.

Invitations to the meetings were sent to officials for Franklin County, the Bluegrass Area Development District, and the Kentucky Division of Emergency Management requesting their support and input for the plan. In addition, Kentucky State University and other community organizations, including business leaders, were invited to attend the public meetings.

The public has been heavily involved in all aspects of the planning process this document references. To encourage public participation in the planning process, press announcements were released for each of the meetings and for the plan review period prior to submittal to the Kentucky Division of Emergency Management and FEMA for their approval. Typically, the residents have much more knowledge of flooding in their neighborhoods and a greater passion to see flooding problems resolved than those not experiencing the flooding. Thus, public

involvement in the process can be a decisive factor in the decision-making process of writing the plan, developing mitigation methods and in the long-term efficacy of the plan.

Public input was received at the beginning of, and throughout the planning process during meetings at the City of Frankfort Council Chambers on June 4, 2009, March 15, 2010, and March 21, 2011. In addition to the invitations to attend and participate in the planning meetings, public input was solicited via a survey available on the City of Frankfort Department of Planning and Building Codes website and through printed copies of the survey, available at the Department of Planning and Building Codes. The survey is included in this plan as **Appendix C**. The meetings were advertised in the local newspaper, on the City website, and via emails and letters to Chamber of Commerce members, governing officials, and professionals responsible for implementation of the plan. There was not sufficient participation in the survey to provide meaningful data; however, the results are presented in **Appendix D**.

The purpose of the first meeting in June 2009 was to acquaint the stakeholders with the purposes of a Flood Mitigation Plan and the potential benefits to their community. The planning process and the purposes of a flood mitigation assistance plan were discussed with the attendees and a questionnaire was circulated to ascertain the citizens' knowledge of flood prevention and readiness for a flooding disaster. The meeting was also used to encourage participation and gain an initial understanding of flooding in the community.

At the second meeting in March 2010, the results of the risk assessment and the different scenarios were discussed. After the discussion of the risk assessment, meeting attendees developed mitigation activities for the plan. The final meeting was to discuss the recommendations of the plan and receive final feedback from stakeholders and interested parties. A list of meeting attendees and the PowerPoint presentation is presented in **Appendix B**. The mitigation activities are found in **Appendix F**.

### **1.3 EXISTING PLANNING AND REGULATORY DOCUMENTS**

There are multiple existing planning level and regulatory documents in place governing development in Frankfort. For example, there are two mitigation plans in place that may provide additional information and benefit to the City of Frankfort: the Bluegrass Area Development District Regional Hazard Mitigation Plan and the Kentucky State Hazard Mitigation Plan in place. The City of Frankfort has also adopted a Comprehensive Plan, Subdivision and Zoning Ordinances, Building Codes, and a Flood Damage Prevention Ordinance (FDPO). Several of these documents are discussed briefly below.

#### **1.3.1 Franklin County Natural Hazard Mitigation Plan**

The Franklin County Natural Hazard Mitigation Plan was developed by the Bluegrass Area Development District (BGADD) and adopted by the City of Frankfort in 2005. The plan is a multi-hazard plan, covering floods, earthquakes, tornadoes/severe thunderstorms, severe winter storms, landslides, sinkholes, dam failure, drought, and wildfires. The plan discusses both Franklin County and the City of Frankfort, but does not provide detailed information about the

City, making the plan difficult to implement in City planning. There are several goals and objectives for each hazard, in addition to mitigation measures for each hazard. The flood mitigation measures include a public information campaign for the public and schools and a goal to continue to seek funding for a flood control project at the Frankfort City Park.

### **1.3.2 Bluegrass Area Development District Regional Hazard Mitigation Plan**

The BGADD Regional Hazard Mitigation Plan (RHMP) was written in 2005 to fulfill the requirements of the Disaster Mitigation Act of 2000. BGADD is a non-profit quasi-governmental organization created in 1967 to assist local governments to provide services and increase professional expertise. The BGADD pools the resources of the 17 counties and 31 incorporated cities to provide for a more robust professional staff than any of the individual jurisdictions could sustain. The ADD provides support for human resources, economic development, comprehensive planning, and other similar services. The ADD is not a regulatory agency and functions similarly to a professional consultant for the communities.

Of the 48 jurisdictions who support the BGADD, 47 participated in the RHMP. The Lexington-Fayette Urban County Government chose to not participate in development of the plan. Frankfort and Franklin County participated in the plan and created mitigation activities that were approved by Kentucky Division of Emergency Management (KYDEM) and FEMA. The City of Frankfort adopted the BGADD RHMP on November 28, 2005.

The RHMP utilized publicly available data and local input to calculate the risks and exposure of the participating communities. The risk analysis indicated Franklin County is at an “extreme” risk of flooding, due to the Kentucky River and its tributaries. The methods used to calculate risk were similar to the methods used in this plan; however, the analysis and results are less detailed in the RHMP due to the scale of analysis.

The RHMP also included specific goals and actions to achieve those goals to decrease hazard susceptibility and to increase responsiveness in the event of a disaster occurring. The activities included two education projects, one general campaign to publish brochures and pamphlets and another to educate school students about flooding, and a goal to seek funding for a flood control project at the Frankfort City Park.

### **1.3.3 Kentucky State Hazard Mitigation Plan**

The most recent State Hazard Mitigation Plan was written and adopted by the legislature in 2007. The plan includes an assessment of the exposure to natural hazards and the mitigation activities for each county in the state. In addition, there are many hazard mitigation goals in the plan; however, there is minimal jurisdictionally-specific information. Consequently, the State Hazard Mitigation Plan was used extensively as a reference but did not contribute specific actions or guidelines to the development of this plan.

### **1.3.4 City of Frankfort Flood Damage Prevention Ordinance**

Frankfort adopted the FDPO in 2007 to control development in flood-prone areas. The City adopted the plan to implement requirements on development in the floodplain due to the significant burden and safety issues imposed on emergency responders and the financial burden caused by recovery efforts. The FDPO requires all development in the floodplain to obtain approval from the Floodplain Administrator. The ordinance has several different requirements for any proposed development, which will not be enumerated here. Example requirements include:

- The lowest floor of the building shall be at least one foot above the base flood elevation.
- All critical facilities will be located outside of the 100-year floodplain, as much as practicable.
- All structures will be designed to minimize buoyancy and hydraulic pressure due to flooding.

The full ordinance is available here: <http://www.frankfort.ky.gov/downloads/>.

### **1.3.5 City of Frankfort Planning and Development Ordinances**

The Comprehensive Plan, Zoning Ordinance, and Subdivision Ordinance collectively direct development in Frankfort and Franklin County towards areas deemed as suitable or desirable. The suitability, or lack thereof, of an area for development could be based on infrastructure capacity (i.e. water delivery capacity, fire protection, etc.) or innate properties of the area (i.e. steep slopes, flood potential, endangered species, etc.).

The documents consistently direct development away from flood-prone areas to minimize the exposure of infrastructure and citizens to the risks and hazards associated with flooding. In addition, all development within city limits must be approved by the Planning Commission, whose decisions are based on these documents. Each of these documents is available here: <http://www.frankfort.ky.gov/downloads/>.

## **2.0 FLOOD HAZARD**

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Flooding is the most significant natural hazard in Kentucky in terms of damages. Major flooding occurs within the state almost every year and it is not unusual for several floods to occur in a single year. Flooding in Kentucky can be classified under three distinct categories: flash flooding, river basin flooding, and urban flooding. Flash flooding usually occurs within minutes or hours of heavy rainfall, from dam or levee failure, or from sudden release of water held by an ice jam. Most flash flooding is caused by slow moving low pressure weather systems that bring thunderstorms into a local area or by heavy rains associated with hurricanes and tropical

storms. Flash flooding can occur any time throughout the year, but is most prevalent during the spring and summer months. River basin flooding is common among Kentucky's major streams and bodies of water.

Flash and basin flooding is a natural phenomenon. However, urban flooding is a result of inadequate drainage infrastructure in developed areas. Urban flooding occurs where man-made development has obstructed the natural flow of water and/or decreased the ability of natural groundcover to absorb and retain surface water runoff. Urban flooding is typically of short duration, controlled by drainage systems which are incapable of handling the amount of runoff. Unlike basin and flash flooding, urban flooding may be minimized through engineering measures and mitigation activities, such as use of rain gardens, rain barrels, etc. Some urban flooding may occur in all developed areas during significant rainfall events; however, frequent urban flooding is a significant issue to residents and municipalities.

The Kentucky River is the primary source of flooding in Frankfort. The major streams and rivers in Frankfort are shown in **Figure 3**.

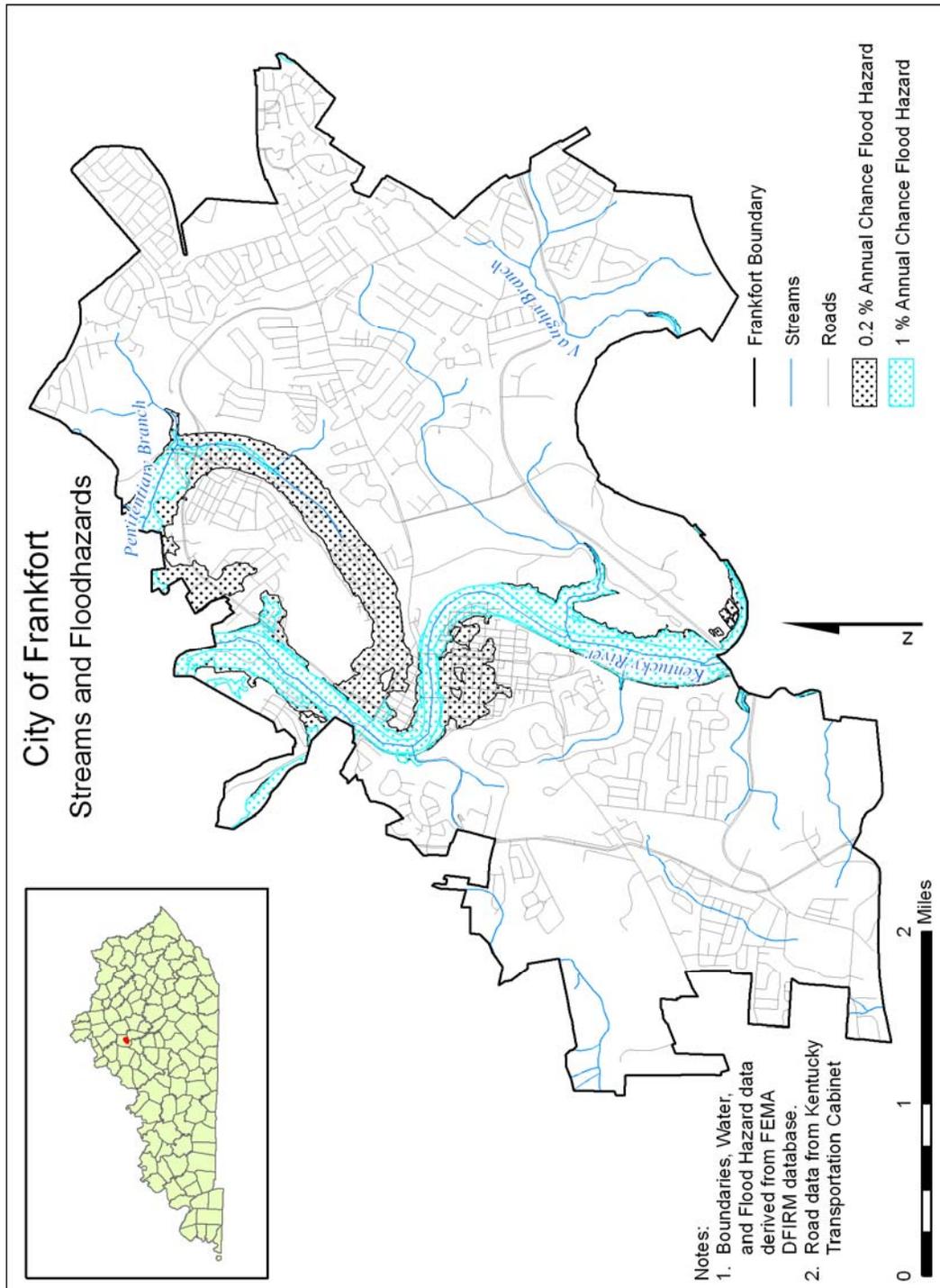


Figure 3. Map Showing the DFIRM Streams in the City of Frankfort with the 100- and 500-year Floodplains

**2.1 FLOOD PROFILE**

The following section provides a “profile” of the flood hazard in the City of Frankfort. This portion of the plan identifies the following information:

- A risk factor table that summarizes the overall risk.
- A description of the hazard and its potential impact.
- Historical background of the hazard and a brief description of known events.
- Probable future occurrences section explaining the likelihood of another occurrence happening in the future based upon annual occurrence ratio derived from the total number of events divided by the time of record.
- Profile maps of the locations and areas affected by the hazard events.

**Table 1. Summary of Flood Risk Factors**

<b>Period of Occurrence</b>	The normal time of year when a hazard occurs.
<b>Number of Events to Date</b>	The number of past events reported to the National Climatic Data Center (NCDC) between 1950-2007.
<b>Annual Chance Probability Ratio</b>	The number of past events divided by time of record.
<b>Warning Time</b>	The amount of time available for shelter to be taken given the natural hazard event.
<b>Potential Impacts</b>	Impacts typically associated with a particular natural hazard.
<b>Injuries and Deaths</b>	The number of injuries or deaths reported to the NCDC.
<b>Property and Crop Damages</b>	The amount of damages reported to the NCDC.

<b>Period of Occurrence</b>	Kentucky River: Late Winter through Spring Flash floods: anytime, but primarily during Spring and Summer rains
<b>Number of Events to-date</b> 1950-2010 (National Climatic Data Center)	14
<b>Annual Chance Probability Ratio</b>	23%
<b>Warning time</b>	River flooding: 3-5 days Flash flooding: minutes to hours
<b>Potential Impacts</b>	Impacts human life, health, and public safety. Utility damage and outages, infrastructure damage (transportation and communication systems), structural damage, fire, damaged or destroyed critical facilities, and hazardous material releases. Can lead to economic

**Table 1. Summary of Flood Risk Factors**

	losses such as unemployment, decreased land values, and agri-business losses. Floodwaters are a public safety issue due to contaminants and pollutants.
<b>Injuries and Deaths</b>	Four reported deaths; no injuries
<b>Property and Crop Damages</b>	\$19.9 million

**2.2 FLOOD HISTORY**

Flooding has always been a problem to communities in Kentucky. The National Climatic Data Center (NCDC) is a division of the National Oceanic and Atmospheric Administration (NOAA), which archives climatic data. The NCDC collects the location and any damage information about storms across the country. **Table 2** lists the flooding events impacting the City of Frankfort and the costs and injuries associated with each event. In addition, if flood damage is severe enough, the U.S. President may initiate a disaster recovery process for the regions affected. Kentucky as a state has had 22 flood related, presidentially declared disasters from 1950-2008, five of which affected Franklin County. **Table 3** shows the flood-related Presidentialy Declared Disasters for Frankfort.

**Table 2. NCDC Flood Events in the City of Frankfort**

Date	Type	Death	Injury	Property Damage (Thousands \$)	Crop Damage (Thousands \$)
3/1/1997	Flood	0	0	5,100	0
3/2/1997	Flood	1	0	9,800	0
7/20/1998	Flash Flood	0	0	0	1,000
3/20/2002	Flood	0	0	0	0
2/17/2003	Flood	0	0	0	0
6/14/2003	Flash Flood	0	0	5	0
5/24/2004	Flash Flood	0	0	0	0
5/30/2004	Flash Flood	0	0	0	0
5/31/2004	Flood	0	0	0	0
6/1/2004	Flood	0	0	0	0
7/14/2006	Flash Flood	0	0	0	0
9/23/2006	Flash Flood	1	0	0	0
8/04/2009	Flash Flood	0	0	0	0
5/03/2010	Flood	0	0	1,005	0

Source: <http://www.ncdc.noaa.gov/oa/ncdc.html>  
 Last updated 12/16/2010

**Table 3. City of Frankfort Declarations - Floods**

<b>Date</b>	<b>Disaster Type</b>	<b>Disaster Number</b>	<b>Funding Received</b> (inflation adjusted for 2008)
03/12/1962	Floods	128	\$3,621,787
03/17/1964	Severe Storms and Flooding	163	\$4,263,027
07/15/1969	Severe Storms and Flooding	265	\$31,109,157
05/15/1972	Heavy Rains and Flood	332	\$2,121,844
12/12/1978	Severe Storms and Flooding	568	\$30,733,216
02/24/1989	Severe Storms and Flooding	821	\$17,757,010
03/04/1997	Severe Storm, Flooding, Tornado	1163	\$172,054,339

Source: <http://www.peripresdecusa.org/mainframe.htm>

Flood history information was primarily obtained from the NCDRC, Presidentially Declared Disaster records, and local information. Given the total of \$15.9 million dollars of impacts over 14 events, the average flood in Frankfort caused approximately \$1.1 million in damages. However, the first record of a flood in the NCDRC database in the City of Frankfort is 1997. In addition, all injuries, deaths, and damages are not reported to the NCDRC, as is evident by the number of events with no data for these categories. Of the 14 events recorded in the NCDRC database, eight do not have any recorded property damages, deaths, or injuries. Based on an analysis of the events with recorded impacts, each flood event will cause 0.3 fatalities and \$2.7 million in property damages. This analysis skews the data significantly, as it does not account for minor flooding that does not cause any substantial impacts to property or any loss of life; therefore, the expected property damages and human impacts are likely somewhere between the two different averages.

### **2.3 FLOOD IMPACTS**

Flooding impacts human life, health, and public safety. Community-wide, the potential for impacts is severe for: utility damage and outages, infrastructure damage (transportation and communication systems), structural damage, fire, damaged or destroyed critical facilities, and hazardous material releases. Flooding also can lead to economic losses such as unemployment, decreased land values, and agri-business losses. Flood impacts may include residential damage, possible business and commercial damage, school closures, and agriculture damages. Most damage occurs to residences when severe floods gain direct entrance to basements, sub-grade living areas, and lower level garages through surface runoff. This type of flooding causes some minor structural damage. Flood waters rarely enter first floor levels by direct runoff, but when it does occur, major structural and content damage occurs. Flood waters also enter sanitary sewer systems through street manholes, which creates major cleanup problems and health hazards, although there is usually no structural damage.

The second major type of flood damage is the flooding of the highways and local roads. Considerable costs are incurred by delays in travel. Flooded roads could impede emergency vehicles and emergency response teams along with other vehicles providing necessary goods and services. Schools are often closed due to lack of access.

A third impact of flooding is neighborhood degradation caused by frequent flooding. These flood events lead to this subtle damage by declining property values. When homes and infrastructure are degraded or damaged by flood waters, the quality of life in the neighborhood will decrease and the time delay in repairing the damage may cause some properties to remain vacant semi-permanently. Thus, repeated flooding of an area has significant indirect effects.

## **2.4 EXTENT OF FLOODING**

The extent, or magnitude, of flooding in Frankfort is constrained through most of the City by the floodwalls and levees along the Kentucky River. Flood depth in the city was calculated from the Flood Insurance Study (FIS) completed by FEMA in 2007 and is shown in **Appendix E, Maps 1 and 2**. Map 1 shows flood depths in the city assuming the flood protection system does not fail. Map 2 shows flood depths in the city if the flood protection systems were to fail completely. The maximum flood depth in the city for the 100-year flood is greater than 35 feet; however, that is only observed within the river channel itself. Flood depths in the areas of the city directly adjacent to the river exceed 15 feet, with flood depths naturally decreasing moving inland. The analysis also indicates the property between Old Lawrenceburg Road (KY-420) and the Kentucky River would be entirely inundated in a 100-year flood if the flood protection infrastructure fails.

Other areas of the city, including South Frankfort, which is protected by the floodwall, may also incur minor flooding (generally less than 5 feet) in depressional areas. One of the most susceptible areas of the city is the historic river channel in North Frankfort, along the Holmes Street corridor, where depths can exceed 15 feet.

During the May 2010 flood, which was the fifth most severe flood recorded in Frankfort, water depths reached 42.8 feet at the USGS Gage, as shown in Figure 2. The average depth recorded by the gage is 10.6 feet. Water depths recorded by the Franklin County Emergency Management Agency varied from 37-43 feet along the river and nearby streets in Frankfort.

## **2.5 PROBABLE FUTURE OCCURRENCES**

For each river, engineers assign statistical probabilities for different sized floods. This is done to rate the size of the flood compared to other floods that have occurred or may occur.

The baseline flood for many engineering designs and hazard mitigation programs is the 100-year flood. FEMA defines the 100-year flood as “The flood elevation that has a one percent chance of being equaled or exceeded each year.” In other words, the term “100-year flood” does not mean that that level of flooding would only occur once per century, rather, it means there is a 1 in 100 probability that that level of flooding would occur in any given year. Thus the 100-year flood could occur more than once in a relatively short period of time.

The NFIP, KYDEM, and the Kentucky Division of Water (KDOW) use this same baseline flooding probability. The 100-year flood is used by the NFIP as the standard for floodplain management.

(Source: <http://www.fema.gov/plan/prevent/floodplain/nfipkeywords/sfha.shtm>)

Another level of risk that is used is the 500-year flood, or 0.2% chance of occurring in any given year. FEMA describes the 500-year flood as deeper than a 100-year flood and covering a greater area, but less likely to occur than a 100-year event. Given that this level of flooding is less likely to occur, it is the standard used for critical facility protection.

**Table 4** indicates the probability of various flood sizes occurring in given time periods in the 100-year floodplain. Notice that during the course of a 30-year mortgage, a homeowner in the 100-year floodplain has a 26% chance of experiencing a 100-year flood, while the odds of experiencing a 10-year event are nearly guaranteed.

**Table 4. Flooding Probability in the 100-year Floodplain**

Time Period	Flood Size			
	10-year	25-year	50-year	100-year
1 Year	10%	4%	2%	1%
10 Years	65%	34%	18%	10%
20 Years	88%	56%	33%	18%
30 Years	96%	71%	45%	26%
50 Years	99%	87%	64%	39%

## 2.6 FLOODPLAINS

Understanding where a community is vulnerable to flooding can have important connotations for land use planning and development decisions in the future. A parcel of land susceptible to flooding should be developed differently than a non-susceptible parcel. In addition, the depth of flooding is an important parameter to understand when developing land use plans and parcel-specific development plans. The damage caused by a flood of several inches would be very different than the damage caused by water several feet deep in a structure.

### 2.6.1 Floodplain Development Pattern

There are 1,187 acres (1.85 square miles) of FEMA-mapped floodplains in Frankfort, accounting for approximately 12% of the total area of the City (**Appendix E, Map 3**). The majority of the floodplains are associated with the Kentucky River running through the center of Frankfort in mostly residential and commercial areas. According to the National Landcover Dataset from data in 2001, 52% of the floodplains in Frankfort are classified as developed, with an additional 40% classified as natural areas, such as forests and wetlands (**Appendix E, Map 4**).

While this is less than an ideal development pattern for flood prone areas, 50% of the developed area is classified as Open Space, which includes parks, golf courses, or other similar land uses. Thus, approximately 75% of the total floodplain is appropriately used by minimally susceptible land uses. **Table 5** shows the different percentages of the developed acreage in the floodplain.

Only 2% of the total developed acreage is classified as High Intensity, which can include apartment complexes or other multi-family residential, or commercial or industrial land uses.

**Table 5. Landcover Classifications in the Floodplain**

Landcover Class	Acreage	Percentage	Developed Landcover Class	Acreage	Percentage
Developed	194.74	52.1%	Open	97.47	50.1%
Natural Areas	148.84	39.8%	Low Density	59.01	30.3%
Open Water	0.24	0.1%	Medium Density	34.67	17.8%
Agricultural	30.22	8.1%	High Density	3.59	1.8%
TOTAL	374.04	100.0%	TOTAL	194.74	100.0%

**2.6.2 National Flood Insurance Program**

Frankfort participates in the NFIP and in the CRS. The NFIP is the program responsible for financially backing flood insurance for property owners and maintains records of policies in effect and the losses within each community participating in the program. The CRS is an incentive-based program to improve flood prevention in participating communities.

Communities receive credit for activities and planning techniques that reduce exposure to flooding or enhance mitigation potential. The citizens of the community who hold NFIP policies receive the benefit of participation, in the form of discounts on insurance premiums. Discounts range from 0-45%. Currently, Frankfort is a Class 8 community, which means residents receive a 10% discount on insurance. **Table 6** summarizes the NFIP information about Frankfort.

**Table 6. Summary of NFIP Insurance Policies and Claims**

Entry Date	July 2, 1981
Current Map Date	September 28, 2007
Policies in Force	189
Value of Policies	\$33,471,300
No. of Paid Losses	813
Total Losses Paid*	\$9,736,083.62
No. of Repetitive Loss Structures*	49
Substantial Damage Claims*	65

\*Since 1978

Source: FEMA CIS database, updated 12/20/10

As part of NFIP recordkeeping, the numbers of properties which have filed for insurance claims more than twice in the last ten years is recorded. These properties are known as repetitive loss properties. Currently, Frankfort has 49 repetitive loss properties, 17 of which have had 4 or more insurance claims. The NFIP also tracks Substantial Damage Claims, which are damages which impact 50% or more of the pre-existing market value of the structure. Any repairs made to a structure with substantial damages are required to comply with all requirements of the

NFIP, including raising the structure above the base flood elevation. There have been 65 substantial damage claims in Frankfort since 1978.

### **2.6.3 Repetitive Loss Properties**

Repetitive Loss (RL) and Severe Repetitive Loss (SRL) properties are a primary concern of FEMA and the NFIP. A map showing the approximate locations of the RL and SRL properties is located in **Appendix E, Map 5**. In order to be classified as RL, a property must have two flood related damage claims exceeding \$1,000 within a 10 year period. SRL properties must be residential, with either four claims of more than \$5,000 each or at least two claims where the building losses are cumulatively greater than the market value of the property. Payments for RL and SRL properties strain the resources of the NFIP and put residents and emergency responders at risk. Across the U.S., RL properties account for 1% of the insurance policies, but they account for 30% of the annual NFIP claims. The table below summarizes information about the RL properties in Frankfort.

**Table 7. Repetitive Loss Property Summary**

Number of Properties	49
Properties Enrolled in NFIP	35
Total Number of Losses	161
Losses to Insured Properties	127
Value of Paid Claims	\$2,903,227
Value of Paid Claims to Insured Properties	\$2,202,396
Number of Buildings with more than 4 Losses	17

There are two SRL properties in Frankfort, with total claims of \$205,859. The average damage claim for these properties is \$20,586. The location of one of the SRL properties is not within or near any floodplain or stream, indicating the flooding is most likely due to inadequate stormwater drainage.

The difficulty with RL properties is illustrated by comparing the value and the number of the claims. Losses paid to RL properties in Frankfort amount to \$2.9 million, which is almost exactly 30% of the total losses paid for property damages in Frankfort. However, the number of claims (161) only account for 20% of the total claims in Frankfort. Thus, RL properties are impacted more frequently and more severely by flooding than other properties. Mitigation of these properties should be a key component of all planning efforts. The location of the RL and SRL properties is available to the local planning agencies through KYDEM.

The majority of the properties are residential; however, the list of RL properties includes a church, multiple commercial buildings, and the Frankfort High School buildings and the Second Street School building.

## 2.7 RISK ASSESSMENT

The risk assessment is the defining section of a flood hazard mitigation plan. The risk assessment portion of the plan defines where communities are most vulnerable to impacts from natural hazards. For example, if a community has a smaller population in one flood-prone area and a high population density in another area, priority should be given to projects to minimize the risk towards the more densely populated area. The risk assessment can involve a number of prioritization parameters, as decided by the planning committee. Examples include the following:

- The size of the population at risk of displacement or injury.
- The age and vulnerability of the at-risk population.
- The importance of the structures in the floodplain (i.e. hospitals, utilities, etc.).
- The replacement costs of the structures.
- The value lost by damage to the property.
- The number of structures at risk.

- The number and/or value of NFIP policies in place.
- The amount of historic NFIP pay-outs.

The risk assessment for this plan is based on the size of the at-risk population, the value of the structures in the floodplain, and the number of critical facilities at risk. The following sections detail the data sources and the methods used to calculate each variable.

According to the 2000 U.S. Census, the average number of people per household in Frankfort is 2.14. Using this number as the number of people per structure, the size of the at-risk population was calculated for each census block and summed, for a result of 541 people. The value of the structures in the floodplain was also calculated based on data from the Franklin County Property Valuation Administration, with a total value of \$47,865,900.

### **2.7.1 At-Risk Population**

Three data sources were utilized to calculate the size of the population living in the floodplain in Frankfort. The first data source was the building locations provided by the City of Frankfort Information Technology Department. The second piece of data used for this calculation was the average household size for the City of Frankfort, according to the 2000 U.S. Census. The final data necessary was the floodplains, as defined by FEMA's DFIRMs.

First, all buildings with less than 700 square feet were excluded from the analysis to exclude garages, sheds, outbuildings, etc. The number of buildings located in the 100-year floodplain (279) was then multiplied by the average household size (2.14 people), for a total vulnerable population of 541 people. This is an estimate of the actual number of people residing in the floodplain, as the level of detail necessary to accurately calculate the at-risk population is unavailable.

### **2.7.2 Structure Value**

The structure value in the floodplains was based primarily on Property Valuation Administration (PVA) data from Franklin County in conjunction with FEMA's floodplains. There are 160 existing buildings at-risk due to the 100 year flood (**Appendix E, Map 6**). The improvement value of all buildings located in the floodplains was summed, for a total value of \$24,047,758. The value of the land was excluded from the calculation as the physical property would not be substantially harmed by floodwaters.

### **2.7.3 Critical Facilities**

As discussed in Section 2.2, plan participants had the opportunity to provide input on the types and locations of critical facilities in Frankfort. The list of critical facilities was based on the dataset collected by FEMA in the HAZUS software. HAZUS is a software program developed by FEMA to assist in the development of models for natural hazard mitigation. FEMA has collected location and value information for several categories of critical facilities in HAZUS, such as hospitals, fire stations, bridges, ports, etc. The compilation of submitted data and the

HAZUS data resulted in the determination that there are fourteen (14) critical facilities located in the Frankfort floodplain. These include:

- One (1) wastewater treatment plant, Value: \$65 million;
- Five (5) wastewater pumping stations, Value: \$10.5 million;
- Five (5) bridges, Value: \$27.5 million;
- One (1) railroad segment, Value: \$745,000;
- Two (2) highway segments (Broadway St. and Capitol Ave.), Value: \$1.14 million;
- One (1) rail station for Central Kentucky Sand and Gravel, Value: \$2.14 million; and,
- One (1) port for Central Kentucky Sand and Gravel, Value: \$1.9 million.

The location of all critical facilities in Frankfort is shown on **Appendix E, Map 7**. Also, while not directly susceptible to flood impacts, the Kentucky River Lock and Dam No.4, located in Frankfort, is a critical facility. Dams require consistent maintenance to prevent structural failures and flooding can put significant pressure on dams. Failure of the dam would have tremendous negative consequences for the property and structures downstream of the dam. The U.S. Army Corps of Engineers (USACE) is responsible for operating and maintaining the dam.

The bridges in Frankfort link the two sides of the city together. The loss of one or two of the bridges could substantially impact traffic flow and be expensive to repair or replace, but the loss would not be catastrophic. If all or most of the bridges were unusable, however, emergency response and commerce would be significantly damaged. Proper care and maintenance of the bridges is vital to minimize the risk of damages. The majority of the bridges are owned and operated by the Kentucky Transportation Cabinet.

#### **2.7.4 Flood Depth Damage Analysis**

A flood depth damage analysis was also conducted to determine real value estimates for structures in the floodplain. Utilizing modeled flood depths from the FEMA Flood Insurance Study (FIS) for Frankfort, Stantec modeled four flood events: the 10, 50, 100, and 500 year floods, with 10, 2, 1, and 0.2% annual probability, respectively. Elevation data was derived from the Light Detection and Ranging (LIDAR) dataset for Frankfort and compared against the flood prone depths associated with the four flood events. Using the FIS and the LIDAR data, the flood depths were calculated on a grid with 50 feet spacing. Stantec then was able to estimate the percentage of a structure which would be impacted by each of the four flood events.

The Franklin County Property Value Assessor's office provided property value data for the City, which was combined with the elevation data to develop real value estimates of annual flood losses. The method is intended to provide an estimate of flood related losses annually for the entire city. This process is based on the FEMA Benefit Cost Analysis procedure.

Based on the analysis, the City of Frankfort is estimated to have approximately \$104,405 of loss, annually. Note this is an average loss estimate, meaning that a flood is unlikely to impact Frankfort every year. The tables below summarize the data for the four different flood events assuming floodwall and levee protection. A map showing the locations of structures impacted by flooding, by the various flood events, is provided in **Appendix E, Map 6**.

**Table 8. Impacts from a 10 year (10% Annual Probability) Flood Event**

Zoning Classification	Number of Buildings	Total Value	Average Annualized Loss
Commercial	5	\$746,666	\$25,551
Residential	1	\$52,500	\$259
Industrial	1	\$156,250	\$154
Historic	0	\$0	\$0
Government	14	\$3,811,111	\$18,894
<b>TOTAL</b>	<b>21</b>	<b>\$4,766,527</b>	<b>\$44,858</b>

**Table 9. Impacts from a 50 year (2% Annual Probability) Flood Event**

Zoning Classification	Number of Buildings	Total Value	Average Annualized Loss
Commercial	31	\$10,061,250	\$11,725
Residential	16	\$1,037,062	\$320
Industrial	4	\$487,500	\$217
Historic	4	\$492,500	\$864
Government	45	\$5,612,677	\$8,956
<b>TOTAL</b>	<b>100</b>	<b>\$17,690,989</b>	<b>\$22,082</b>

**Table 10. Impacts from a 100 year (1% Annual Probability) Flood Event**

Zoning Classification	Number of Buildings	Total Value	Average Annualized Loss
Commercial	40	\$10,502,000	\$10,162
Residential	32	\$2,186,061	\$1,252
Industrial	6	\$685,416	\$185
Historic	22	\$5,182,083	\$890
Government	60	\$5,492,198	\$5,869
<b>TOTAL</b>	<b>160</b>	<b>\$24,047,758</b>	<b>\$18,358</b>

**Table 11. Impacts from a 500 year (0.2% Annual Probability) Flood Event**

<b>Zoning Classification</b>	<b>Number of Buildings</b>	<b>Total Value</b>	<b>Average Annualized Loss</b>
Commercial	286	\$71,329,792	\$2,508
Residential	506	\$30,866,446	\$894
Industrial	105	\$6,997,469	\$1,623
Historic	38	\$6,797,000	\$704
Government	198	\$254,750,624	\$13,378
<b>TOTAL</b>	<b>1133</b>	<b>\$370,741,331</b>	<b>\$19,107</b>

The detailed depth damage analysis is too complex to readily include in this plan. However, the data and results have been supplied to the Plan Administrator to be used in future mitigation planning efforts. Any future grant applications for mitigation activities must include a detailed cost-benefit analysis and this data will expedite the analysis.

**2.8 FUTURE SUSCEPTIBILITY**

Future susceptibility is based on estimated population growth and the need for future structures in the hazard area. For multi-hazard mitigation plans that include natural hazards that impact large areas of the community, this is an important tool to adequately prepare for the future. However, in many communities across the nation, including Frankfort, development in the floodplain is heavily regulated or completely restricted. As such, future susceptibility is unlikely to increase substantially as new development is restricted to that which is suitable for flood prone areas. Susceptibility of the residential structures in the floodplain will gradually decrease over time, as more structures are flood-proofed or removed.

**2.9 MITIGATION STRATEGY**

Mitigation strategies for flooding are the goal of the preceding planning efforts. The Mitigation Strategy portion of this plan leverages the results of the hazard identification and vulnerability assessment to identify local risk reduction goals and actions. The process incorporated participation and coordination amongst the planning team to develop goals and actions that are specific, measurable, achievable, relevant, and time or schedule dependent (SMART).

The mitigation strategies developed by the plan participants provide a blueprint for reducing the potential losses identified in the risk assessments and does not conflict with existing authorities, policies, programs, and/or resources.

**2.9.1 Definition of Mitigation**

FEMA defines mitigation as “sustained action that reduces or eliminates long-term risk to people and property from hazards and their effects.” Mitigation is the on-going effort at the federal, state, local, and individual levels to decrease the impact of disasters upon families, homes,

jurisdictions, and the economy. Mitigation also includes making existing and future development in hazard-prone areas safer. A jurisdiction can steer growth toward areas with fewer risks through non-structural measures, such as restricting development in flood-prone areas or requiring structural adaptations for earthquake susceptible areas. Preventing damages to property and loss of lives is the essence of mitigation. Incorporating mitigation into decisions relating to a jurisdiction's growth can result in a safer, more resilient jurisdiction, and one that is more attractive to families and businesses.

Mitigation on the personal level can reduce the likelihood of disruption and property damage due to natural hazards. Mitigation actions individuals can take may include becoming aware of hazards and preparing a response plan for their household or locating structures and critical components (i.e. electrical junction boxes) away from hazard prone areas.

### **2.9.2 Mitigation Goals**

Mitigation goals are the overlying directives to guide specific mitigation actions in a hazard mitigation plan. The planning participants chose to utilize the FEMA suggested mitigation goals. Individuals were also given the opportunity to develop additional goals during the mitigation strategy development process, if they desired. The mitigation goals utilized for this plan are:

1. Reduce risks through regulations, including building codes, restricting development in hazardous areas, etc.
2. Reduce exposure to hazards through building or parcel specific activities, such as flood-proofing, structure acquisition, or retrofitting.
3. Reduce impacts through response and recovery activities that are implemented during a disaster.
4. Minimize impacts through projects, such as detention basins, tornado sirens, etc.
5. Assist residents to prepare for risks and implement protective measures to better protect themselves and their property.
6. Prevent the overflow of untreated or minimally treated sewage into public waterways or onto private property.

### **2.9.3 Mitigation Strategies**

The mitigation strategies were developed through cooperation of the planning participants, individual conversations, and meeting discussions. The planning participants developed a series of community mitigation worksheets defining the action, the responsible agencies, and potential funding sources. The worksheets encouraged the planning team members to evaluate local resources and local needs to create mitigation activities which the community would be capable of completing. The mitigation activities are included as **Appendix F**. A map showing the location of the proposed mitigation activities is shown in **Appendix E, Map 8**. The numbering on the map corresponds to the number of the mitigation activity.

The mitigation strategies are primarily focused on improvement of stormwater and waste water handling systems. For example, the Sewer Board proposes to relocate the waste water pumping stations out of the flood hazard area and the Public Works Department plans to purchase backup generators for the pump stations behind the floodwall and levee. While these activities will not directly impact the RL and SRL properties in Frankfort, improving the infrastructure will prevent some properties from flooding.

The city should also focus on rehabilitation or removal of RL properties. The primary focus should be the two SRL properties in the City. One of the SRL properties is not located near any mapped stream or floodplain, thus indicating infrastructure improvements in the area could potentially alleviate the problem causing the flooding. This same SRL is also close to a RL property, thus improving the one area could beneficially impact two priority properties. Other strategies may focus on flood-proofing, warning systems, and awareness programs to help landowners prepare for flooding.

The mitigation strategies primarily focus on decreasing the susceptibility of existing buildings. However, several of the strategies will also benefit new buildings within the city. The alterations and improvements to the sanitary sewer system (Activities 4 and 5) would protect new buildings by decreasing their exposure to untreated and minimally treated sewage. Activity 1 would also benefit new buildings in the city by reducing the likelihood of flooding behind the floodwalls and levees.

Prior to implementation of a mitigation activity, a full benefit-cost analysis must be completed, especially if the City intends to apply for grant funding. This analysis will be expedited by using the flood risk analysis conducted by Stantec, which was provided to the Department of Planning and Building Codes. In addition, each mitigation activity must maintain compliance with the NFIP requirements. In order to maintain compliance with NFIP, the mitigation activities must not increase the risk of or the community's exposure to flooding, support the construction of any structure in the floodplain, and other similar activities.

**2.9.4 Prioritization of Mitigation Activities**

Each planning participant worked with community resources to develop mitigation activities based upon local vulnerabilities and capabilities. These actions were identified and prioritized based on need, local capabilities, and the capacity of an action to eliminate or reduce risk. The following table summarizes the categories defining the different priorities.

**Table 12. Activity Prioritization**

Priority	Description
A-Very High	Priority A projects permanently eliminate damages or significantly reduce the probability of deaths and injuries in a specified area. Priority A is also given to other activities that have a high probability of systematically reducing damages or deaths and injuries across a wide area from one or more hazards.

**Table 12. Activity Prioritization**

Priority	Description
B-High	Priority B projects permanently reduce damages in a specified area. Priority B is also given to other activities with the potential for reducing damages, deaths and injuries across a wide area from one or more hazards.
C-Medium	Priority C projects, or activities, permanently reduce damages or significantly reduce the probability of deaths and injuries in a specified area from one of the community's less significant hazards.
D-Low	Priority D projects or activities help alert the public to the approach of a threat from any hazard, or educate the public about the need for disaster preparedness and mitigation.

**2.9.5 Activity Benefit-Cost Review**

As part of the development of the mitigation actions, the planning participants were asked to consider the return on investment for each proposed activity. Both the benefits and the costs were examined on a qualitative basis (i.e. High, Medium, or Low). The three categories were divided based on the estimated value of the benefits derived or the cost of implementing the action or project. If the costs or benefits were expected to be less than \$100,000, the category was Low. If costs or benefits exceeded \$100,000 but be less than \$500,000, the category was Medium. If costs or benefits were expected to surpass \$500,000, the category was High. The result produced a generalized approach for assessing relative benefit to cost ratios.

The planning participants were aware that a more detailed benefit-cost analysis would be required prior to implementation of an activity. When FEMA grant funding was suggested as the funding source for an activity, the group recognized that a FEMA approved benefit-cost analysis would be necessary.

**2.9.6 Mitigation Activity Implementation**

Mitigation activities will be implemented through the combined efforts of local governmental agencies, concerned citizens and stakeholders, and federal agencies, which are often the primary source of funding for projects. All activities seeking federal funding must complete a benefit-cost analysis complying with FEMA standards. In addition, each action must be analyzed for potential hurdles and/or burdens. An ideal system for conducting this analysis is the STAPLEE method. STAPLEE is an acronym, which stands for Social, Technical, Administrative, Political, Legal, Environmental, and Economic. Each of these categories may create difficulties in the implementation process that may be resolved or minimized if handled appropriately.

During the mitigation activity planning process, each of the participants was asked to identify the likely manager of each of the activities. If the listed responsible agency is appropriate, they should conduct the detailed planning and implementation of the projects in coordination with applicable agencies and interested parties. Each of the mitigation actions must maintain compliance with the standards of the NFIP.

### 3.0 Other Hazards

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Though this plan is predominately directed at mitigating losses due to flooding, other natural hazards impact the City of Frankfort. This plan will not address the other hazards in as much detail; however, it is important to be aware of other hazards and the risks associated with them. The Kentucky State Hazard Mitigation Plan (KSHMP) considered the following hazards:

- Dam failure
- Drought
- Earthquake
- Extreme heat
- Flood
- Karst/Sinkhole
- Land subsidence
- Landslide
- Severe storm
- Severe winter storm
- Tornado
- Wildfire

All of these hazards are unlikely to impact Frankfort, notably wildfires and landslides. Land subsidence due to mining is also unlikely; however, the geology around Frankfort is suitable for sinkhole development. The following hazards are discussed below:

- Dam failure
- Drought
- Earthquake
- Extreme heat
- Hailstorm
- Severe storm
- Severe winter storm
- Tornado

Most natural hazards may cause other hazards or exacerbate difficult or dangerous conditions. For example, severe storms may cause flooding and an extreme heat event during a drought may be extremely dangerous to cattle and outdoor laborers. Thus, an understanding of each of the hazards is important to adequately prepare for future natural hazard events.

#### 3.1 DAM FAILURE

According to the KSHMP there are approximately 80,000 dams in the United States, many privately owned. Other dams are owned by states, local municipalities, public utilities, and federal agencies. Dams can provide many benefits including drinking water, navigation, water for crops, hydroelectric power, lakes for recreation, and reducing flooding. However, if dams are not designed, operated and maintained appropriately, dam failure can cause significant property damage and loss of life. The National Dam Safety Program is designed to protect Americans from these potential losses. Dams are classified based on the assessment of the potential damages downstream from the dam. Dam classifications range from Class A to Class C. A Class A dam is one with where no loss of life is expected and damage will only occur to the dam owner's property. A Class B dam is one where loss of human life is not probable, but economic loss, environmental damage, and/or disruption of lifeline facilities can be expected. Class C is indicated for dams if the loss of one or more human life is possible. The average age of dams in the U.S. is 40 years old.

There are several types of dams, including embankment, concrete, concrete arch, and coal impoundment dams. Embankment dams are the most common type of dams. Construction materials can include natural soil, rock, or waste materials from mining or milling operations. According to the KSHMP, 81% of dams inventoried in the U.S. are earthen dams. Concrete and concrete arch dams utilize the weight of the concrete to maintain structural integrity. Concrete dams often serve multiple purposes, such as water retention and electrical generation. Concrete dams also enable the construction of locks to allow navigation through the dam. Coal impoundments are dams utilized in the coal mining or power generation process. Typically they are constructed using earthen materials, such as rock and soil, and/or coal waste products, such as coal ash.

### **3.1.1 Potential Impacts**

The hazard associated with dams is the risk due to failure of the dam. If it occurs, failure of a dam is usually catastrophic, resulting in the loss of nearly all of the retained water. As the dam fails, the high quantity and flow rate of the water can cause scouring and may undermine buildings and bridges, causing substantial damage. The Lock and Dam No. 4 on the Kentucky River is owned and operated by the USACE and is located in Frankfort; however, it is downstream of the majority of the City of Frankfort. Consequently, the majority of any damage would be caused to the northern portion of the City and areas just outside of the city limits. However, there are other dams upstream of Frankfort which may cause damages to the City. The risk to the City is in the same areas most susceptible to natural flooding, such as the homes along Paul Sawyer Drive.

## **3.2 DROUGHT**

A drought is defined as the cumulative deficit of precipitation relative to what is normal for a region over an extended period of time. Unlike other natural hazards, a drought is a non-event that evolves as a prolonged dry spell. Droughts occur when a long period passes without substantial rainfall. A heat wave combined with a drought is a very dangerous situation.

When a drought begins or ends may be difficult to determine. A drought can be short, lasting just a few months, or persist for years before climatic conditions return to normal. While drought conditions can occur at any time throughout the year, the most common time is during the summer months. High temperatures, prolonged high winds, and low relative humidity can aggravate drought conditions.

Because the impacts of a drought accumulate slowly at first, a drought may not be recognized until it has become well established. The many aspects of drought reflect its varied impacts on people and the environment. While the impacts of precipitation deficit may be extensive, it is the deficit, not the impacts, that defines a meteorological drought.

Droughts can lead to economic losses such as unemployment, decreased land values, and agronomic losses. In 1998, over two billion dollars in property loss was credited to drought in the U.S.

The Palmer Drought Severity Index (PDSI), in the table below, indicates the prolonged and abnormal moisture deficiency or excess. The PDSI is an important climatological tool for evaluating the scope, severity, and frequency of prolonged periods of abnormally dry or wet weather. It can be used to help delineate disaster areas and indicate the availability of irrigation water supplies, reservoir levels, range conditions, amount of stock water, and potential intensity of forest fires.

**Table 13. Palmer Classification System**

-4.0 inches or less	Extreme drought
-3.0 inches to -3.99 inches	Severe drought
-2.0 inches to -2.99 inches	Moderate drought
-1.9 inches to -1.99 inches	Mild drought
-0.5 inches to -0.99 inches	Incipient dry spell
0.49 inches to -0.49 inches	Near normal
0.5 inches to 0.99 inches	Incipient wet spell
1.0 inches to 1.99 inches	Slightly wet
2.0 inches to 2.99 inches	Moderately wet
3.0 inches to 3.99 inches	Very wet
+4.0 inches or more	Extremely wet

Drought is measured in the PDSI according to the level of recorded precipitation against the average, or normal, amount of precipitation for a region.

**3.2.1 Drought Impacts**

Crop failure is the most apparent effect of drought in that it has a direct impact on the economy and, in many cases, health (nutrition) of the population that is affected by it. Due to a lack of water and moisture in the soil, many crops will not produce normally or efficiently and, in many cases, may be lost entirely, causing loss of income to the farm and, potentially, loss of jobs for farm hands.

Water shortage is a very serious effect of drought in that the availability of potable water is severely decreased when drought conditions persist, especially if the water source is surface water. Springs, wells, streams, and reservoirs have been known to run dry due to the decrease in ground water, and, in extreme cases, navigable rivers have become unsafe for navigation as a result of drought.

Fire susceptibility is also increased with the lack of moisture associated with a drought. Dry conditions have been known to promote the occurrence of widespread wildfires and allow fires to spread more rapidly due to the dryness of the vegetation. In cases of extreme or prolonged drought, environmental degradation in the forms of erosion and ecological damage can be seen. As moisture in topsoil decreases and the ground becomes drier, the susceptibility to windblown erosion increases. As a drought is prolonged, root systems can be damaged and/or destroyed

resulting in loss of habitat for some species and causing long-term loss of productivity. In addition, during extended drought situations the soil surrounding structures may subside, creating cracks in foundations and separation of foundations from above ground portions of the structure.

According to the NCDC database, Frankfort has not been impacted by a drought since 1950. However, there were significant droughts across Kentucky in both 2007 and 2010. One of the reasons for the lack of documentation may be due to the difficulty in determining damages. For most droughts, the primary damages are related to low yields for agricultural products and the additional expense of pumping water. The costs of droughts are primarily diffuse and somewhat difficult to quantify. In general, Frankfort is minimally susceptible to drought, as it is a non-agricultural community.

### **3.3 EARTHQUAKE**

An earthquake is a sudden, rapid shaking of the earth caused by the breaking and shifting of rock beneath the earth's surface. The forces of plate tectonics have shaped the earth as the huge plates that form the earth's surface move slowly over, under, and past each other. Sometimes the movement is gradual while at other times, the plates are locked together, unable to release the accumulating energy. When the accumulated energy grows strong enough, the plates break free releasing the stored energy and producing seismic waves, generating an earthquake.

Ground motion is the movement of the earth's surface during earthquakes or explosions and is the catalyst for most of the damage during an earthquake. Ground motions are amplified by soft soils overlying hard bedrock, referred to as ground motion amplification. Ground motion amplification can cause an excess amount of damage during an earthquake, even to sites very far from the epicenter.

Earthquakes can affect hundreds of thousands of square miles, cause damage to property measured in the tens of billions of dollars, result in fatalities and injuries to widespread populations, and disrupt the social and economic functioning of the affected area. Earthquakes can collapse buildings and bridges, disrupt utilities, and sometimes trigger secondary disasters, such as landslides, avalanches, flash floods, fires, and destructive ocean waves (tsunamis). During an earthquake, buildings with foundations resting on unconsolidated fill and other unstable soil and trailers and homes not tied to their foundations are at special risk because they can be shaken off of their foundations.

Most property damage and earthquake-related deaths are caused by the failure and collapse of structures. The level of damage depends upon the amplitude and duration of the shaking, which are directly related to the earthquake size, distance from the fault site, and regional geology.

Earthquake impacts may be highly variable depending on the location of the epicenter, demographics, geology, topography, and building codes. The Northridge, California,

earthquake of January 17, 1994, struck a modern urban environment generally designed to withstand the forces of earthquakes. Relatively few lives were lost due to the earthquake, but its economic cost was estimated at \$20 billion. Exactly one year later, Kobe, Japan, a densely-populated community less prepared for earthquakes than Northridge, was devastated by the most costly earthquake ever to occur. Property losses were projected at \$96 billion, and at least 5,378 people were killed. These two earthquakes tested building codes and construction practices, as well as emergency preparedness and response procedures.

California experiences the most frequent damaging earthquakes. But earthquakes in the central or eastern United States affect much larger areas than earthquakes of similar magnitude in the western United States. The largest earthquakes ever felt in the continental U.S. were along the New Madrid Fault in Missouri, where a three-month long series of quakes from 1811 to 1812 included three quakes larger than a magnitude 8 on the Richter scale. These earthquakes were felt over the entire eastern U.S., with portions of Missouri, Tennessee, Kentucky, Indiana, Illinois, Ohio, Alabama, Arkansas, and Mississippi experiencing the strongest ground shaking.

The University of Memphis estimates that during a 50 year period the probability of a repeat of the 1811-1812 earthquakes is 7-10% for a magnitude of 7.5-8.0%; and 25-49% for a magnitude 6.0 or larger.

### **3.3.1 Earthquake Magnitude**

Earthquakes are measured in terms of their magnitude and intensity. Magnitude is measured using the Richter scale that describes the energy release of an earthquake through a measure of shock wave amplitude. Intensity is most commonly measured using the Modified Mercalli Intensity (MMI) scale.

The Richter scale measures an earthquake's magnitude using an open-ended logarithmic scale that describes the energy release of an earthquake through a measure of shock wave amplitude. An earthquake's magnitude is expressed in whole numbers and decimal fractions. Each whole number increase in magnitude represents a 10-fold increase in measured wave amplitude, or a release of 32 times more energy than the preceding whole number value.

The Modified Mercalli scale measures the effect of an earthquake on the earth's surface. Composed of 12 increasing levels of intensity that range from unnoticeable shaking to catastrophic destruction, the scale is designated by Roman numerals. The intensity of each event corresponds with Roman numerals, with I corresponding to imperceptible (instrumental) events, IV corresponding to moderate (felt by people awake), to XII for catastrophic (total destruction). The lower values of the scale detail the manner in which people feel the earthquake, while the increasing values are based on observed structural damage. The intensity values are assigned after gathering responses to questionnaires administered to postmasters in affected areas in the aftermath of the earthquake.

A detailed description of the Modified Mercalli scale of Earthquake Intensity and its correspondence to the Richter scale is given in **Table 14**.

**Table 14. Modified Mercalli Intensity Scale for Earthquakes**

Scale	Intensity	Description	Corresponding Richter Scale Magnitude
I	Instrumental	Detected only on seismographs	
II	Feeble	Some people feel it	<4.2
III	Slight	Felt by people resting; like a truck rumbling by	
IV	Moderate	Felt by people walking	
V	Slightly Strong	Sleepers awake; church bells ring	<4.8
VI	Strong	Trees sway; suspended objects swing, objects fall off shelves	<5.4
VII	Very Strong	Mild Alarm; walls crack; plaster falls	<6.1
VIII	Destructive	Moving cars uncontrollable; masonry fractures, poorly constructed buildings damaged	
IX	Ruinous	Some houses collapse; ground cracks; pipes break open	<6.9
X	Disastrous	Ground cracks profusely; many buildings destroyed; liquefaction and landslides are widespread	<7.3
XI	Very Disastrous	Most buildings and bridges collapse; roads, railways, pipes and cables destroyed; general triggering of other hazards	<8.1
XII	Catastrophic	Total destruction; trees fall; ground rises and falls in waves	>8.1

Earthquakes strike suddenly and without warning and can occur at any time of the year, and at any time of the day or night. On a yearly basis, 70 to 75 damaging earthquakes occur throughout the world. Estimates of losses from a future earthquake in the US approach \$200 billion. There are 45 states and territories in the U.S. at moderate to very high risk from earthquakes.

**3.3.2 Earthquake Impacts**

The effects from earthquakes are caused by ground shaking, surface faulting, ground failure, and less commonly, tsunamis. Ground shaking is a term used to describe the vibration of the ground during an earthquake. As a generalization, the severity of ground shaking increases as magnitude increases, and decreases as distance from the source increases. Surface faulting is the differential movement of the two sides of a fracture at the earth’s surface. Death and injuries from surface faulting are very unlikely, but casualties can occur indirectly through fault damage to structures.

Ground failure many times is induced by liquefaction which is a physical process, not a type of ground failure. Liquefaction occurs due to the shaking associated with an earthquake. As the

seismic waves move through a soil, the soil temporarily loses strength and acts like a viscous fluid rather than solid soils. Lateral spreads involve the lateral movement of large blocks of soil as a result of liquefaction in a subsurface layer. Lateral spreads generally develop on gentle slopes, most commonly on those between 0.3 and 3 degrees. Horizontal movements on lateral spreads commonly are as much as 10 to 15 feet, but, where slopes are particularly steep and the duration of ground shaking is long, lateral movement may be as much as 100 to 150 feet. Lateral spreads usually break up internally, forming numerous fissures and scarps.

Earthquakes can impact human life, health and public safety. Power outages, utility damage, infrastructure damage, structural damage, fire outbreaks, damaged or destroyed critical facilities, and hazardous material releases are all potential impacts following an earthquake event. Travel to any location can be extremely dangerous after an earthquake and should be avoided if possible due to road failures and fallen utility lines.

Aftershocks and secondary events often occur after the main quake and could trigger landslides, release of hazardous materials, and dam failure (which could lead to flooding). The greatest hazard potential for earthquakes exists in highly populated areas, because these areas tend to have a greater number of tall buildings that are more vulnerable to seismic impact. Buildings and infrastructure (roads, bridges, etc.) built during the 1920s to 1960s are also generally more susceptible to seismic movement than newer construction.

Geology also strongly impacts the severity and geographic extent of earthquake damages. Although earthquakes in the central or eastern U.S. occur less frequently, they affect much larger areas than earthquakes of similar magnitude in the western U.S. For example, the San Francisco earthquake of 1906 (magnitude 7.8) was felt 350 miles away in the middle of Nevada, whereas the New Madrid earthquake of December 1811 (magnitude 8.0) rang church bells in Boston, Massachusetts, 1,000 miles away. Differences in geology east and west of the Rocky Mountains cause this strong contrast.

An earthquake in Frankfort may have significant negative consequences. As discussed in the Dam Failure section, there are multiple dams upstream of Frankfort on the Kentucky River, in addition to Lock and Dam No.4. Failure of any of these dams could have substantial impacts to the infrastructure in and residents of Frankfort. Failure of the bridges across the Kentucky River would also have immediate impact to the economy and safety within the City. Failure of all five of the bridges is unlikely, but possible.

### **3.4 EXTREME HEAT**

Temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks are defined as extreme heat. Our bodies dissipate heat by varying the rate and depth of blood circulation, by losing water through the skin and sweat glands, and as a last resort, by panting, when blood is heated above 98.6°F. Sweating cools the body through evaporation. However, high relative humidity retards evaporation, robbing the body of its ability to cool itself.

CITY OF FRANKFORT FLOOD MITIGATION PLAN

Other Hazards  
June 2011

Heat kills by taxing the human body beyond its abilities to cool itself. In a normal year, about 175 Americans succumb to the demands of summer heat. In the 40-year period from 1936 through 1975, nearly 20,000 people were killed in the US by the effects of heat and solar radiation. In the disastrous heat wave of 1980, more than 1,250 people died.

How our bodies respond to heat is impacted by a combination of the air temperature and the relative humidity. Hydration and cooling needs are different for a 90°F day with 30% humidity versus a 90°F day with 90% humidity. The National Weather Service (NWS) has devised a measurement system known as the heat index (HI) to estimate the temperature a person is exposed to over a common temperature and humidity range. The NWS will initiate alert procedures when the HI is expected to exceed 105°- 110°F for at least two consecutive days. The chart below shows the HI that corresponds to the actual air temperature and relative humidity.

°F	90%	80%	70%	60%	50%	40%
80	85	84	82	81	80	79
85	101	96	92	90	86	84
90	121	113	105	99	94	90
95		133	122	113	105	98
100			142	129	118	109
105				148	133	121
110						135

HI	Possible Heat Disorder:
80°F - 90°F	Fatigue possible with prolonged exposure and physical activity.
90°F - 105°F	Sunstroke, heat cramps and heat exhaustion possible.
105°F - 130°F	Sunstroke, heat cramps, and heat exhaustion likely, and heat stroke possible.
130°F or greater	Heat stroke highly likely with continued exposure.

\*<http://www.crh.noaa.gov/pub/heat.htm>

\* Due to the nature of the heat index calculation, the values in the table have an error +/- 1.3 F.

Figure 4. Temperature versus Relative Humidity Scale

**3.4.1 Extreme Heat Impacts**

When heat gain exceeds the level the body can remove, body temperature begins to rise, and heat related illnesses and disorders might develop. Elderly persons, small children, chronic invalids, those on certain medications and persons with weight and alcohol problems are particularly susceptible to heat reactions, especially during heat waves in areas where a moderate climate usually prevails. Heat disorders generally have to do with a reduction or collapse of the body’s ability to shed heat by circulatory changes and sweating, or a chemical (salt) imbalance caused by too much sweating. When heat gain exceeds the level the body can remove, or when the body cannot compensate for fluids and salt lost through perspiration, the temperature of the body’s inner core begins to rise and heat-related illness may develop.

Ranging in severity, heat disorders share one common feature: the individual has overexposed or over exercised for their age and physical condition in the existing thermal environment. Studies indicate that, other things being equal, the severity of heat disorders tend to increase with age. Heat cramps in a 17 year old may be heat exhaustion in someone 40 years old and heat stroke in a person over 60 years old.

Sunburn is the lowest level of over-exposure. Though sunburn is not an effect of exposure to heat, but rather to solar radiation, sunburn can significantly retard the skin’s ability to shed excess heat. Heat cramps are painful spasms usually in the muscles of the legs and abdomen, generally accompanied by heavy sweating. Heat exhaustion is the next level of impact caused by excessive heat. Heat exhaustion causes heavy sweating, muscular weakness, and a weak pulse. The skin is also cold, pale and clammy. Heat stroke (or sunstroke) is the worst possible symptom of excess heat, prior to death. To be classified as heat stroke, the victim’s body temperature is 106°F. or higher, with hot dry skin and sweating has stopped by this point due to lack of body moisture. **Table 15** summarizes the temperature ranges where heat-related illnesses are common and the impacts likely to occur with each.

**Table 15. Heat Index/Heat Disorders Impacts**

<b>Heat Index</b>	<b>Heat Disorders Impacts</b>
130°F or Higher	Heatstroke/sunstroke highly likely with continued exposure
105°F- 130°F	Sunstroke, heat cramps or heat exhaustion likely, and heatstroke possible with prolonged exposure and/or physical activity
90°F- 105°F	Sunstroke, heat cramps and heat exhaustion possible with prolonged exposure and/or physical activity
80°F - 90°F	Fatigue possible with prolonged exposure and/or physical activity

The most substantial heat-related impacts to the public include potential difficulties with electrical power and drinking water availability. Usage of utilities (electric and water) to combat the effects of the heat cause a strain on the system due to air conditioners, fans, and water

usage, etc. In extreme cases, roads, bridges, and railroad tracks have been known to suffer damage from extreme heat conditions.

Extreme heat events would primarily impact the elderly in Frankfort. Outdoor laborers would also be at significant risk of heat related disorders. The risk of damage to infrastructure in the City due to extreme heat is minimal.

### **3.5 HAILSTORM**

Hail is defined as the precipitation in the form of pellets of ice larger than five millimeters (0.2 inches) in diameter. Hail is a relative frequent occurrence associated with thunderstorms. Hail is formed as ice pellets are lifted by updrafts and collect super cooled water droplets. During this process the hail continues to increase in size until it becomes too heavy to be lifted by the winds. Hail-streaks, the area where the hail falls, can be more than a mile wide and multiple miles long.

#### **3.5.1 Hail Impacts**

Hail is a relatively common hazard capable of producing extensive property damage as the hailstones fall at speeds as high as 120 miles per hour. Small hailstones may not be damaging, but large hail has dented metal, broken glass, and caused injuries. Hail regularly causes damages to roofs and vehicles. Hail can cause thousands of dollars in damages to property and crops.

Hail is unlikely to significantly impact most infrastructure, such as bridges, hospitals, etc., but may cause substantial damage to some types of infrastructure, such as above-ground electrical and communication systems. In addition, hail may damage crops, vehicles (including police cruisers and fire trucks), and building roofs.

The NCDC records 20 instances of hail in Frankfort from 1950 to 2010, with zero recorded property or crop damages and no injuries or fatalities.

### **3.6 SEVERE STORMS (THUNDERSTORMS)**

A thunderstorm is formed from a combination of moisture, rapidly rising warm air and a force capable of lifting air such as a warm and cold front, a sea breeze or a mountain. All thunderstorms contain lightning and may occur singly, in clusters or in lines. Thus, it is possible for several thunderstorms to affect one location in the course of a few hours. Some of the most severe weather occurs when a single thunderstorm affects one location for an extended period time. The NWS considers a thunderstorm as severe if it develops  $\frac{3}{4}$  inch hail or 50-knot (58 mph) winds. In the last 25 years, severe storms have been involved in over 300 federal disasters.

Radar observers use the intensity of the radar echo to distinguish between rain showers and thunderstorms. Lightning detection networks routinely track cloud-to-ground flashes, and therefore thunderstorms.

Thunderstorms occur when clouds develop sufficient upward motion and are cold enough to provide the ingredients (ice and super cooled water) to generate and separate electrical charges within the cloud. The cumulonimbus cloud is the perfect lightning and thunder factory, earning its nickname, "thunderhead". All thunderstorms are dangerous and capable of threatening life and property in localized areas.

While thunderstorms and lightning can be found throughout the U.S., they are most likely to occur in the central and southern states. The NWS estimates more than 100,000 thunderstorms occur in the U.S. each year. Thunderstorms are also capable of producing tornadoes and heavy rain that can lead to flash flooding. These hazards are addressed separately in the plan.

Thunderstorms affect relatively small areas as the average storm is 15 miles in diameter and lasts an average of 30 minutes. Nearly 1,800 thunderstorms are occurring at any moment around the world; however, of the estimated 100,000 thunderstorms that occur each year in the U.S., only about 10 percent are classified as severe.

Lightning is an electrical discharge that results from the buildup of positive and negative charges within a thunderstorm. When the buildup becomes strong enough, lightning appears as a "bolt". This flash of light occurs within the clouds or between the clouds and the ground. A bolt of lightning reaches a temperature approaching 50,000 degrees Fahrenheit in a split second. The rapid heating and cooling of air near the lightning causes thunder.

Lightning is the second most frequent killer in the U.S. Each year, lightning is responsible for an average of 93 deaths (more than tornadoes), 300 injuries, and several hundred million dollars in damage to property. In the United States, there are an estimated 25 million cloud-to-ground lightning strikes each year. The average deaths attributed to lightning strikes exceed those attributed to tornadoes. Lightning usually claims only one or two victims at a time and does not cause mass destruction of property, and because of this, it is underrated as a risk.

### **3.6.1 Severe Storm Impacts**

Severe storms may cause significant damage to the areas impacted through the combined impacts of wind, rain, lightning, and hail. Severe storms may trigger other hazards, such as flooding or tornadoes. Lightning is capable of damaging structures and infrastructure (especially the electrical grid) and starting fires. Lightning causes half the wildfires in the western U.S. In addition, lightning regularly injures and kills people across the country. Approximately 25% of victims die and 70% of survivors suffer long-term effects.

The NCDC database records one instance of lightning, when there was a fatality, and 63 occurrences of strong winds. The winds caused \$5.7 million in damages.

### **3.7 SEVERE WINTER STORMS**

A winter storm can range from moderate snow over a few hours to blizzard conditions with blinding wind-driven snow, sleet and/or ice and extreme cold that lasts several days. A severe winter storm is defined as an event that drops four or more inches of snow during a 12-hour period or six or more inches during a 24-hour span. Severe winter storms are fueled by strong temperature gradients and an active upper-level cold jet stream. Some winter storms may be large enough to affect several states while others may affect only a single community. Most winter storms are accompanied by low temperatures and blowing snow, which can severely reduce visibility.

Snow and ice are threats to most of the U.S. around the winter season, which begins December 21 and ends March 21. During the early and late months of the winter season, snow becomes warmer, giving it a greater tendency to melt on contact or stick to the surface. The beginning and end of the winter season also brings a greater chance of freezing rain and sleet.

Every state in the continental U.S. and Alaska has been impacted by severe winter storms. The super-storm of March 1993 caused over \$2 billion in property damage in twenty states and Washington D.C. At least 79 deaths and 600 injuries were attributed to the storm.

The most important winter storms are blizzards and ice storms due to their capacity to cause interruptions in service and damage infrastructure. Blizzards are by far the most dangerous of all winter storms. They are characterized by temperatures below twenty degrees Fahrenheit and winds of at least 35 miles per hour. In addition to the temperatures and winds, a blizzard must have a sufficient amount of falling or blowing snow. The snow must reduce visibility to one-quarter mile or less for at least three hours. With high winds and heavy snow, these storms can punish residents throughout much of the U.S. during the winter months each year.

Ice storms occur when freezing rain falls from clouds and freezes immediately on impact. Ice storms occur when there is cold air at the surface and warm, moist air at higher altitudes. As the warm air advances and is lifted over the cold air, precipitation begins falling as rain at high altitudes then cools as it passes through the cold air mass below, and, in turn, freezes upon contact with chilled surfaces at temperatures of 32°F or below. In extreme cases, ice may accumulate several inches thick, though just a thin coating is often enough to do severe damage.

#### **3.7.1 Severe Winter Storm Impacts**

Freezing rain can result in extensive damage to utility lines and buildings while making any type of travel extremely dangerous. The results are sometimes devastating: entire states can be almost entirely without electricity and communication for several weeks. Winter storms can paralyze a community by shutting down normal day-to-day operations. Heavy snow can also lead to the collapse of weak roofs or unstable structures. Storm effects can cause hazardous conditions and hidden problems, including the following:

- *Power outages* result when snow and ice accumulate on trees causing branches and trunks to break and fall onto power lines. Blackouts vary in size from one street to an entire city. Loss of electric power means loss of heat for some residents, which poses a significant threat to human life, particularly the young and the elderly.
- *Extreme cold* temperatures may lead to frozen water mains and pipes, damaged car engines, and prolonged exposure to cold resulting in frostbite.
- *Flooding* may occur after precipitation has accumulated and then temperatures rise once again, which melts snow and ice. In turn, as more snow and ice accumulate the threat of flooding increases.
- *Snow and ice accumulation on roadways* can cause severe transportation problems in the form of extremely hazardous roadway conditions.

Kentucky is typically continental, has the polar jet stream located near or over it during the winter months, bringing low pressure systems and therefore precipitation into the region, and averages approximately 140 days at or below 32°F. A combination of any of these conditions can lead to a severe winter storm.

Severe winter storms are a common occurrence in Kentucky, with 13 recorded storms in the NCDC database. While that is approximately a 22% annual probability of a severe winter storm, the recorded storms have caused \$26.6 million in damages, four fatalities, and four injuries. Additional indirect costs could be included in this estimate because of lost work time and decreased economic productivity. Frankfort is highly vulnerable to severe winter storms because of the significant percentage of the employees in the City who commute from out of the City and the above-ground electrical and communication infrastructure.

### **3.8 TORNADOES**

A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud extending to the ground. Tornadoes are spawned by a thunderstorm (or sometimes as a result of a hurricane) and produced when a cold air mass flows over a layer of warm air, forcing the warm air to rise rapidly through the cold air.

The damage from a tornado is a result of the high wind velocity and wind-blown debris with paths that can be in excess of one mile wide and fifty miles long. Tornado season is generally March through August, although tornadoes can occur at any time of year. They tend to occur in the afternoons and evenings, with over 80% of all tornadoes striking between noon and midnight.

Most tornadoes are just a few dozen yards wide and touch down only briefly, but highly destructive tornadoes may carve out a path over a mile wide and several miles long. The destruction caused by tornadoes may range from light to catastrophic depending on the intensity, size, and duration of the storm. Effects of tornadoes may include crop and property

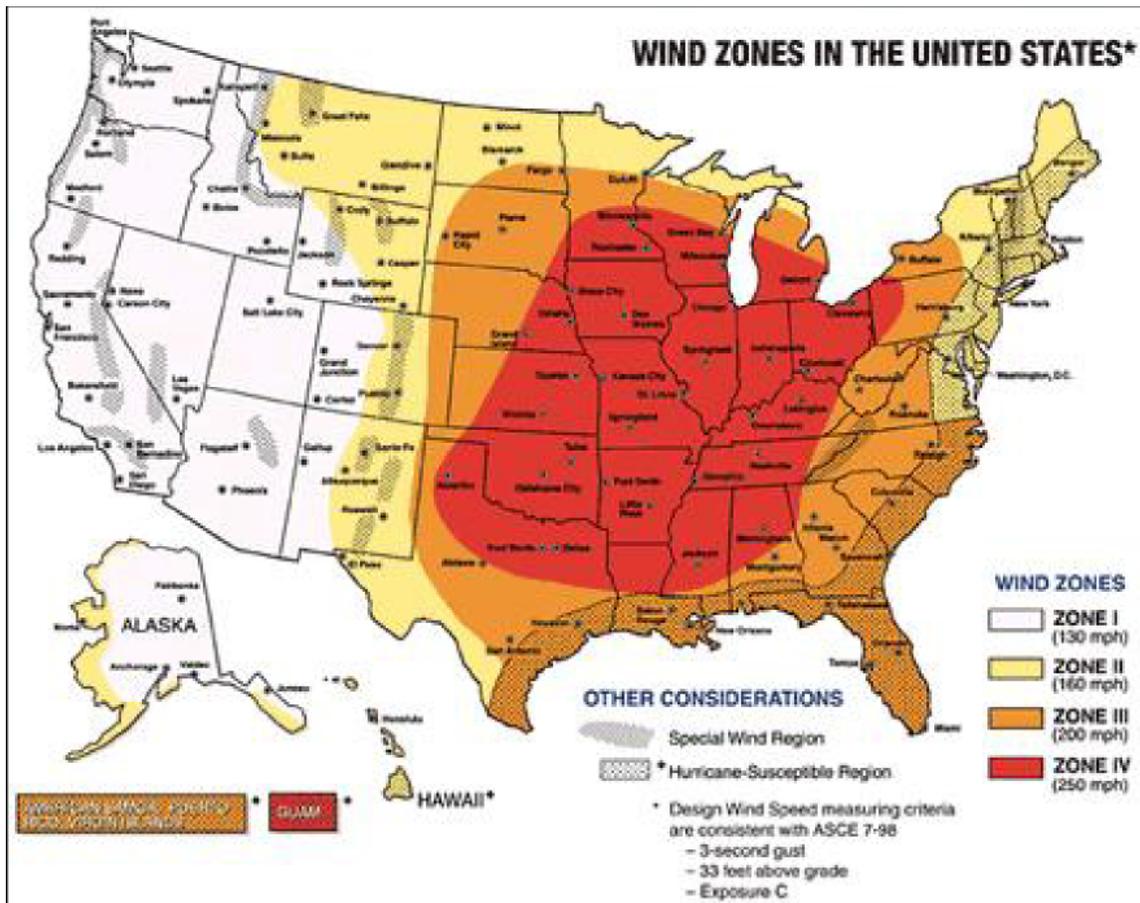
CITY OF FRANKFORT FLOOD MITIGATION PLAN

Other Hazards  
June 2011

damage, power outages, environmental degradation, injury, and death. Tornadoes are known to blow off roofs, move cars and tractor-trailers, and demolish structures.

Typically, tornadoes are localized in impact and cause the greatest damages to structures of light construction, such as residential homes. A tornado can move as fast as 125 mph with internal winds speeds exceeding 300 mph.

The maps below illustrate the predictability of tornadic activity according to NOAA. Frankfort is located within the wind Zone IV where wind speeds can reach up to 250 mph. Zone IV also signifies that there is a high probability for tornadic activity in the County.



Source: [http://www.fema.gov/plan/prevent/saferoom/tsfs02\\_wind\\_zones.shtm](http://www.fema.gov/plan/prevent/saferoom/tsfs02_wind_zones.shtm)

Figure 5. Wind Zones in the United States

Over the past 25 years, more than 100 federal disaster declarations included damage associated with tornadoes. On April 3, 1974, 148 tornadoes in 13 states killed 315 people and is the largest recorded tornadic event in history.

The magnitude of a tornado is categorized by the damage pattern (i.e. path) and wind velocity, according to the Fujita-Pearson Tornado Measurement scale. This scale is the only widely used rating method with the aim of validating classification by relating the degree of damage to the intensity of the wind. **Table 16** summarizes the Fujita scale with descriptions of typical damage caused by each storm magnitude.

**Table 16. Fujita Scale for Tornadoes**

Type	MPH	General Description
F1	73 - 112	Moderate Damage - Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads.
F2	113 - 157	Considerable Damage - Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light object missiles generated; cars lifted off ground.
F3	158 - 206	Severe Damage - Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.
F4	207 - 260	Devastating Damage - Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated.
F5	261 - 318	Incredible Damage - Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters (109 yards); trees debarked; incredible phenomena will occur.

Source: FEMA State and Local Mitigation Planning How-To-Guide: Understanding Your Risks

### 3.8.1 Tornado Impacts

Due to the destructive nature of tornadoes and wind, these events impact human life, health, and public safety. Community-wide impacts include: utility damage and outages, infrastructure damage (transportation and communication systems), structural damage, and damaged or destroyed critical facilities. Tornadoes can also cause severe transportation problems and make travel extremely dangerous. Although tornadoes strike at random, making all buildings vulnerable, three types of structures are more likely to suffer damage: mobile homes, homes on crawlspaces (more susceptible to lift), and buildings with large spans, such as airplane hangars, gymnasiums and factories.

There have been five recorded tornadoes that impacted the City of Frankfort since 1950. These five tornadoes have cause \$2.8 million in damages, four fatalities, and 85 injuries. Like all communities in the area, Frankfort is highly vulnerable to tornadoes because they are not constrained geographically.

## 4.0 PLAN MAINTENANCE

Regular review and updates of the Flood Mitigation Plan are important, as the susceptibility of the City is changing and potential avenues for mitigation are consistently adapting. The

sections below describe the methods and frequency for plan maintenance activities. At a minimum, FEMA requires the plan to be updated within five years; however, the plan should be evaluated annually, after a disaster, and/or after significant changes in land use or demographics in the hazard area. The Frankfort Department of Planning and Building Codes is the responsible agency for maintaining and updating the Plan.

## **4.1 MONITORING, EVALUATING, AND UPDATING THE PLAN**

### **4.1.1 Monitoring**

The plan representatives will continue to monitor the status and track the progress of the plan elements on an annual basis. The representatives will meet annually to oversee the progress made on the implementation of the identified actions, evaluate plan progress, and update the plan as needed to reflect changing conditions.

### **4.1.2 Evaluating**

Evaluation of the plan will not only include checking the implementation status of mitigation actions, but also assessing their degree of effectiveness and determining if the actions or goals need to be adapted. To assess the effectiveness of a mitigation action, the planning committee will review the benefits (or avoided losses) of the mitigation activities that were in place during the previous year. These will be compared to the goals the Plan has set to achieve. The team will also evaluate whether mitigation actions need to be discontinued or modified in light of new developments or changes within the community. Public comment on the plan and achievement of goals and objectives will also be solicited annually during the evaluation by the committee. The process will be documented by the Community Representatives and submitted to the Frankfort Department of Planning and Building codes for review who will then update the City website with any review updates.

### **4.1.3 Updating**

As required by part 201.6(c)(4)(i) of the Local Hazard Mitigation Plan Review Crosswalk (Appendix G), this plan will be updated within five years of the date of the FEMA approval of the plan. The plan may be updated earlier, at the discretion of the Planning Committee. Also, the Committee's ability to update the mitigation process by adding new data and incorporating it into the mitigation plan, will allow for the efficient use of available resources, staff, and programs. Any changes in the Plan will be documented and appended in a section titled "Amendments". The Action Plan will be maintained as an Appendix so it can remain a living document.

## **4.2 IMPLEMENTATION THROUGH EXISTING PROGRAMS**

The identified action projects address reducing the effects of hazards on new buildings and infrastructure as well as existing buildings and infrastructure. Frankfort Department of Planning and Building Codes staff should evaluate methods to include the results of the risk assessment and the proposed mitigation activities into existing planning and regulatory documents,

especially during the regular updating process. Elements of the Flood Mitigation Plan may be incorporated into other planning mechanisms such as Master Plans, Flood Mitigation Plans, Capital Improvement Plans, Land Use Plans, Emergency Management Plans, Zoning Ordinances, Building Codes, and Post-Disaster Mitigation Policies and Procedures where appropriate. In addition, projects will be implemented through existing or ongoing programs.

### **4.3 CONTINUED PUBLIC PARTICIPATION**

In order to have continued public support of the mitigation process, it is important that the public be involved not only in the preparation of the initial plan, but also in any modifications or updates to the plan. To ensure that public support is maintained, the following actions may be taken by the Community Representatives or Project Administrator:

- Develop informational mailings to be distributed to the public about mitigation efforts in the City and updates made to the Plan.
- Develop mitigation flyers or mailings containing mitigation activities and actions that private landowners can implement to reduce exposure and damages.
- Develop a survey following a Presidential, Emergency, or State Declaration to solicit public input about current or possible future mitigation activities, and place it on the City website.
- Hold a public meeting when updating or evaluating the plan to obtain public input.
- Hold a public meeting prior to plan update/re-adoption every five (5) years, to allow for public comment on the plan.

### **4.4 GRANT OPPORTUNITIES**

There are several sources of funding for both pre- and post-disaster hazard mitigation policies and projects. While all mitigation techniques will save money by avoiding different types of losses, the implementation of mitigation efforts can be costly and well beyond the local jurisdiction or county's capacity to fund the mitigation activity. There are existing federal and state funding programs that can be utilized for funding assistance. The state level funding programs are primarily handled through the Department of Local Governments. The following is a list of some sources of funding presently available. This list is not comprehensive, as new programs can be developed or existing programs can be eliminated or modified over time.

- 1) *Pre-disaster Mitigation Program: FEMA:* Through the Disaster Mitigation Act of 2000, Congress approved the creation of a national program to provide a funding mechanism that is not dependent on a Presidential disaster declaration. The Pre-Disaster Mitigation (PDM) Program provides funding to states and communities for cost-effective hazard mitigation activities that complement a comprehensive mitigation program, as well as reduce injuries, loss of life, and damage and destruction of property.

- 2) *Emergency Management Performance Grant: FEMA:* The Emergency Management Performance Grant (EMPG) encourages the development of comprehensive emergency management at the State and local level in order to improve emergency management planning, preparedness, mitigation, response, and recovery capabilities. Funding is provided to the State, which can be used to educate people and protect lives and structures from natural and technological hazards.
- 3) *Public Assistance Grant Program: FEMA:* The Public Assistance Grant Program provides supplemental assistance to states, local governments, and certain private non-profit organizations to alleviate sufferings and hardship resulting from major disasters or emergencies declared by the President. These grants allow State and local government to respond to disasters, recover from their impact, and mitigate impact from future disasters.
- 4) *Flood Mitigation Assistance Program: FEMA:* FEMA's Flood Mitigation Assistance Program (FMA) provides funding to assist states and communities in implementing measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the National Flood Insurance Program (NFIP). FMA was created as part of the National Flood Insurance Reform Act of 1994 (42 U.S.C. 4101) with the goal of reducing or eliminating claims under the NFIP. FMA is a pre-disaster grant program, and is made available to states on an annual basis. This funding is exclusively available for mitigation planning and implementation of mitigation measures.

The community must be a participant in NFIP and the project must be cost-effective, beneficial to the NFIP fund, and technically feasible. The project must conform to the minimum standards of the NFIP Floodplain Management Regulations, the applicant's Flood Mitigation Plan, and all applicable laws and regulations.

- 5) *Hazard Mitigation Grant Program: FEMA:* The Hazard Mitigation Grant Program (HMGP) was created in November 1988 through Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act. The HMGP assists states and local communities in implementing long-term mitigation measures following a Presidential disaster declaration.

A project must conform to the State's Hazard Mitigation Plan, provide a beneficial impact on the disaster area, meet environmental requirements, solve a problem independently, and be cost-effective.

- 6) *Community Development Block Grants: US Department of Housing and Urban Development:* The Community Development Block Grant (CDBG) program provides grants to local governments for community and economic development projects that primarily benefit low- and moderate-income people. The CDBG program also provides grants for post-disaster hazard mitigation and recovery following a Presidential disaster declaration. To be eligible for a CDBG, a community must have

- a population less than 50,000 (200,000 for counties) and be located within a Presidential disaster declaration area.
- 7) *Sustainable Development Assistance: Department of Energy:* A Sustainable Development Assistance team works with communities to help them define and implement sustainable development strategies as part of their comprehensive community planning efforts. The team provides technical assistance to disaster-affected communities as they plan for long-term recovery by introducing a wide array of environmental technologies and sustainable redevelopment planning practices.
  - 8) *Emergency Watershed Protection: Department of Agriculture: Natural Resources Conservation Service (NRCS):* The Emergency Watershed Protection Program provides financial assistance to sponsors and individuals in implementing emergency measures to relieve imminent hazards to life and property created by a disaster. Activities include providing financial and technical assistance to remove debris from streams, protect destabilized stream banks, and purchase floodplain easements. The program is designed for the implementation of recovery measures. It is not necessary for a national emergency to be declared to be eligible for assistance.
  - 9) *Emergency Relief Program (Transportation Infrastructure): Department of Transportation, Federal Highway Administration:* The Emergency Relief (ER) Program provides assistance for repair of Federal-aid roads. This funding is allocated to rebuild transportation facilities that are damaged extensively, causing a “disastrous impact” on transportation services. States must request ER funding in order to initiate this assistance program.
  - 10) *United States Army Corps of Engineers:* Congress delegates to USACE the authority and appropriations for projects through the Water Resources and Development Act (WRDA). Projects eligible for funding include the following: disaster response, water supply, shore protection, navigation, facilities design and construction, installation support, hydropower, recreation, flood damage reduction, environmental infrastructure, ecosystem restoration, master planning, regulatory projects, and the rehabilitation of flood control structures.
  - 11) *Community Emergency Relief Funds (CERF):* The CERF program provides funding to communities impacted by disasters documented by a declaration from the Governor. In order to be eligible, a community must have been impacted in the prior 18 months.
  - 12) *Local Matching Funds for Flood Control:* Funding is available to help municipalities meet the cost-share match requirements of federal flood control grant programs.

## **5.0 Conclusion**

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The City of Frankfort has significant exposure to flooding, owing primarily to its development around the Kentucky River. The City has many repetitive loss properties and two severe repetitive loss properties, which contribute substantially to the fiscal impact of flooding. In addition, the wastewater treatment plant is within the floodplain and is vulnerable to flooding. Should the treatment plant be impacted by flooding, it would have significant negative effects on health and safety for residents of Frankfort and people downstream of the City.

The plan participants developed several mitigation strategies to reduce impacts to critical facilities and the city residents. Successful implementation of these strategies would positively impact overall flood susceptibility and improve the quality of life in Frankfort.

**Appendix A**

**Plan Adoption Ordinance**

## **Appendix B**

# **Public Meeting Documentation**

# City of Frankfort

## Capital of Kentucky

815 West Second Street, P.O. Box 697  
Frankfort, Kentucky 40602  
(502) 875-8500

*Where History Is Made Every Day!*

Mayor  
H. Gippy Graham

### Commissioners

Kathy Carter  
William I. May, Jr.  
Sellus Wilder  
Rodney S. Williams

May 28, 2009

Mr. Keith Lee  
Chair, Frankfort/Franklin County Planning Commission  
80 Foxly Lane  
Frankfort, KY 40601

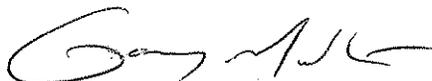
Re: City of Frankfort Floodplain Management Plan

Dear Community Leader:

The City of Frankfort has been awarded a Federal Emergency Management Agency (FEMA) Pre-Disaster Mitigation (PDM) Planning Grant to produce a Floodplain Management Plan. Through the "City of Frankfort Floodplain Management Plan", your risk-prone assets will be better identified, prioritized, and ultimately managed. After formal adoption of this plan by the City, Frankfort will be eligible for FEMA Mitigation Grant Programs which can fund up to 75% of cost effective mitigation projects.

The purpose of this letter is to request representation from your office at the **Stakeholder Kickoff Meeting** on June 15, 2009 at the City of Frankfort, Council Chambers from 5:00 p.m. until 6:00 p.m. Your attendance is highly encouraged and will benefit the entire community through more comprehensive flood mitigation planning. You or a representative from your office is also invited to participate in the public involvement meeting following the stakeholder meeting, which will begin at 6:30. If your office is interested in participating in the plan, but a representative from your office cannot attend the kickoff meeting, please contact me for further assistance. In addition, a survey is available through the City of Frankfort website at <http://www.frankfort.ky.gov/planning-and-building-codes.html> to solicit information. I am also available should you have any additional questions or concerns. Thank you for your assistance.

Sincerely,



Gary Muller  
Planning Director  
City of Frankfort  
Frankfort, Kentucky

cc: Mike Anderson, Stantec



Equal Opportunity Employer M/F/E  
Equal Housing Opportunity



# City of Frankfort

Stakeholder and Public Kickoff Meetings  
City of Frankfort Council Chambers  
June 15, 2009

Gary Muller  
Director of Planning and Building  
Codes, City of Frankfort  
502-352-2100

Kristen Dunaway  
Matt Wagener  
Stantec Consulting Services, Inc.  
502-212-5000



June 15, 2009



# Agenda

- Introductions
- What is a FMA?
- Planning Process
- Risk Assessment
- Mitigation Strategies
- Plan Maintenance
- Next Steps



June 15, 2009



# Background

City of Frankfort awarded FEMA  
Flood Mitigation Assistance (FMA)  
planning grant.



June 15, 2009



# What Should a FMA Plan Do?

- Reduce long-term risk to human life and property.
- Give a community a "comprehensive" guide for future flood mitigation efforts.
- Include representation from city departments and the public.



June 15, 2009





## What Should a FMA Plan Not Do?

It will not replace your Emergency Operation Plan

Will only look at Flooding



June 15, 2009



## What Can a FMA Plan Do?



1. Identify and assess risk.
2. Develop strategies for reducing risk.
3. Improve communication between agencies.
4. Enhance existing programs.
5. **Development of Data to include in future FEMA grant applications.**



1. Disaster Mitigation Act of 2000 (DM2K)\*
  2. Pre-Disaster Mitigation (PDM)\*
  3. Hazard Mitigation Grant Program (HMGP)\*
  4. Severe Repetitive Loss (SRL)
  5. Repetitive Flood Claims (RFC)
- \* Requires 25% local match



June 15, 2009



## What Can a FMA Plan Do?



June 15, 2009



## What Can a FMA Plan Do?



Greenways



June 15, 2009





Repetitive Loss Buildings: 49  
 Repetitive Loss Payments: \$2,061,649.57

Category	Count	Amount	Count	Amount	Total
All Repetitive Loss	49	\$2,061,649.57	49	\$2,061,649.57	\$2,061,649.57
All Repetitive Loss - Flood	49	\$2,061,649.57	49	\$2,061,649.57	\$2,061,649.57
All Repetitive Loss - Other	0	\$0.00	0	\$0.00	\$0.00
All Repetitive Loss - Total	49	\$2,061,649.57	49	\$2,061,649.57	\$2,061,649.57



## CRS Activity Points

Activity Point	Count	Amount	Count	Amount	Total
All CRS Activity Points	100	\$1,000,000.00	100	\$1,000,000.00	\$1,000,000.00
All CRS Activity Points - Flood	100	\$1,000,000.00	100	\$1,000,000.00	\$1,000,000.00
All CRS Activity Points - Other	0	\$0.00	0	\$0.00	\$0.00
All CRS Activity Points - Total	100	\$1,000,000.00	100	\$1,000,000.00	\$1,000,000.00



## Planning Goal?



Create a FMA Plan to:

- Protect lives, property, economic viability and quality of life,
- Become more flood resistant,
- Compliment existing efforts,
- Organize future mitigation efforts.



June 15, 2009



## Project Overview



1. Planning Process,
  - Meetings, stakeholder input, data gathering
2. Risk Assessment (Flood Hazard Identification and Vulnerability),
  - Analyze past occurrences, probabilities, document and map.
3. Flood Hazard Mitigation Strategy,
  - Determine strategies to reduce risk (preventative, protection, projects, education, etc)
4. Flood Hazard Mitigation Plan Maintenance Process
  - Periodic plan monitoring, evaluating and update. Annual reviews.
5. Flood Hazard Mitigation Plan Review, Approval and Adoption
  - Committee, advisory group, public review and council adoption.



June 15, 2009



## Mitigation Activities

<b>Preventative Activities.</b>	Reduce risks through regulations including building codes, development outside of hazardous areas, and local planning or capital improvement projects.
<b>Property Protection.</b>	Activities that are building or parcel specific such as flood proofing, structure acquisition, or retrofiting.
<b>Emergency Services.</b>	Measures that are implemented during a disaster to minimize associated impacts. Response / Recovery.
<b>Structural Projects.</b>	Control flooding, drainage, and other hazards, ex. detention basins.
<b>Public Information.</b>	Initiatives that educate residents to risks and protective measures to better protect themselves and their property.

June 15, 2009



## Complete the Survey



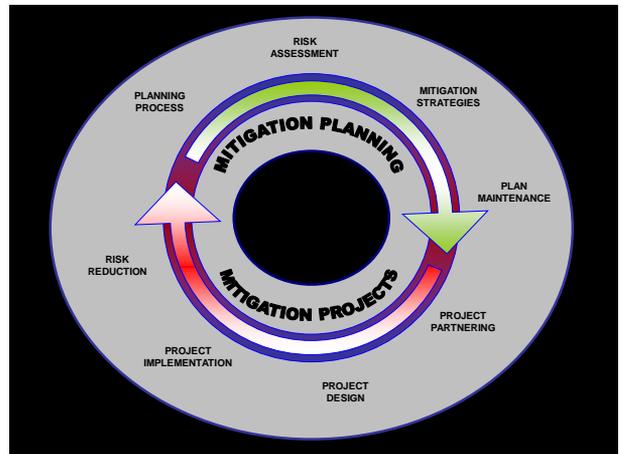
[http://www.surveymonkey.com/s.aspx?sm=IN132pEI\\_2bXR9HbASOYF5cQ\\_3d\\_3d](http://www.surveymonkey.com/s.aspx?sm=IN132pEI_2bXR9HbASOYF5cQ_3d_3d)



## Plan Schedule

1. Planning Process, (0-9 months)
2. Risk Assessment (Flood Hazard Identification and Vulnerability), (0-2 months)
3. Flood Hazard Mitigation Strategy, (2-4 months)
4. Flood Hazard Mitigation Plan Maintenance Process, and (5-6 months)
5. Flood Hazard Mitigation Plan Review, Approval and Adoption (6-9 months)

June 15, 2009





## What Is A Floodplain Management Plan?

A floodplain management plan is a plan prepared by representatives from the jurisdiction. The plan identifies and assesses areas at risk of flooding. The plan also develops the recommended mitigation activities to reduce the associated risks.



**FEMA**

## Why Conduct A Floodplain Management Plan?

Local jurisdictions have the option of preparing a multi-jurisdictional hazard mitigation plan under the Disaster Mitigation Act of 2000 (DMA 2000).

### Benefits of this process include:

- Enables comprehensive approaches to flood mitigation
- Allows economies of scale by leveraging individual capabilities and sharing costs and resources
- Avoids duplication of efforts
- Imposes an external discipline on the process



**Stantec**

Stantec will support the City of Frankfort in this effort

## City of Frankfort Floodplain Management Plan

**Flood Mitigation Plan Public Meeting**  
(everyone is welcome)

**Monday, March 15, 2010**  
**5:30 p.m.**

**City of Frankfort Council Chambers**



**For more information please contact:**

Gary Muller  
City of Frankfort  
City Planner or  
Maya DeRosa at  
502-875-8500





## Your Presence is Requested

Please give back to your community by participating in the development of the City of Frankfort Floodplain Management Plan.

This plan will help to identify areas prone to flooding, and develop the actions necessary to mitigate these risks in the future. Your participation will help local officials and planners to better identify and rank areas throughout the City that are subject to higher risk and therefore in need of prioritized risk reduction.



## Mitigation Alternatives

The floodplain management plan is a major step toward recognizing flood risk throughout the City. It is also a requirement to qualify for federal flood mitigation funding. These funds may be used to offset costs for projects intended to reduce local exposure to loss of life or damage of property. Examples of projects that can qualify for federal funding include:

- Acquisition of property for willing sellers
- Flood proofing structures
- Elevation of flood prone structures
- Implementation of vegetative management programs
- Minor flood control / capital improvement projects



## Mitigation Strategies

### Mitigation Goals

- Goals to reduce or avoid flood impacts for the City will be developed.

### Mitigation Actions:

- Specific mitigation actions will be recommended based on risk assessments and local participation.

### Mitigation Prioritization:

- Each recommended mitigation action will be prioritized based on a variety of factors including social impact, administrative capabilities, and environmental impact.





# City of Frankfort Floodplain Management Plan

In partnership with:



FEMA



Kentucky Division of  
Emergency  
Management



Stantec

## Stakeholder Roles and Responsibilities Checklist

- Representation during at least two planning meetings.
- Submit inventory of plans, data, and reports relevant to flood mitigation planning.
- Provide property mapping and values.
- Complete Flood Hazard Mitigation Survey.
- Identify critical structures and facilities.
- Develop community wide flood mitigation goals.
- Submit a targeted list of mitigation actions.
- Review and comment on draft plan.

---

### Items to be completed by others:

- Formally adopt final plan.
- Incorporate plan in existing planning efforts.
- Participate in plan maintenance through yearly reviews and five year updates.

# City of Frankfort

## Capital of Kentucky

815 West Second Street, P.O. Box 697  
Frankfort, Kentucky 40602  
(502) 875-8500

*Where History Is Made Every Day!*

Mayor  
H. Gippy Graham

### Commissioners

Kathy Carter  
William I. May, Jr  
Sellus Wilder  
Rodney S. Williams

March 9, 2010

Hon. H. Gippy Graham  
Mayor, City of Frankfort  
P. O. Box 697  
Frankfort, KY 40602

Re: City of Frankfort Floodplain Management Plan

Dear Mayor Graham:

The City of Frankfort has been awarded a Federal Emergency Management Agency (FEMA) Pre-Disaster Mitigation (PDM) Planning Grant to produce a Floodplain Management Plan. Through the "City of Frankfort Floodplain Management Plan", your risk-prone assets will be better identified, prioritized, and ultimately managed. After formal adoption of this plan by the City, Frankfort will be eligible for FEMA Mitigation Grant Programs which can fund up to 75% of cost-effective mitigation projects.

The purpose of this letter is to request representation from your office at the second meeting for this effort on March 15<sup>th</sup>, 2010 at the Council Chambers, City of Frankfort, starting at 5:30 p.m. Your attendance is highly encouraged and will benefit the entire community through more comprehensive flood mitigation planning. This meeting is open to the public.

It is critical that representatives from the community, including your agency, attend this meeting. First and foremost, with information from the community, the plan will represent the concerns in the community. Second, with increased public participation the City can count these activities for the Community Rating System, and qualify for points in the program that can reduce flood insurance premiums for local businesses and residents.

We will discuss the data that we have received to date and potential strategies to reduce the impacts of flooding in the City. Specifically, the mitigation strategies will account for ongoing or proposed future activities planned throughout the City. These and other recommended activities will be organized into five general categories:

**Preventative Activities:** Activities that keep problems from becoming exacerbated through regulations including building codes, development of hazardous areas, and local planning or capital improvement projects.

**Property Protection:** Activities that are building or parcel specific such as flood-proofing, acquisition or retrofitting.

**Emergency Services:** Activities implemented during a disaster to minimize associated impacts.



**Structural Projects:** These Equal Housing Opportunity  include flood mitigation, drainage, and other hazards.

**Public Information:** These initiatives educate residents about flood hazards and the protective measures they can perform to better protect themselves and their property.

If there is any additional information you would like included in the plan that has not yet been submitted, please email them to [gmuller@frankfort.ky.gov](mailto:gmuller@frankfort.ky.gov) or you may mail them to my address below. Should you have any questions, please feel free to contact me.

If you can not attend the meeting, please send a representative from your office to attend in your place. In addition, a survey is available through the City of Frankfort website at <http://gis01.stantec.com/frankfort-hazplan/> to solicit information. I am also available should you have any additional questions or concerns. Thank you for your assistance.

Sincerely,



Gary Muller  
Planning and Building Codes Director  
City of Frankfort



**City of Frankfort**  
**Stakeholder and Public Meeting**  
**City of Frankfort Council Chambers**  
 March 15, 2010  
 5:30 p.m.

Gary Muller  
 Director of Planning and Building Codes  
 City of Frankfort  
 502-352-2100

Kristen Dunaway 502-432-8545  
 Jared Edwards 812-285-4060  
 Stantec Consulting Services, Inc.



March 15, 2010



**Agenda**

- Introductions
- What is a FMA Plan?
- Planning Process
- Risk Assessment
- Mitigation Strategies
- Plan Maintenance
- Next Steps



March 15, 2010



**Background**

City of Frankfort awarded FEMA  
 Flood Mitigation Assistance (FMA)  
 planning grant.



March 15, 2010



**What Should a FMA Plan Do?**

- Reduce long-term risk to human life and property.
- Give a community a "comprehensive" guide for future flood mitigation efforts.
- Include representation from city departments and the public.



March 15, 2010





## What Should a FMA Plan Not Do?

It will not replace your Emergency Operation Plan

Will only look at Flooding



March 15, 2010



## How Can a FMA Plan Help?



1. Identify and assess risk.
2. Develop strategies for reducing risk.
3. Improve communication between agencies.
4. Enhance existing programs.
5. **Development of Data to include in future FEMA grant applications.**



1. Disaster Mitigation Act of 2000 (DM2K)\*
  2. Pre-Disaster Mitigation (PDM)\*
  3. Hazard Mitigation Grant Program (HMGP)\*
  4. Severe Repetitive Loss (SRL)
  5. Repetitive Flood Claims (RFC)
- \* Requires 25% local match



March 15, 2010



## How Can a FMA Plan Help?



March 15, 2010



## How Can a FMA Plan Help?

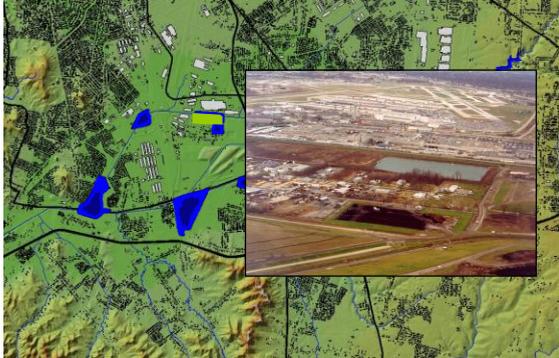


Greenways



March 15, 2010

## Flood Storage Basins



March 15, 2010



## How Can a FMA Plan Help?



Can improve the City's  
Community Rating System  
(CRS) rating.

Increase Flood Insurance  
Discounts.



March 15, 2010



## Planning Goal?

### Create a FMA Plan to:

- Protect lives, property, economic viability and quality of life,
- Become more flood resistant,
- Compliment existing efforts,
- Organize future mitigation efforts.



March 10, 2010



## Project Overview

1. Planning Process,
  - Meetings, stakeholder input, data gathering
2. Risk Assessment (Flood Hazard Identification and Vulnerability),
  - Analyze past occurrences, probabilities, document and map.
3. Flood Hazard Mitigation Strategy,
  - Determine strategies to reduce risk (preventative, protection, projects, education, etc)
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  - Periodic plan monitoring, evaluating and update. Annual reviews.
5. Flood Hazard Mitigation Plan Review, Approval and Adoption
  - Committee, advisory group, public review and council adoption.



March 15, 2010



Number of Policies in Force: 191  
 Insurance in Force: \$32,453,000.00  
 Total Losses Paid: \$7,917,839.95

**Community Overview**

Community Name	State	County	State FIPS Code	County FIPS Code
Frankfort, KY	KY	Franklin	21	009

**Community Statistics**

Category	Value
Total Policies	191
Total Premiums	\$32,453,000.00
Total Losses Paid	\$7,917,839.95



Total Policies in Place: 191  
 Total Premiums: \$216,773

**Insurance Overview**

As of 10/31/2009

Category	Value
Total Policies	191
Total Premiums	\$216,773.00
Total Losses Paid	\$7,917,839.95

March 15, 2010



Repetitive Loss Buildings: 49  
 Repetitive Loss Payments: \$2,061,649.57

**Community Repetitive Loss**

Community Name	State	County	State FIPS Code	County FIPS Code	Total
Frankfort, KY	KY	Franklin	21	009	\$2,061,649.57

**Repetitive Loss Buildings**

Category	Count
Total Repetitive Loss Buildings	49



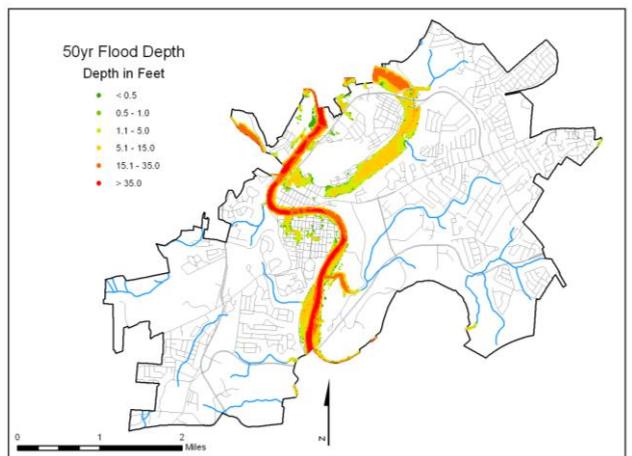
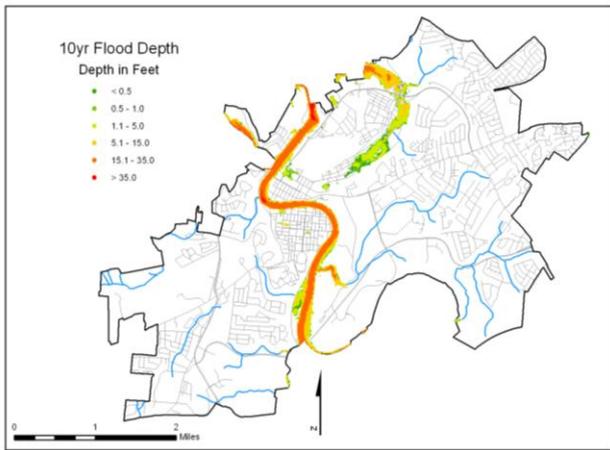
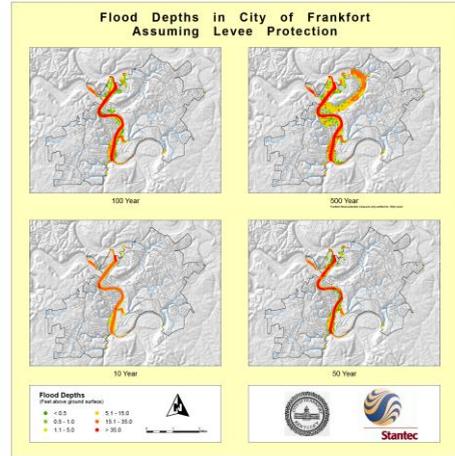
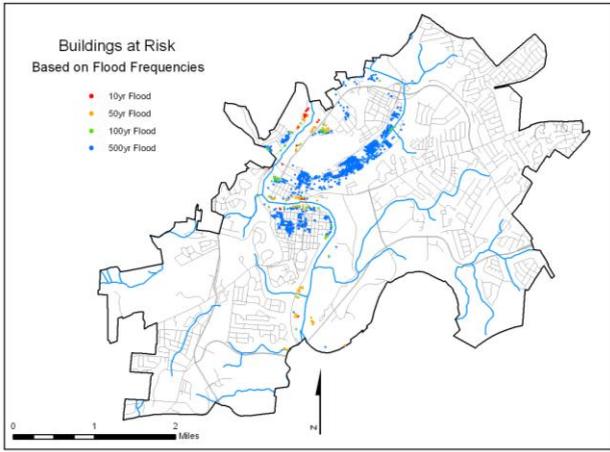
CRS Activity Points

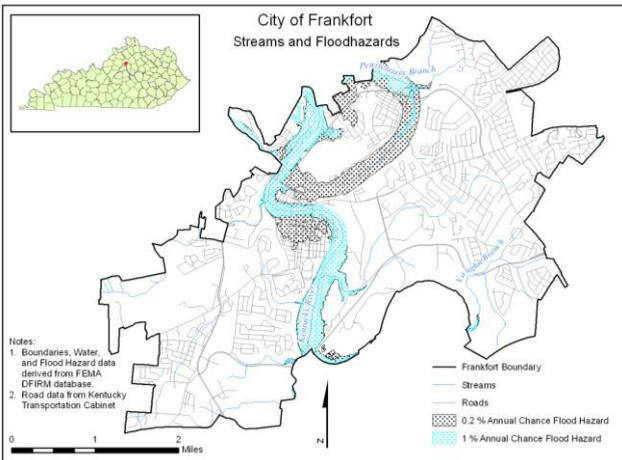
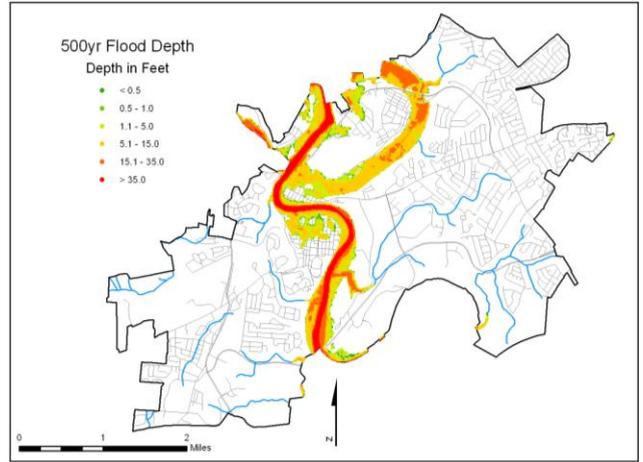
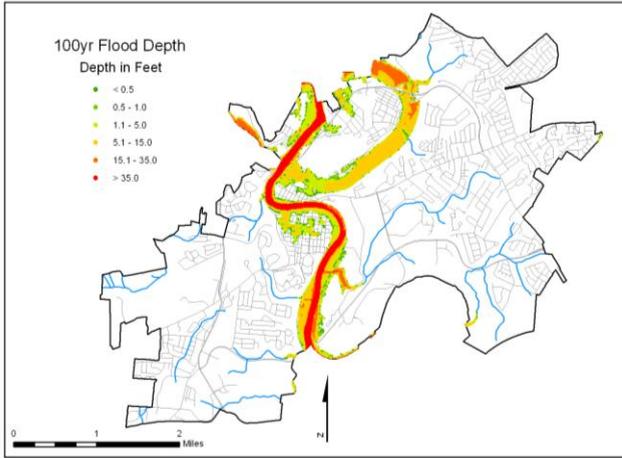
**CRS Activity Points**

Activity	Points
CRS New Reports	1
CRS Reports	1
CRS New Payments	1
CRS Payments	1
CRS New Buildings	1
CRS Buildings	1
CRS New Losses	1
CRS Losses	1
CRS New Claims	1
CRS Claims	1
CRS New Adjustments	1
CRS Adjustments	1
CRS New Inspections	1
CRS Inspections	1
CRS New Safety	1
CRS Safety	1









## Mitigation Activities

- Preventative Activities.** Reduce risks through regulations including building codes, development outside of hazardous areas, and local planning or capital improvement projects.
- Property Protection.** Activities that are building or parcel specific such as flood proofing, structure acquisition, or retrofitting.
- Emergency Services.** Measures that are implemented during a disaster to minimize associated impacts. Response / Recovery.
- Structural Projects.** Control flooding, drainage, and other hazards, ex. detention basins.
- Public Information.** Initiatives that educate residents to risks and protective measures to better protect themselves and their property.

March 15, 2010





## FEMA Eligible Project Funding

Eligible Activities	HMPF	PCM	FMA	RFC	SPL
<b>1. Mitigation Projects</b>	✓	✓	✓	✓	✓
Property Acquisition and Structure Demolition	✓	✓	✓	✓	✓
Property Acquisition and Structure Relocation	✓	✓	✓	✓	✓
Structure Elevation	✓	✓	✓	✓	✓
Mitigation Reconstruction	✓	✓	✓	✓	✓
Dry Floodproofing of Historic Residential Structures	✓	✓	✓	✓	✓
Dry Floodproofing of Non-Residential Structures	✓	✓	✓	✓	✓
Minor Localized Flood Reduction Projects	✓	✓	✓	✓	✓
Structural Retrofitting of Existing Buildings	✓	✓	✓	✓	✓
Non-structural Retrofitting of Existing Buildings and Facilities	✓	✓	✓	✓	✓
Safe Room Construction	✓	✓	✓	✓	✓
Infrastructure Retrofit	✓	✓	✓	✓	✓
Soil Stabilization	✓	✓	✓	✓	✓
Wildfire Mitigation	✓	✓	✓	✓	✓
Post-Disaster Code Enforcement	✓	✓	✓	✓	✓
576 Initiative Projects	✓	✓	✓	✓	✓
<b>2. Hazard Mitigation Planning</b>	✓	✓	✓	✓	✓
<b>3. Management Costs</b>	✓	✓	✓	✓	✓



## Complete the Survey



[http://www.surveymonkey.com/s.aspx?sm=IN132pEI\\_2bXR9HbASOYF5cQ\\_3d\\_3d](http://www.surveymonkey.com/s.aspx?sm=IN132pEI_2bXR9HbASOYF5cQ_3d_3d)



## Resources

<http://www.kyem.ky.gov/assistance/mitigation.htm>



## Resources

<http://www.kentuckyfood.org/>

**Hazard Mitigation - Current Topics**

KDEM announces our Hazard Mitigation Grant Program (HMGP) for DR-1844

**Availability of Hazard Mitigation Grant Program Funds DR-1844**

[Click Here to view the minutes of the Jan. 21, 2010 Monthly State Hazard Mitigation Team \(SHMT\) Meeting](#)

**Quick to Action Opportunities**

Hazard Mitigation is an action taken to eliminate or reduce the long-term risk to human life and property from natural and technological hazards. While preparedness and response may focus primarily on reacting to a disaster itself, mitigation is a continuous activity intended to make families and communities more disaster-resistant.

Examples of mitigation include:

- Wise management of development in flood-prone areas
- Enactment and enforcement of building codes which require structures to withstand a baseline level of disaster forces
- Acquisition or relocation of nonresidential flood-prone buildings
- Dynamic retrofit of buildings
- Tornado safe rooms and community shelters
- Substitution for existing flood-prone safe rooms
- Utility protective measures
- Drain water management and localized flood control projects

For more information on Hazard Mitigation please visit: [HMGP Mitigation Site](#)

The Kentucky Division of Emergency Management has a mitigation section in its Operations and Recovery Branch and participates in several FEMA-sponsored programs, including:

- The Hazard Mitigation Grant Program (HMGP)
- The Flood Mitigation Assistance Program (FMA)
- The Post-Disaster Mitigation Program (PDM)
- The Sustainable Floodplain Hazard Mitigation Program

**Kentucky Floodplain Management Toolkit**

Digital Maps | Overview | Floodplain Manager | City/County Engineers | Community Resources

**Welcome to the Division of Water's Floodplain Management Toolkit**

This website is a content-based tutorial, community outreach and training program for the State of Kentucky Digital Map Modernization effort (DFRIMS) as well as a resource for various floodplain management programs.

The Digital Map toolbar (above) is where you'll find digital map information based on your professional interest.

The Tutorial Menu (left) is where you'll find training information for a variety of programs from the National Flood Insurance Program to the Community Rating System. Also the Glossary can be used for overview of key terms and definitions.

The Toolbox icon (top-right) is linked to the entire Floodplain Administrator's Handbook.

The Background and Fact Menu (bottom) gives historical information as well as current and future news in the field of Floodplain Management.

**Why is Floodplain Management Important?**

Floodplain Management is a critical component of the State of Kentucky's floodplain management program. It is a multi-disciplinary effort that involves the State, local government, and the private sector.

**Who can be a Floodplain Manager?**

Any person involved with, or interested in, the management of floodplains, wetlands and waterbodies is eligible for professional certification. Most applicants are local floodplain managers, but certification is open to all.



## Resources

<http://www.kyem.ky.gov/assistance/mitigation.htm>

**Hazard Mitigation - Current Topics**

**\*IMPORTANT\***

KYEM announces our Hazard Mitigation Grant Program (HMGP) for DR-1844

**Availability of Hazard Mitigation Grant Program Funds DR-1844**

[Go back to top of page](#)

Choose this link to view the minutes of the Jan. 21, 2010 **Monthly State Hazard Mitigation Team (SHMT) Meeting**

**Other Hazard Mitigation**

Hazard Mitigation is any action taken to eliminate or reduce the long-term risk to human life and property from natural and technological hazards. While preparedness and response may focus primarily on reacting to a disaster itself, mitigation is a continuous activity intended to make families and communities more disaster-resistant.

Examples of mitigation include:

- Flood management or development in flood-prone areas
- Erection and enforcement of building codes which require structures to withstand a baseline level of disaster forces
- Acquisition or elevation of residential flooded buildings
- System retrofit of buildings
- Detach safe rooms and community shelters
- Reprovision for building a residential safe room
- Flood control line treatment and localized flood control projects

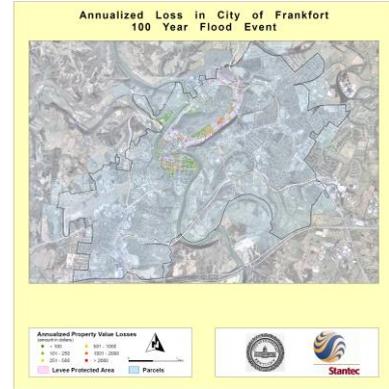
For more information on Hazard Mitigation please visit: [FEMA Mitigation Site](#)

The Kentucky Division of Emergency Management has a mitigation section in its Operations and Recovery Branch and participates in several FEMA-sponsored programs, including:

- The Hazard Mitigation Grant Program (HMGP)
- The Flood Mitigation Assistance Program (FMA)
- The Pre-Disaster Mitigation Program (PDM)
- The Sustainable Floodplain Risk Reduction (SFRP)



## Mapping Activity



## Mapping Activity



## Essential Facilities

- Hospitals
- Schools
- Emergency Operation Centers
- Communication Facilities
- Electric Power Facilities
- Natural Gas Facilities
- Fire Stations
- Police Stations
- Potable Water Facilities
- Waste Water Treatment Facilities





# Mapping Activity

2.



Contact Name \_\_\_\_\_ Contact Phone No. \_\_\_\_\_

**Mitigation Goals:**

- Preventative Activities.** Reduce risks through regulations including building codes, development outside of hazardous areas, and local planning or capital improvement projects.
- Property Protection.** Reduce exposure to hazards through building or parcel specific activities such as flood proofing, structure acquisition, or retrofitting.
- Emergency Services.** Reduce impacts through response and recovery activities that are implemented during a disaster.
- Structural Projects.** Minimize impacts through projects, such as detention basins, terraced shorelines, berms, etc.
- Public Information.** Assist residents to prepare for risks and protective measures to better protect themselves and their property.
- Other:** \_\_\_\_\_

Item Number	Goal Number	Hazard	Mitigation Action	Responsible Agency & Contact Person	Funding Source	Implementation Timeline	Estimated Benefits <sup>1</sup>	Estimated Costs <sup>2</sup>
Example	2		Purchase homes in the 100 year floodplain and convert the space to a park or green space to reduce flood impacts.	County Planning Department - Bob Jones, Director	Hazard Mitigation Grant Program & General Funds	5 years	Medium	Medium
1.								
2.								
3.								
4.								
5.								
6.								

<sup>1</sup> Benefits and Costs estimates should be based on these categories:  
 Less than \$100,000 = Low  
 \$100,000 - \$500,000 = Medium  
 More than \$500,000 = High



CITY OF FRANKFORT  
PLANNING & BUILDING CODES DEPARTMENT  
P.O. Box 697  
Frankfort, Kentucky 40601  
Phone: (502) 352-2100 Fax: (502) 875-3579

**To:** Jim Wainscott, Legal Ad Department  
The State Journal

**From:** Gary Muller

**Fax:** (502)-227-2831

**Pages including cover sheet:**

# 1

**Date:** March 8, 2011

**Re:** Legal Advertisement for Publication – Bill to : **City of Frankfort – Planning Department**

**Urgent**    **For Review**    **Please Reply**    **FYI**    **As Requested**

**Comments:**

Please publish the following legal advertisement on Sunday March 13, 2011 and Sunday March 20, 2011.

**NOTICE OF PUBLIC MEETING**

The Frankfort Planning Department will hold a special public involvement meeting on March 21, 2011 at 5:30 p.m. in the Council Chambers of City Hall, which is located at 315 West Second Street. The purpose of the meeting is to discuss the nearly completed Frankfort Flood Mitigation Plan and seek input and comments. Copies of the draft plan will be available at the meeting and on the Department's website.

Additional information may also be obtained by calling 352-2100, Monday through Friday, 8:00 a.m. to 4:30 p.m. or by visiting the city's website at [www.frankfort.ky.gov](http://www.frankfort.ky.gov)

*WARNING: THE INFORMATION IN THIS FACSIMILE TRANSMISSION IS INTENDED FOR THE CONFIDENTIAL USE OF THE DESIGNATED RECIPIENT NAMED ABOVE. THIS MESSAGE MAY BE PRIVILEGED INFORMATION. IF THE READER OF THIS MESSAGE IS NOT THE INTENDED RECIPIENT, YOU ARE NOTIFIED THAT YOU HAVE RECEIVED THIS DOCUMENT IN ERROR AND ANY REVIEW AND DISSEMINATION, DISTRIBUTION AND COPYING OF THIS MESSAGE IS STRICTLY PROHIBITED. IF YOU HAVE RECEIVED THIS DOCUMENT IN ERROR, PLEASE NOTIFY THIS OFFICE IMMEDIATELY VIA TELEPHONE AND RETURN THE ORIGINAL MESSAGE TO THE ABOVE ADDRESS BY MAIL. THANK YOU.*

# City of Frankfort

## Capital of Kentucky

315 West Second Street, P.O. Box 697  
Frankfort, Kentucky 40602  
(502) 875-8500

*Where History Is Made Every Day!*

**Mayor**  
**H. Gippy Graham**

**Commissioners**  
**Katie Flynn Hedden**  
**William I. May, Jr**  
**Michael F. Turner**  
**Sellus Wilder**

March 8, 2011

Emily Frank  
KY Division of Emergency Mgt.  
100 Minuteman Parkway  
Frankfort, KY 40601

Re: City of Frankfort Floodplain Management Plan

Dear Ms. Frank:

The City of Frankfort Flood Mitigation Plan is nearing completion! There will be a final public meeting to discuss the plan and seek input on March 21, 2011 at 5:30 pm in the City Council chambers. As you may recall, during previous meetings, the consultant hired to draft the plan, Stantec Consulting Services, Inc. (Stantec), has discussed the strategies Frankfort currently has in place to control and minimize flooding and the results of the risk assessment. At the last meeting, participants were invited to identify specific mitigation actions the City could pursue to further reduce flood losses and/or minimize exposure to flooding.

At this meeting, Stantec will summarize the process used to develop the plan, with special emphasis on the recommendations for future action. In addition, Stantec will discuss the remaining steps in the approval process and potential funding sources once the plan is approved and adopted. Once the plan is accepted by FEMA and adopted by the City, Frankfort will be eligible for grants covering up to 75% of the cost of mitigation activities.

After the presentation, there will be time for questions and comments for Stantec and myself. A draft of the plan is currently available on the Department of Planning and Building Codes website at <http://www.frankfort.ky.gov/planning-and-building-codes.html>. Copies of the plan will also be available at the meeting.

We look forward to seeing you at the meeting and receiving your input. All comments and contributions are welcome in order to make our Plan as useful and functional as possible.

Thank you,

Gary Muller, Director  
Planning and Building Codes Department  
City of Frankfort  
315 W. Second Street.  
Frankfort, Kentucky 40602



**Equal Opportunity Employer M/F/H**  
**Equal Housing Opportunity** 



## City of Frankfort Flood Mitigation Plan

**Stakeholder and Public Meeting**  
City of Frankfort Council Chambers  
March 21, 2011  
5:30 p.m.

**Gary Muller**  
Director of Planning and  
Building Codes  
City of Frankfort

**Jared Edwards**  
Environmental Scientist  
Stantec Consulting Services, Inc.











## Agenda

- Introductions
- Purpose of an FMA plan
- Planning Process
- Results
- Next Steps
  - Approval
  - Adoption
  - Maintenance







## FMP Purpose & Goals

- NFIP compliance
- Become eligible for FEMA funding
- Locate susceptible areas
- Define mitigation ideas







## FMP Benefits



Can improve the City's  
Community Rating System  
(CRS) rating.

Increase Flood Insurance  
Discounts.







## FMP Benefits

1. Identify and assess risk.
2. Develop strategies for reducing risk.
3. Improve communication between agencies.
4. Enhance existing programs.
5. **Development of Data to include in future FEMA grant applications.**



Stantec



## Risk Assessment

- Stantec reviewed:
  - NFIP data
  - Historic flood losses
  - Bluegrass ADD Regional HMP
  - Kentucky HMP
  - Zoning, subdivision, floodplain ordinances
  - Frankfort Comprehensive Plan



Stantec



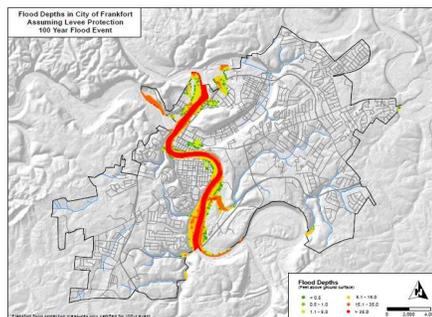
## Risk Assessment

<b>Number of Events to-date:</b> 1950-2010 (National Climatic Data Center)	14
<b>Annual Chance Probability Ratio</b>	23%
<b>Injuries and Deaths (NCDC)</b>	Four reported deaths; no injuries
<b>Property and Crop Damages (NCDC)</b>	\$19.9 million
<b>Flood Insurance Policies</b>	189
<b>Value of Policies</b>	\$33.5 million
<b>Number of Paid Losses</b>	813
<b>Value of Paid Losses</b>	\$9.7 million
<b>Repetitive Loss (RL) Properties</b>	49
<b>Value of RL Property Claims</b>	\$2.9 million
<b>Number of RL Property Claims</b>	161

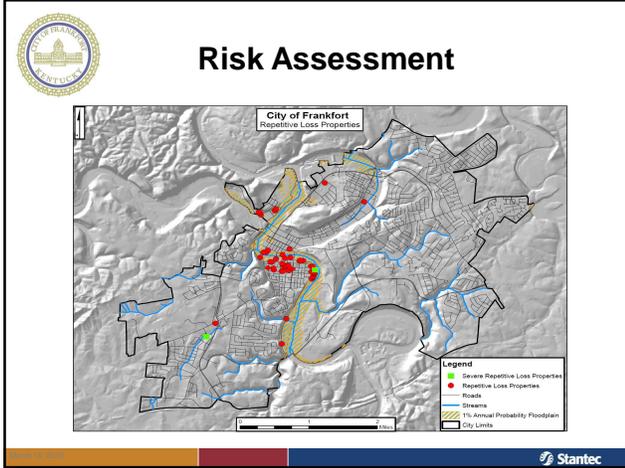
Stantec



## Risk Assessment



Stantec



**Mitigation Strategies**

Community Name: City of Frankfort      Contact Name: Cary Baker, Planning Director      Contact Phone No.: 502.322.2100

**Mitigation Goals:**

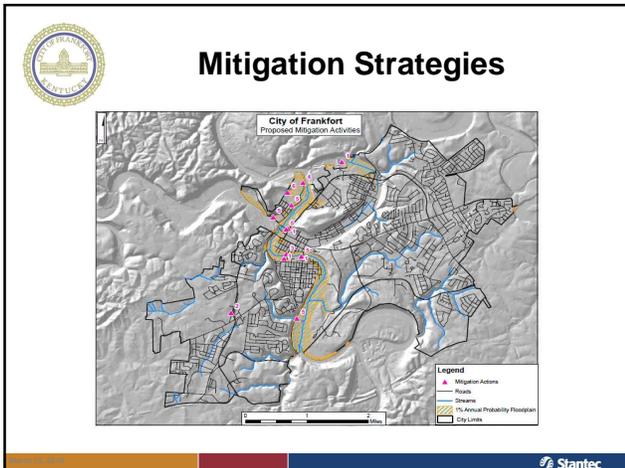
- Preventative Activities:** Reduce risk through regulations including building codes, enforcement of building codes, and code planning or code improvement projects.
- Property Protection:** Reduce exposure to hazards through building or other specific activities such as flood proofing, structural retrofits, or weathering.
- Emergency Response:** Reduce impacts through response and recovery activities that are implemented during disaster.
- Structural Protection:** Minimize impacts through structures, such as seawall design, levee design, storm surge walls, etc.
- Public Information:** Educate residents to prepare for risks and promote preparedness to reduce property damage and loss of property.
- Environmental:** Prevent the overflow of untreated or minimally treated sewage into public waterways or into private property.

Other:

Item Number	Goal	Mitigation Action	Responsible Agency or Organization	Funding Source	Implementation Timeline	Estimated Benefits	Estimated Costs
1	1	Purchase homes in the 100-year floodplain and convert the space to a park or other non-residential use.	City of Frankfort Department - Cary Baker, Planning Director	Private Property City Program & Federal Grant	5 years	High	High
2	2	Purchase backup generator for flood pump stations - South Wapping, South Wapping, South Wapping, etc.	Public Works Dept - Jeff Heston	City Program & Federal Grant	5 years	High	Medium
3	3	Construct new stormwater treatment storage tanks.	Public Works Dept - Jeff Heston	City Program & Federal Grant	5 years	Low	Medium
4	4	Build a flood protection wall at 103 Wapping Street.	Public Works Dept - Jeff Heston	City Program & Federal Grant	5 years	High	High
5	5	Build a levee or floodwall to protect the waste water treatment plant.	Public Works Dept - Jeff Heston	City Program & Federal Grant	5-10 years	High	High
6	6	Build a levee or floodwall to protect the waste water treatment plant.	Public Works Dept - Jeff Heston	City Program & Federal Grant	5-10 years	High	High
7	7	Build a levee or floodwall to protect the waste water treatment plant.	Public Works Dept - Jeff Heston	City Program & Federal Grant	5-10 years	High	High

\* Benefits and Costs estimates should be based on these categories:  
 \$0-\$100,000 - Low  
 \$100,000-\$500,000 - Medium  
 More than \$500,000 - High

Stantec



**Mitigation Strategies**

Examples:

- Purchase and install backup generators for floodwater pump stations.
- Build a flood protection wall at 103 Wapping Street.
- Build a levee or floodwall at the wastewater treatment plant.

Stantec



## Repetitive Losses

- Repetitive Losses are:
  - Properties with 2 or more losses exceeding \$1,000 in a ten year period.
- Frankfort has 49 repetitive loss properties
- Severe Repetitive Loss is a *RESIDENTIAL* building with:
  - 4 or more flood claims exceeding \$5,000, OR
  - 2 separate claims with the total exceeding market value
- Frankfort has 2 severe repetitive loss properties



## Repetitive Losses

- Third St. & Shelby St.
- Probably a drainage-related problem
- Could be fixed by a relatively simple infrastructure upgrade?



## Repetitive Losses

- Paul Sawyer Drive
- Direct flooding – no barrier between homes and river
- Purchase and remove homes?
- Elevate them?
- Build sandbag walls?



## Next Steps

- Draft Review
- Changes and updates
- Kentucky DEM review
- FEMA review
- Adoption



## Project Funding

Eligible Activities	HMGP	PDM	FMA	RFC	SRL
<b>1. Mitigation Projects</b>	√	√	√	√	√
Property Acquisition and Structure Demolition	√	√	√	√	√
Property Acquisition and Structure Relocation	√	√	√	√	√
Structure Elevation	√	√	√	√	√
Mitigation Reconstruction	√	√	√	√	√
Dry Floodproofing of Historic Residential Structures	√	√	√	√	√
Dry Floodproofing of Non-residential Structures	√	√	√	√	√
Minor Localized Flood Reduction Projects	√	√	√	√	√
Structural Retrofitting of Existing Buildings	√	√	√	√	√
Non-structural Retrofitting of Existing Buildings and Facilities	√	√	√	√	√
Safe Room Construction	√	√	√	√	√
Infrastructure Retrofit	√	√	√	√	√
Soil Stabilization	√	√	√	√	√
Wildfire Mitigation	√	√	√	√	√
Post-Disaster Code Enforcement	√	√	√	√	√
<b>2. Hazard Mitigation Planning</b>	√	√	√	√	√
<b>3. Management Costs</b>	√	√	√	√	√

## Resources

<http://kyem.ky.gov/assistance/hazardmitigation/>

## Resources

<http://www.kentuckyflood.org/>

## Resources

<http://www.disasterassistance.gov>



## Summary

- The Plan is almost done!
- We still need your comments
- The City needs to incorporate mitigation into other planning mechanisms
- Maintenance and updates!



## Questions?



**Frankfort Flood Mitigation Plan  
Public Meeting - Frankfort Council Chambers  
June 15, 2009**

Name	Community/Agency	Title	Phone Number	Email
Eric Brooker	City of Frankfort Public Works		502-875-8500	<a href="mailto:ebrooker@frankfort.ky.gov">ebrooker@frankfort.ky.gov</a>
Jonathan Parker	City of Frankfort	Homeowner		
Bill Scalf	City of Frankfort	Sewer Director	502-875-2448	<a href="mailto:wscalf@frankfort.ky.gov">wscalf@frankfort.ky.gov</a>
Gary Muller	City of Frankfort Planning and Building Codes	Director	502-352-2100	<a href="mailto:gmuller@frankfort.ky.gov">gmuller@frankfort.ky.gov</a>
Kristen Dunaway	Stantec Consulting	Environmental Planner	812-285-4060	<a href="mailto:kristen.dunaway@stantec.com">kristen.dunaway@stantec.com</a>
Matt Wagoner	Stantec Consulting	Senior Associate	812-285-4060	<a href="mailto:matt.wagoner@stantec.com">matt.wagoner@stantec.com</a>

**Frankfort Flood Mitigation Plan  
Public Meeting - Frankfort Council Chambers  
March 15, 2010**

Name	Community/Agency	Title	Phone Number	Email
Gayle Deaton	Franklin County Community Development		502-875-8751	<a href="mailto:comdev@dcr.net">comdev@dcr.net</a>
Deron Rambo	Franklin County Emergency Management	Director	502-682-2726	<a href="mailto:drambo@frankfort.ky.gov">drambo@frankfort.ky.gov</a>
Bill Scalf	City of Frankfort	Sewer Director	502-875-2448	<a href="mailto:wscalf@frankfort.ky.gov">wscalf@frankfort.ky.gov</a>
Tom Bradley	City of Frankfort Public Works		502-875-8500	<a href="mailto:tbradley@frankfort.ky.gov">tbradley@frankfort.ky.gov</a>
Jack McNear	Kentucky State University	Associate V.P. Capital Planning, Construction, & Facilities	502-597-5853	<a href="mailto:jack.mcnear@ksu.edu">jack.mcnear@ksu.edu</a>
H. Gippy Graham	City of Frankfort	Mayor	502-875-8500	<a href="mailto:ggraham@frankfort.ky.gov">ggraham@frankfort.ky.gov</a>
Jeff Hackbart	City of Frankfort Public Works	Director	502-875-8500	<a href="mailto:jhackbart@frankfort.ky.gov">jhackbart@frankfort.ky.gov</a>
Patti Cross	City of Frankfort/Franklin County	Planning and Zoning Commiss	502-223-8525	<a href="mailto:patticross@bellsouth.net">patticross@bellsouth.net</a>
Shaun Murphy	City of Frankfort	Homeowner	502-223-9818	<a href="mailto:thesmurphs1@yahoo.com">thesmurphs1@yahoo.com</a>
Gary Muller	City of Frankfort Planning and Building Codes	Director	502-352-2100	<a href="mailto:gmuller@frankfort.ky.gov">gmuller@frankfort.ky.gov</a>
Kristen Dunaway	Stantec Consulting	Environmental Planner	812-285-4060	<a href="mailto:kristen.dunaway@stantec.com">kristen.dunaway@stantec.com</a>
Jared Edwards	Stantec Consulting	Environmental Scientist	812-285-4060	<a href="mailto:jared.edwards@stantec.com">jared.edwards@stantec.com</a>

**Frankfort Flood Mitigation Plan  
Public Meeting - Frankfort Council Chambers  
March 21, 2011**

<b>Name</b>	<b>Community/Agency</b>	<b>Title</b>	<b>Phone Number</b>	<b>Email</b>
Deron Rambo	Franklin County Emergency Management	Director	502-682-2726	<a href="mailto:drambo@frankfort.ky.gov">drambo@frankfort.ky.gov</a>
Bill Scalf	City of Frankfort	Sewer Director	502-875-2448	<a href="mailto:wscalf@frankfort.ky.gov">wscalf@frankfort.ky.gov</a>
Tom Bradley	City of Frankfort Public Works		502-875-8500	<a href="mailto:tbradley@frankfort.ky.gov">tbradley@frankfort.ky.gov</a>
Gary Muller	City of Frankfort Planning and Building Codes	Director	502-352-2100	<a href="mailto:gmuller@frankfort.ky.gov">gmuller@frankfort.ky.gov</a>
Fred Goins	City of Frankfort	Interim City Manager	502-875-8500	<a href="mailto:fgoins@frankfort.ky.gov">fgoins@frankfort.ky.gov</a>
Jared Edwards	Stantec Consulting	Environmental Scientist	502-212-5000	<a href="mailto:jared.edwards@stantec.com">jared.edwards@stantec.com</a>

# **Appendix C**

## **Survey**

# City of Frankfort Floodplain Management Plan Survey



## FLOOD HAZARD INFORMATION

---

1. Please indicate the nearest intersection to your home. If you would like to include your address, it is optional:

2. In the past 10 years, have you or someone in your household experienced a flood within the City?

- Yes
- No

3. Do you consider yourself prepared for the probable impacts from a flooding event that may occur within the City? \* *If you answered no to question #3, please move on to question #4.*

- Yes
- No

**3a. If you answered yes to question #3,**

Where did you learn about being prepared for a disaster? (Please check all that apply)

- Emergency preparedness information from a government source (i.e. Federal, State, or Local emergency management)
- Personal experience. Have experienced one or more natural hazard events
- Locally provided news or other media information
- Schools and other educational institutions
- Meetings or trainings offered by volunteer organizations (Red Cross, etc)
- Other (please specify) \_\_\_\_\_

**3b. How prepared you feel you and your household are for the probable impacts of flood events likely to occur within the City?**

- Not at all prepared
- Somewhat prepared
- Adequately prepared
- Well prepared
- Very well prepared



3c. What steps, if any, have you or someone in your household taken to prepare for a flood disaster? (Check all that apply.)

Have stored or stocked up on:

- |   |  |
|---|--|
| <input type="checkbox"/> Food                             | <input type="checkbox"/> Smoke detector on each level of the house |
| <input type="checkbox"/> Water                            | <input type="checkbox"/> Prepared a disaster supply kit            |
| <input type="checkbox"/> Flashlight (s)                   | <input type="checkbox"/> Received First Aid/ CPR training          |
| <input type="checkbox"/> Batteries                        | <input type="checkbox"/> Made an evacuation plan                   |
| <input type="checkbox"/> Battery-powered radio            | <input type="checkbox"/> Discussed utility shutoffs                |
| <input type="checkbox"/> Medical supplies (First Aid Kit) | <input type="checkbox"/> Other (please specify)                    |
| <input type="checkbox"/> Fire extinguisher                |  |
- 

4. How concerned are you about floods impacting the greater Frankfort area?

- Not Concerned
- Somewhat Concerned
- Concerned
- Very Concerned
- Extremely Concerned

5. What are the most effective ways for you to receive information about how to make your household and home safer from floods (*Please check all that apply.*)

Newspapers:

- |  |   |
|--|---|
| <input type="checkbox"/> Newspaper stories | <input type="checkbox"/> Fire Department/Rescue |
| <input type="checkbox"/> Newspaper ads     | <input type="checkbox"/> Internet               |

Television:

- |  |  |
|--|--|
| <input type="checkbox"/> Television news | <input type="checkbox"/> Fact sheet/Brochure |
| <input type="checkbox"/> Television ads  | <input type="checkbox"/> Chamber of Commerce |

Radio:

- |                                     |   |
|-------------------------------------|---|
| <input type="checkbox"/> Radio news | <input type="checkbox"/> Magazine                           |
| <input type="checkbox"/> Radio ads  | <input type="checkbox"/> University or research institution |

Other Methods:

- |                                  |       |
|----------------------------------|-------|
| <input type="checkbox"/> Schools | _____ |
| <input type="checkbox"/> Books   |       |
| <input type="checkbox"/> Mail    |       |

6. To the best of your knowledge, is your property located in a designated floodplain?

- Yes
- No
- Not sure

7. Do you have flood insurance?

- Yes
- No



8. How vulnerable to damage is your infrastructure to flooding?

- Severely Vulnerable
- Moderately Vulnerable
- Minimally Vulnerable
- Don't Know

9.) How vulnerable to damage are the critical facilities (i.e. police stations, fire stations, emergency operation centers, etc) within your jurisdiction to flooding?

- Severely Vulnerable
- Moderately Vulnerable
- Minimally Vulnerable
- Don't Know

### **NATURAL HAZARD MITIGATION**

---

10. Did you consider the impact that the possible occurrence of a flood would have on your home before you purchased or moved in?

- Yes
- No

11. Was the presence of a natural hazard risk zone (i.e. flood zone) disclosed to you by a Real Estate agent, Seller, or Landlord before you purchased/moved into your home?

- Yes
- No

12. Would the disclosure of this type of information influence your decision to purchase/move into a home?

- Yes
- No

13. Would you be willing to spend money to modify/retrofit your current home from the impacts of future flood disasters? (Examples of retrofitting are: Elevating a flood prone home, flood proofing basements, creating rain gardens to prevent runoff, etc.)

- Yes
- No
- Maybe

*(If you answered No, please skip to question #15)*



14. How much money would you be willing to spend to better protect your home from the impacts of flooding?

- \$5,000 and above
- \$2,500 to \$4,999
- \$1,000 to \$2,499
- \$500 to \$999
- \$100 to \$499
- Less than \$100
- Nothing
- Don't know
- Other (please specify) \_\_\_\_\_

15. Which of the following **incentives** would help to encourage you to spend money to retrofit your home from the possible impacts of a flood? (*Please check all that apply.*)

- Low interest rate loan
- Insurance premium discount
- Mortgage discount
- Property tax break or incentive
- Grant funding that requires a "Cost-Share"
- None
- Other (please specify) \_\_\_\_\_

16. If your property were located in a designated high hazard area or had received repetitive damages from a natural event, would you consider a buyout or relocation offered by a public agency?

- Yes
- No

#### **GENERAL HOUSEHOLD INFORMATION**

---

17. Please indicate your age range:

- 18 to 29
- 30 to 39
- 40 to 49
- 50 to 59
- 60 or over

18. Gender:

- Male
- Female



19. Please indicate your highest level of education:

- Grade school/no schooling
- Some high school
- High school graduate/GED
- Some College/Trade school
- College Degree
- Post Graduate degree
- Other \_\_\_\_\_

20. How long have you lived in Frankfort?

- Less than 1 year
- 1 to 4 years
- 5 to 9 years
- 10 to 19 years
- 20 or more years

21. Do you have home access to the Internet?

- Yes
- No

22. Do you own or rent your home and/or commercial property?

- Own
- Rent

23. Do you own/rent a:

- Single-family home
- Duplex
- Apartment (3-4 units in structure)
- Apartment (5 or more units in structure)
- Condominium/townhouse
- Manufactured home
- Commercial property
- Other \_\_\_\_\_

24. **Other Comments:**


**Please return completed survey to the City of Frankfort City Planner, Gary Muller.**

**Appendix D**  
**Survey Results**

## Frankfort Flood Mitigation Plan Survey

1. Please indicate the nearest intersection to your home. If you would like to include your address, it is optional.	
Answer Options	Response Count
	10
<i>answered question</i>	<b>10</b>
<i>skipped question</i>	<b>0</b>

2. In the past 10 years, have you or someone in your household experienced a flood within the city?		
Answer Options	Response Percent	Response Count
Yes	22.2%	2
No	77.8%	7
<i>answered question</i>		<b>9</b>
<i>skipped question</i>		<b>1</b>

3. Do you consider yourself prepared for the probable impacts from a flooding event that may occur within the city? (If you answer no to this question, please move on to question #4.)		
Answer Options	Response Percent	Response Count
Yes	50.0%	5
No	50.0%	5
<i>answered question</i>		<b>10</b>
<i>skipped question</i>		<b>0</b>

3a. If you answered yes to question #3, Where did you learn about being prepared for a disaster? (Please check all that apply)		
Answer Options	Response Percent	Response Count
Emergency preparedness information from a government	66.7%	4
Personal experience. Have experienced one or more	66.7%	4
Locally provided news or other media information	66.7%	4
Schools and other educational institutions	16.7%	1
Meetings or trainings offered by volunteer organizations	16.7%	1
Other (please specify)	16.7%	1
<i>answered question</i>		<b>6</b>
<i>skipped question</i>		<b>4</b>
Number	Response Date	Other (please specify)
1	Sep 1, 2009 3:32 PM	flood insurance information

<b>3b. How prepared do you feel you and your household are for the probable impacts of flood events likely to occur within Frankfort.</b>		
<b>Answer Options</b>	<b>Response Percent</b>	<b>Response Count</b>
Not at all prepared	0.0%	0
Somewhat prepared	57.1%	4
Adequately prepared	28.6%	2
Well prepared	0.0%	0
Very well prepared	14.3%	1
<i>answered question</i>		<b>7</b>
<i>skipped question</i>		<b>3</b>

<b>3c. What steps, if any, have you or someone in your household taken to prepare for a flood disaster? (Check all that apply)</b>		
<b>Answer Options</b>	<b>Response Percent</b>	<b>Response Count</b>
Food	40.0%	2
Water	40.0%	2
Flashlight(s)	80.0%	4
Batteries	60.0%	3
Battery-powered radio	40.0%	2
Medical supplies (First Aid Kit)	80.0%	4
Fire extinguisher	40.0%	2
Smoke detector on each level of the house	40.0%	2
Prepared a disaster supply kit	20.0%	1
Received First Aid/ CPR training	20.0%	1
Made an evacuation plan	20.0%	1
Discussed utility shutoffs	20.0%	1
Other (please specify)	20.0%	1
<i>answered question</i>		<b>5</b>
<i>skipped question</i>		<b>5</b>
<b>Number</b>	<b>Response Date</b>	<b>Other (please specify)</b>
1	Sep 1, 2009 3:32 PM	furniture removal

<b>4. How concerned are you about floods impacting the greater Frankfort area?</b>		
<b>Answer Options</b>	<b>Response Percent</b>	<b>Response Count</b>
Not Concerned	11.1%	1
Somewhat Concerned	11.1%	1
Concerned	55.6%	5
Very Concerned	11.1%	1
Extremely Concerned	11.1%	1
<i>answered question</i>		<b>9</b>
<i>skipped question</i>		<b>1</b>

**5. What are the most effective ways for you to receive information about how to make your household and home safer from floods? (Please check all that apply)**

Answer Options	Response Percent	Response Count
Newspaper stories	50.0%	5
Newspaper ads	10.0%	1
Television news	40.0%	4
Television ads	20.0%	2
Radio news	40.0%	4
Radio ads	10.0%	1
Schools	10.0%	1
Books	0.0%	0
Mail	30.0%	3
Fire Department/Rescue	0.0%	0
Internet	70.0%	7
Fact sheet/Brochure	70.0%	7
Chamber of Commerce	0.0%	0
Public workshops/Meetings	50.0%	5
Magazine	10.0%	1
University or research institution	10.0%	1
Other (please specify)	10.0%	1
<i>answered question</i>		<b>10</b>
<i>skipped question</i>		<b>0</b>
<b>Number</b>	<b>Response Date</b>	<b>Other (please specify)</b>
1	Mar 23, 2010 7:17 PM	EM Office Website

**6. To the best of your knowledge, is your property located in a designated floodplain?**

Answer Options	Response Percent	Response Count
Yes	30.0%	3
No	50.0%	5
Not Sure	20.0%	2
<i>answered question</i>		<b>10</b>
<i>skipped question</i>		<b>0</b>

**7. Do you have flood insurance?**

Answer Options	Response Percent	Response Count
Yes	22.2%	2
No	77.8%	7
<i>answered question</i>		<b>9</b>
<i>skipped question</i>		<b>1</b>

<b>8. How vulnerable to damage is your infrastructure to flooding?</b>		
<b>Answer Options</b>	<b>Response Percent</b>	<b>Response Count</b>
Severely Vulnerable	20.0%	2
Moderately Vulnerable	10.0%	1
Minimally Vulnerable	50.0%	5
Don't Know	20.0%	2
<i>answered question</i>		<b>10</b>
<i>skipped question</i>		<b>0</b>

<b>9. How vulnerable to damage are the critical facilities (i.e. police stations, fire stations, emergency operation centers, etc) within your jurisdiction to flooding?</b>		
<b>Answer Options</b>	<b>Response Percent</b>	<b>Response Count</b>
Severely Vulnerable	40.0%	4
Moderately Vulnerable	40.0%	4
Minimally Vulnerable	10.0%	1
Don't Know	10.0%	1
<i>answered question</i>		<b>10</b>
<i>skipped question</i>		<b>0</b>

<b>10. Did you consider the impact that the possible occurrence of a flood would have on your home before you purchased or moved in?</b>		
<b>Answer Options</b>	<b>Response Percent</b>	<b>Response Count</b>
Yes	100.0%	10
No	0.0%	0
<i>answered question</i>		<b>10</b>
<i>skipped question</i>		<b>0</b>

<b>11. Was the presence of a natural hazard risk zone (i.e. flood zone) disclosed to you by a Real Estate agent, Seller, or Landlord before you purchased/moved into your home?</b>		
<b>Answer Options</b>	<b>Response Percent</b>	<b>Response Count</b>
Yes	70.0%	7
No	30.0%	3
<i>answered question</i>		<b>10</b>
<i>skipped question</i>		<b>0</b>

<b>12. Would the disclosure of this type of information influence your decision to purchase/move into a home?</b>		
<b>Answer Options</b>	<b>Response Percent</b>	<b>Response Count</b>
Yes	80.0%	8
No	20.0%	2
<i>answered question</i>		<b>10</b>
<i>skipped question</i>		<b>0</b>

13. Would you be willing to spend money to modify/retrofit your current home from the impacts of future flood disasters? (Examples of retrofitting are: Elevating a flood prone home, flood proofing basements, creating rain gardens to prevent runoff, etc.) (If you answered No, please skip to question #15.)		
Answer Options	Response Percent	Response Count
Yes	50.0%	5
No	20.0%	2
Maybe	30.0%	3
<i>answered question</i>		<b>10</b>
<i>skipped question</i>		<b>0</b>

14. How much money would you be willing to spend to better protect your home from the impacts of flooding?		
Answer Options	Response Percent	Response Count
\$5,000 and above	25.0%	2
\$2,500 to \$4,999	12.5%	1
\$1,000 to \$2,499	25.0%	2
\$500 to \$999	12.5%	1
\$100 to \$499	0.0%	0
Less than \$100	0.0%	0
Nothing	0.0%	0
Don't know	25.0%	2
Other (please specify)	0.0%	0
<i>answered question</i>		<b>8</b>
<i>skipped question</i>		<b>2</b>

15. Which of the following incentives would help to encourage you to spend money to retrofit your home from the possible impacts of a flood? (Please check all that apply.)		
Answer Options	Response Percent	Response Count
Low interest rate loan	44.4%	4
Insurance premium discount	55.6%	5
Mortgage discount	44.4%	4
Property tax break or incentive	55.6%	5
Grant funding that requires a "Cost-Share"	44.4%	4
None	22.2%	2
Other (please specify)		2
<i>answered question</i>		<b>9</b>
<i>skipped question</i>		<b>1</b>

16. If your property were located in a designated high hazard area or had received repetitive damages from a natural event, would you consider a buyout or relocation offered by a public agency?		
Answer Options	Response Percent	Response Count
Yes	90.0%	9
No	10.0%	1
<i>answered question</i>		<b>10</b>
<i>skipped question</i>		<b>0</b>

17. Please indicate your age range:		
Answer Options	Response Percent	Response Count
18 to 29	10.0%	1
30 to 39	20.0%	2
40 to 49	20.0%	2
50 to 59	40.0%	4
60 or over	10.0%	1
<i>answered question</i>		<b>10</b>
<i>skipped question</i>		<b>0</b>

18. Gender:		
Answer Options	Response Percent	Response Count
Male	50.0%	5
Female	50.0%	5
<i>answered question</i>		<b>10</b>
<i>skipped question</i>		<b>0</b>

19. Please indicate your highest level of education:		
Answer Options	Response Percent	Response Count
Grade school/no schooling	0.0%	0
Some high school	0.0%	0
High school graduate/GED	0.0%	0
Some College/Trade school	40.0%	4
College Degree	50.0%	5
Post Graduate degree	10.0%	1
Other (please specify)		0
<i>answered question</i>		<b>10</b>
<i>skipped question</i>		<b>0</b>

20. How long have you lived in Frankfort?		
Answer Options	Response Percent	Response Count
Less than 1 year	0.0%	0
1 to 4 years	0.0%	0
5 to 9 years	20.0%	2
10 to 19 years	20.0%	2
20 or more years	60.0%	6
<i>answered question</i>		<b>10</b>
<i>skipped question</i>		<b>0</b>

21. Do you have home access to the Internet?		
Answer Options	Response Percent	Response Count
Yes	90.0%	9
No	10.0%	1
<i>answered question</i>		<b>10</b>
<i>skipped question</i>		<b>0</b>

22. Do you own or rent your home and/or commercial property?		
Answer Options	Response Percent	Response Count
Own	100.0%	9
Rent	0.0%	0
<i>answered question</i>		<b>9</b>
<i>skipped question</i>		<b>1</b>

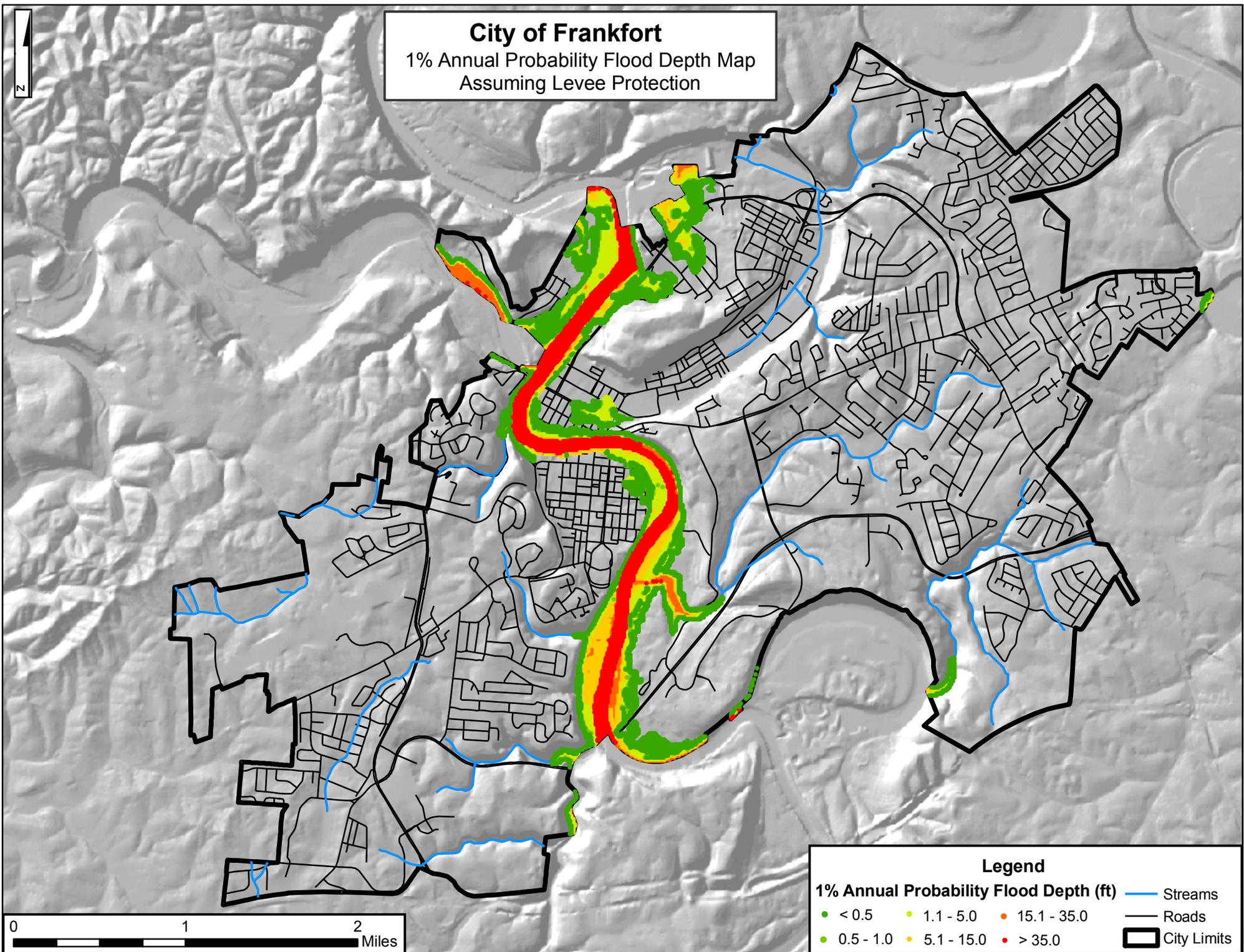
23. Do you own/rent a:		
Answer Options	Response Percent	Response Count
Single-family home	100.0%	9
Duplex	0.0%	0
Apartment (3-4 units in structure)	0.0%	0
Apartment (5 or more units in structure)	0.0%	0
Condominium/townhouse	0.0%	0
Manufactured home	0.0%	0
Other (please specify)	0.0%	0
<i>answered question</i>		<b>9</b>
<i>skipped question</i>		<b>1</b>

24. Other Comments:	
Number	Response Text
1	My house has only flooded twice in it's history from the KY River. The real issue with my property is heavy rains. The water suddenly appears from our backyards (Coleman Spring at the end of Steel St) and runs through my house like a raging stream. It can be as deep as two feet or more when we have large rainstorms. Mine is not the only house that is affected.
2	I represent a university and we have a property in a flood zone.
3	We are not in a floodplain area at home- Indian Hills; don't know if we have flood insurance

# **Appendix E**

## **Maps**

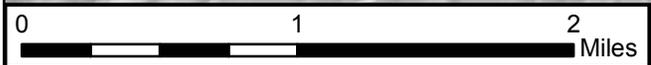
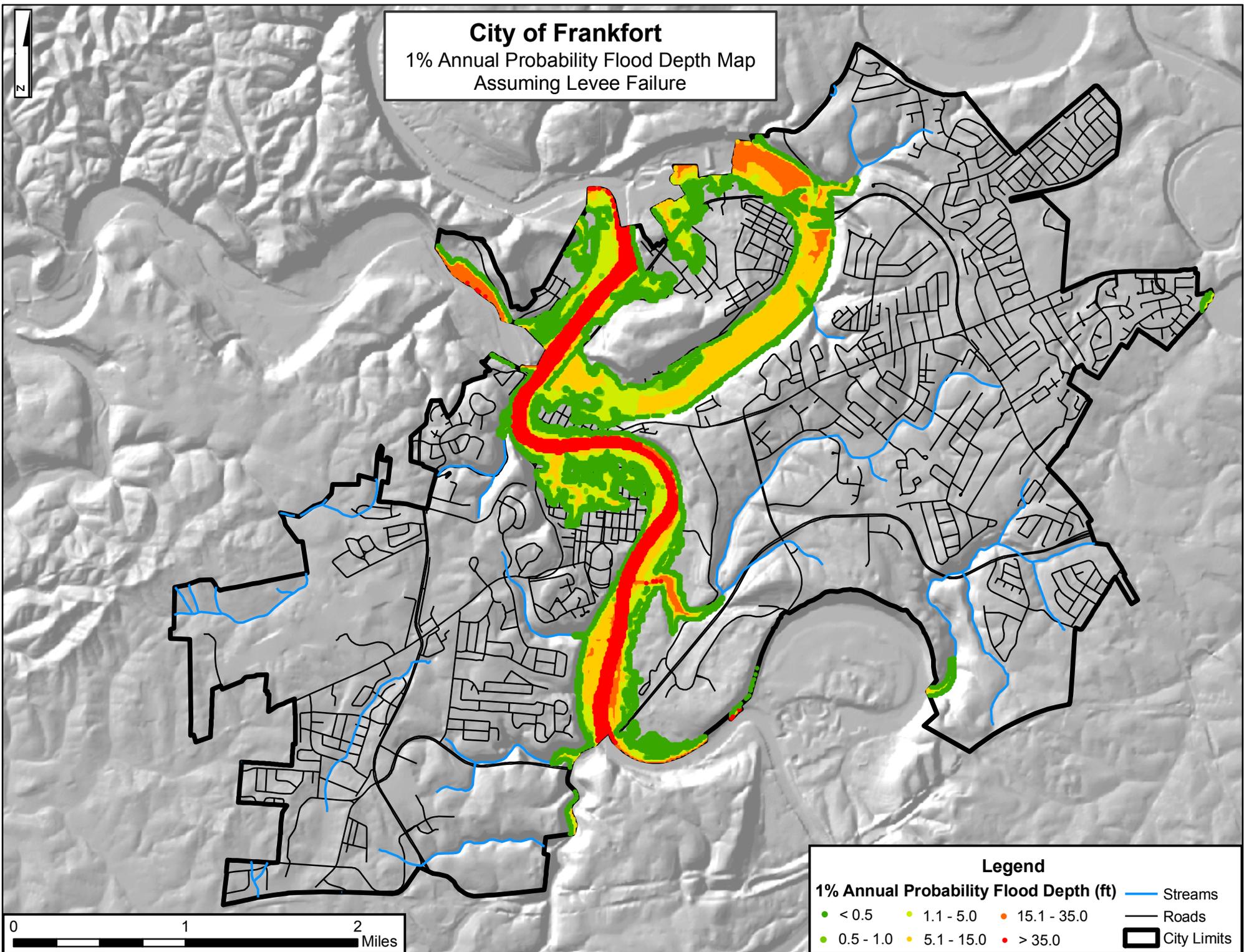
**City of Frankfort**  
1% Annual Probability Flood Depth Map  
Assuming Levee Protection



**Legend**

<span style="color: green;">●</span> < 0.5	<span style="color: yellow;">●</span> 1.1 - 5.0	<span style="color: orange;">●</span> 15.1 - 35.0	<span style="color: blue;">—</span> Streams
<span style="color: green;">●</span> 0.5 - 1.0	<span style="color: yellow;">●</span> 5.1 - 15.0	<span style="color: red;">●</span> > 35.0	<span style="color: black;">—</span> Roads
			<span style="border: 1px solid black; display: inline-block; width: 15px; height: 10px;"></span> City Limits

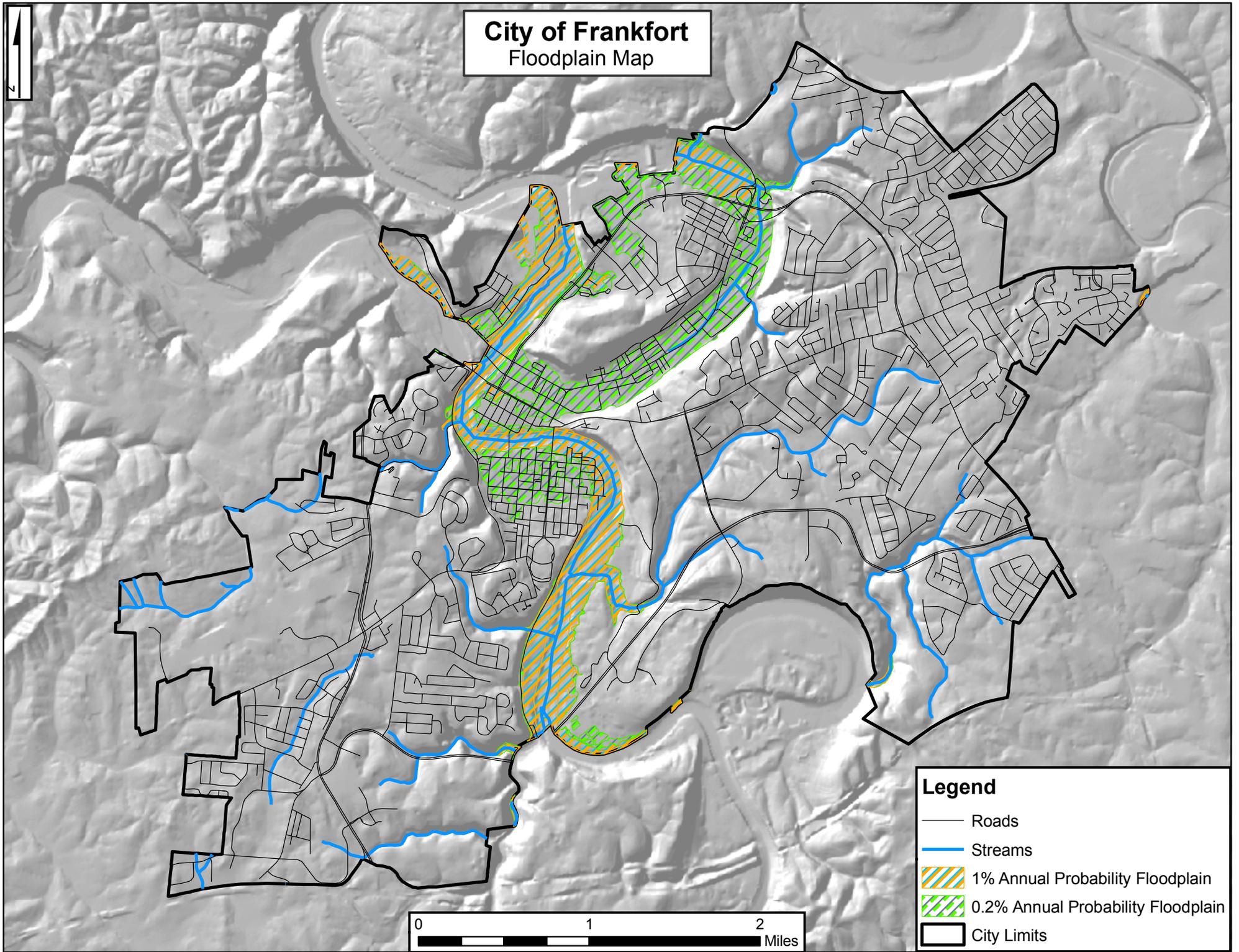
**City of Frankfort**  
1% Annual Probability Flood Depth Map  
Assuming Levee Failure



**Legend**

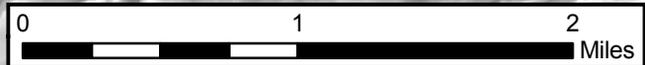
<span style="color: green;">●</span> < 0.5	<span style="color: yellow;">●</span> 1.1 - 5.0	<span style="color: orange;">●</span> 15.1 - 35.0	<span style="color: blue;">—</span> Streams
<span style="color: lightgreen;">●</span> 0.5 - 1.0	<span style="color: gold;">●</span> 5.1 - 15.0	<span style="color: red;">●</span> > 35.0	<span style="color: gray;">—</span> Roads
			<span style="border: 1px solid black; display: inline-block; width: 15px; height: 10px;"></span> City Limits

# City of Frankfort Floodplain Map

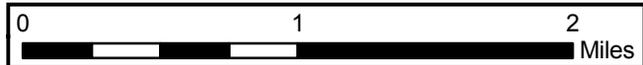
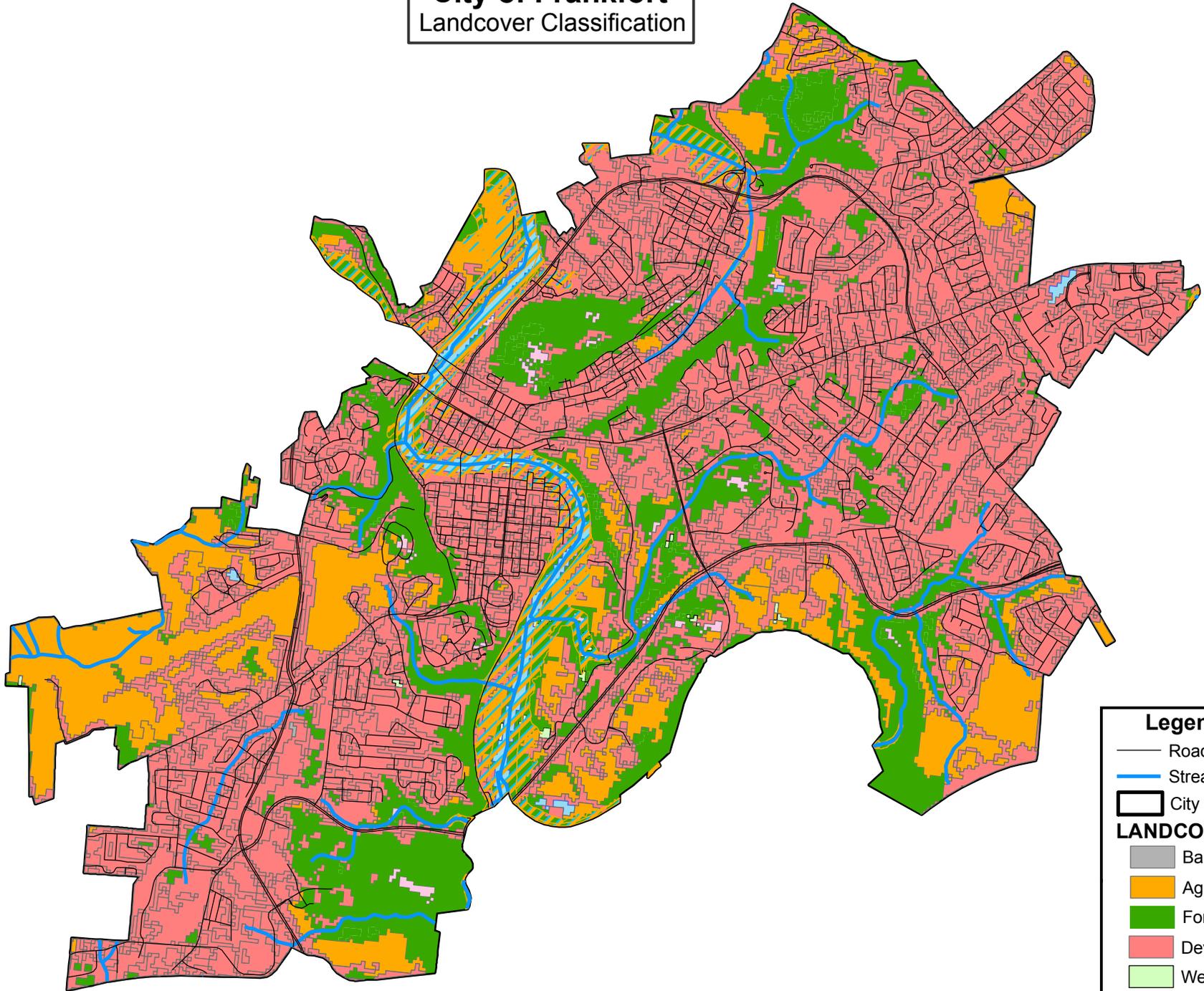


## Legend

- Roads
- Streams
- ▨ 1% Annual Probability Floodplain
- ▨ 0.2% Annual Probability Floodplain
- ▭ City Limits



# City of Frankfort Landcover Classification



**Legend**

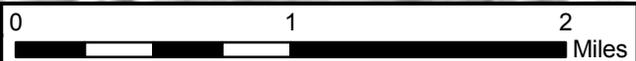
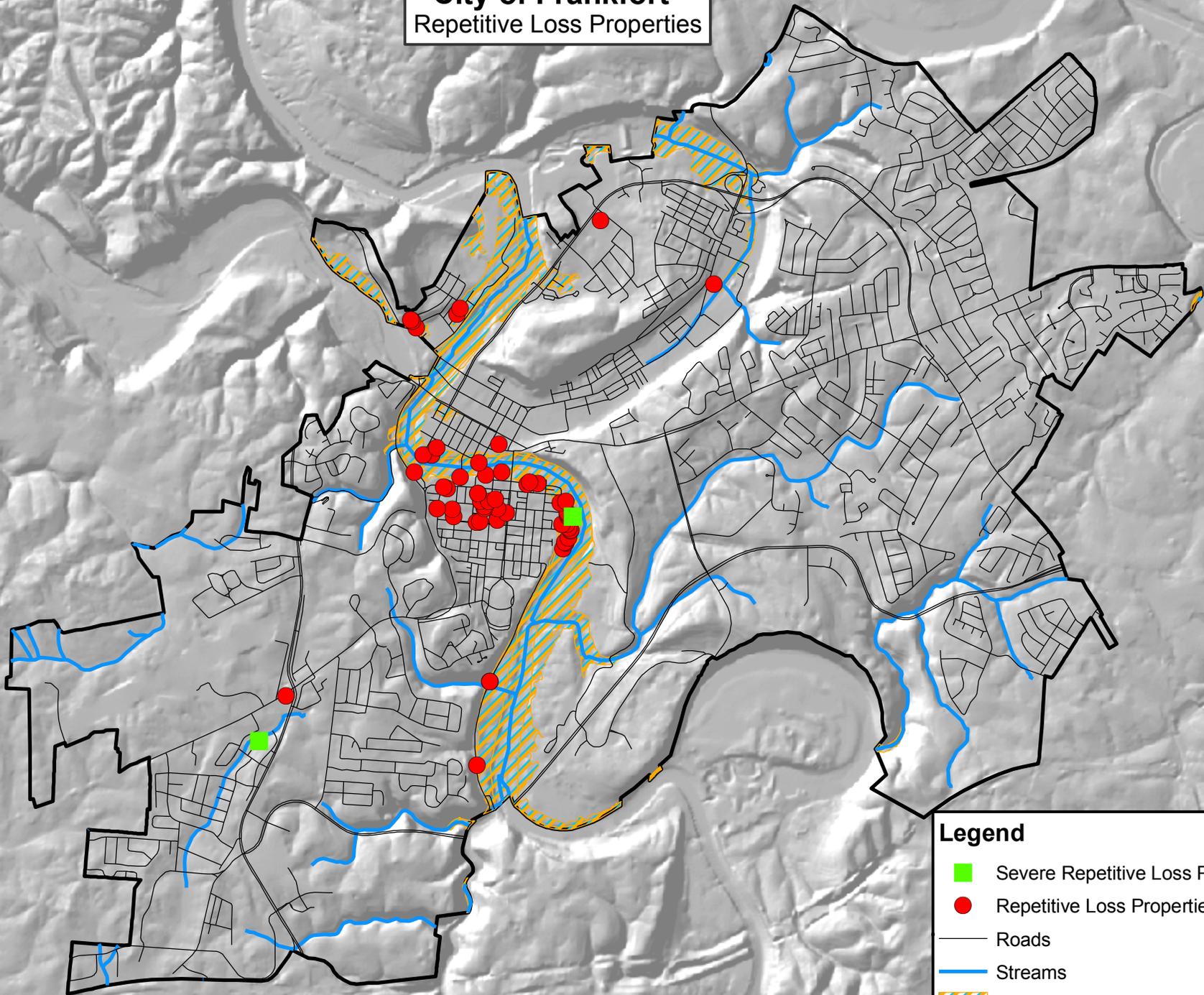
- Roads
- Streams
- ▭ City Limits

**LANDCOVER**

- ▭ Barren Land
- ▭ Agricultural
- ▭ Forest
- ▭ Developed
- ▭ Wetland
- ▭ Herbageous
- ▭ Open Water

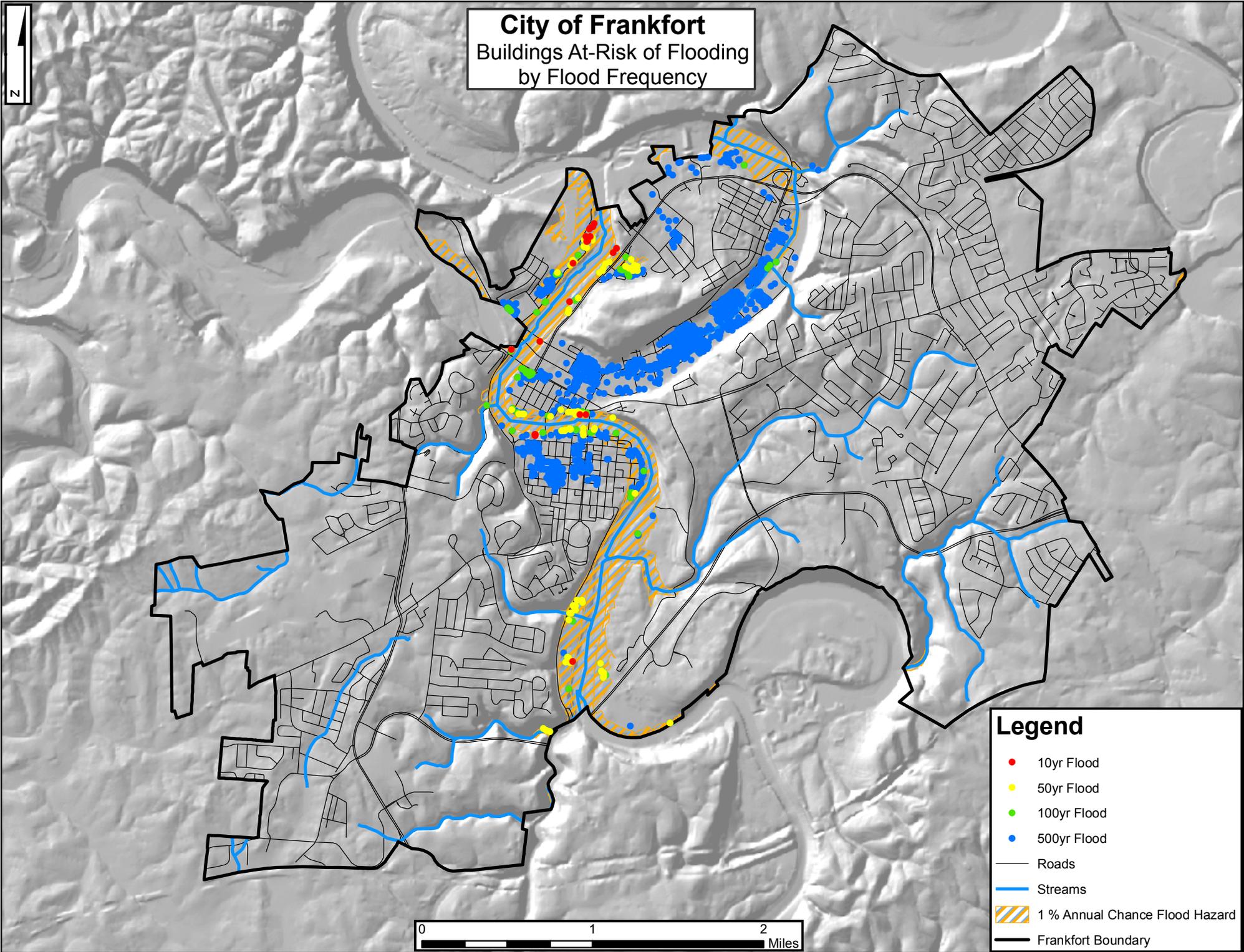
# City of Frankfort

## Repetitive Loss Properties



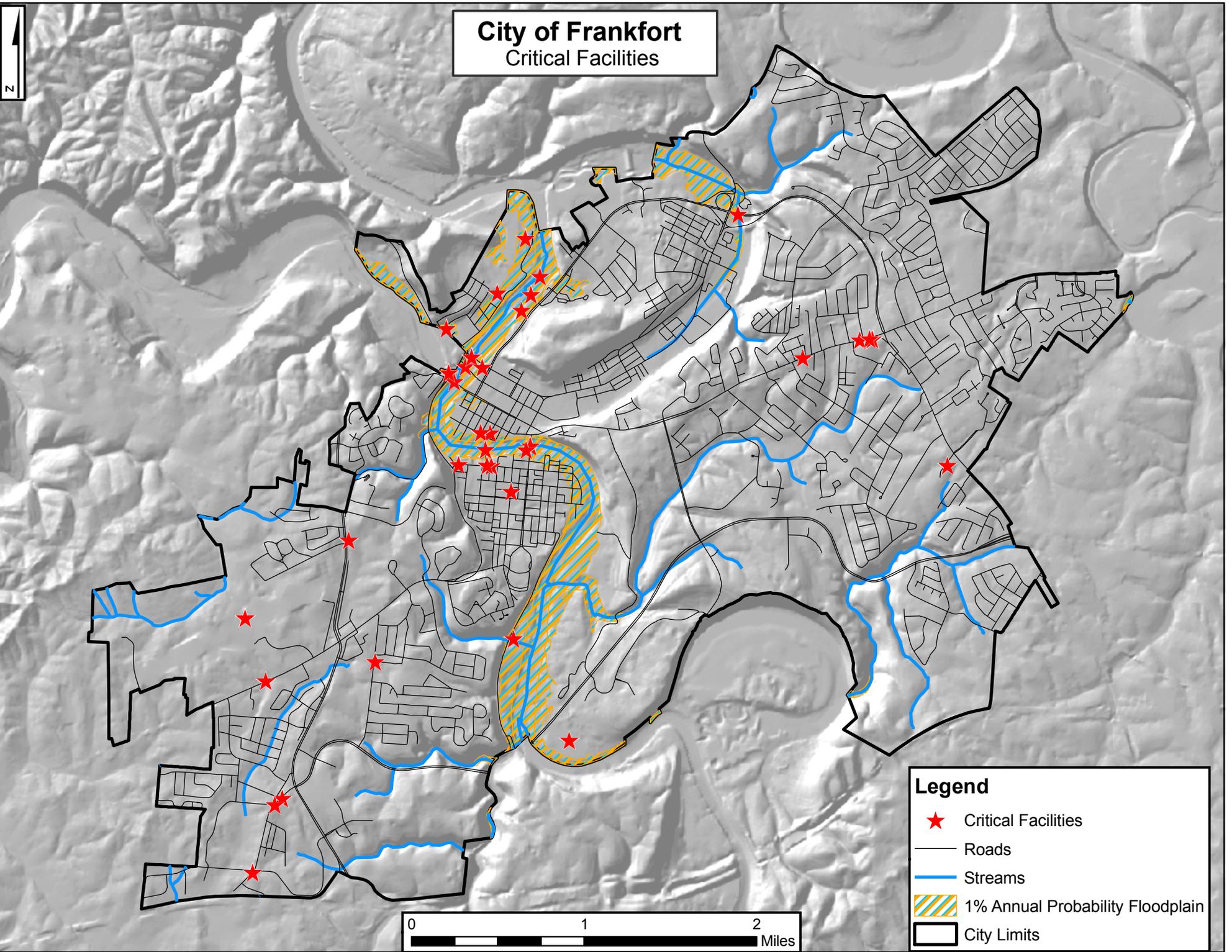
### Legend

-  Severe Repetitive Loss Properties
-  Repetitive Loss Properties
-  Roads
-  Streams
-  1% Annual Probability Floodplain
-  City Limits



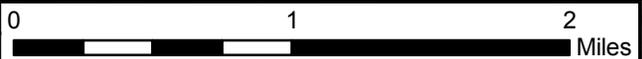
# City of Frankfort

## Critical Facilities



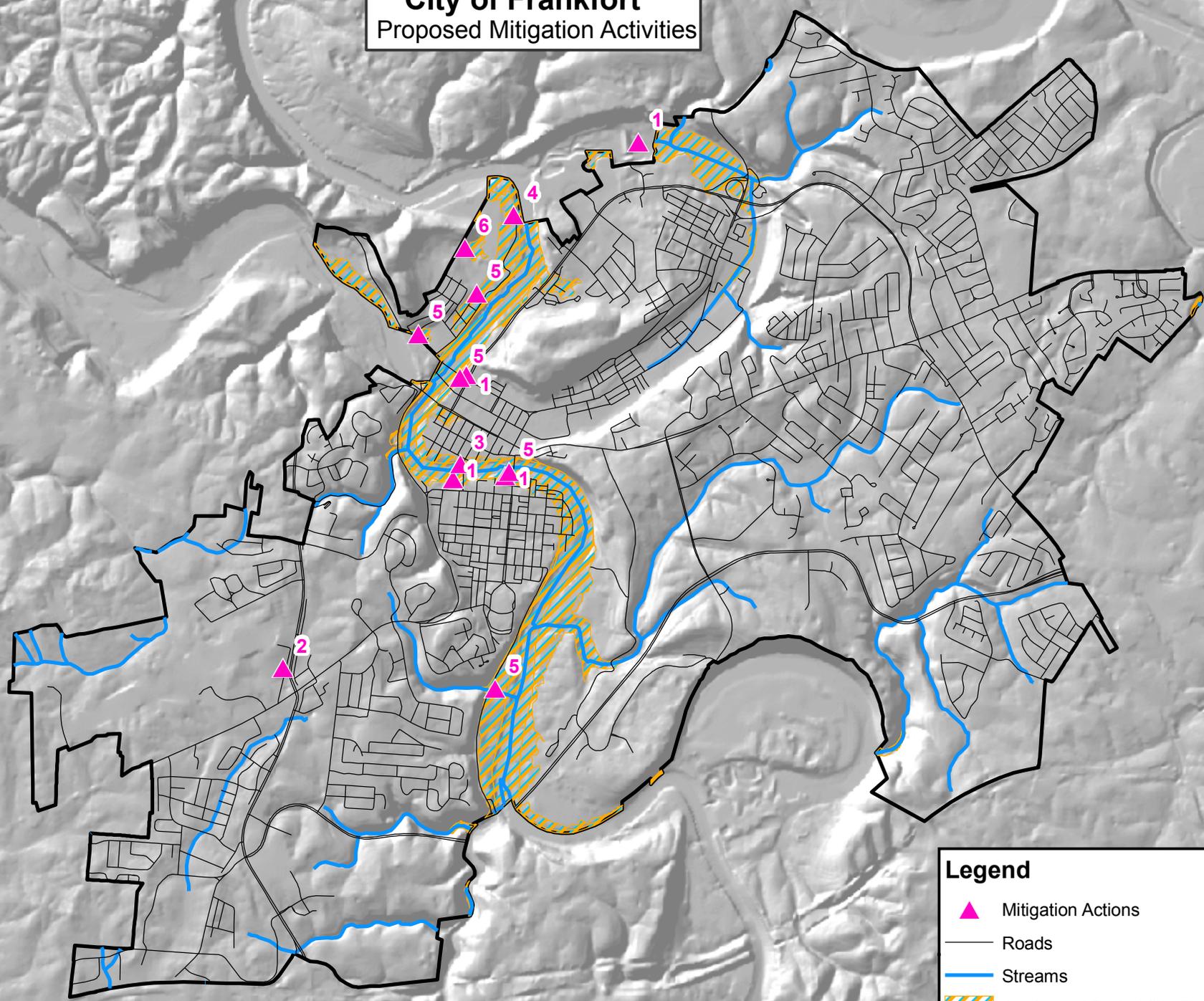
### Legend

-  Critical Facilities
-  Roads
-  Streams
-  1% Annual Probability Floodplain
-  City Limits



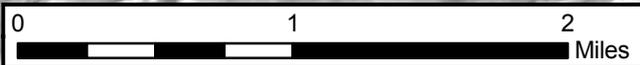
# City of Frankfort

## Proposed Mitigation Activities



**Legend**

- Mitigation Actions
- Roads
- Streams
- 1% Annual Probability Floodplain
- City Limits



# **Appendix F**

## **Mitigation Activities**

Community Name: City of Frankfort

Contact Name: Gary Muller, Planning Director

Contact Phone No.: 502-352-2100

**Mitigation Goals:**

1. **Preventative Activities.** Reduce risks through regulations including building codes, development outside of hazardous areas, and local planning or capital improvement projects.
2. **Property Protection.** Reduce exposure to hazards through building or parcel specific activities such as flood proofing, structure acquisition, or retrofitting.
3. **Emergency Services.** Reduce impacts through response and recovery activities that are implemented during a disaster.
4. **Structural Projects.** Minimize impacts through projects, such as detention basins, tornado shelters, tornado sirens, etc.
5. **Public Information.** Assist residents to prepare for risks and protective measures to better protect themselves and their property.
6. **Environmental.** Prevent the overflow of untreated or minimally treated sewage into public waterways or onto private property.
7. **Other.** \_\_\_\_\_

Item Number	Goal Number	Mitigation Action	Responsible Agency & Contact Person	Funding Source	Implementation Timeline	Estimated Benefits <sup>†</sup>	Estimated Costs <sup>†</sup>
<i>Example</i>	2	<i>Purchase homes in the 100 year floodplain and convert the space to a park or greenspace to reduce flood impacts.</i>	<i>County Planning Department - Bob Jones, Director</i>	<i>Hazard Mitigation Grant Program &amp; General Funds</i>	<i>5 years</i>	<i>Medium</i>	<i>Medium</i>
1.	4	Purchase backup generator for flood pump stations. – South Frankfort, North Frankfort, Battle Alley, Jones Run	Public Works Dept. – Jeff Hackbart	Hazard Mitigation Grant Program & General Funds	5 years	High	High
2.	2	Construct new stormwater inlet into the drainage tunnel.	Public Works Dept. – Jeff Hackbart; Plant Board – Herbie Bannister	Hazard Mitigation Grant Program & General Funds	5 years	High	Medium
3.	2/4	Build a flood protection wall at 103 Wapping Street	Kentucky State University Planning Committee	Hazard Mitigation Grant Program & General Funds	5 years	Low	Medium
4.	1	Build a levee or floodwall to protect the waste water treatment plant	Sewer Board Director – Bill Scalf	FEMA & Local funds	3-5 years	High	High
5.	2/4/6	Move waste water pumping stations. – Capital Ave., Old Lawrenceburg Rd., Mero St., Benson Ave., Wilson Ave.	Sewer Board Director – Bill Scalf	FEMA & Local funds	5-10 years	High	High
6.	2	Purchase a secondary access to the waste water treatment plant for access during flood events.	Sewer Board Director – Bill Scalf	FEMA & Local funds	2-4 years	High	Medium
7.	5	Maintain updated copies of FIRM maps and the Frankfort FIS at the City Building for public access and review.	Planning and Building Codes Department – Gary Muller	Local Funds	1 year	Low	Low
8.	5	Maintain copies of FEMA NFIP documentation available for public use and review at the City Building.	Planning and Building Codes Department – Gary Muller	Local Funds	1 year	Low	Low

<sup>†</sup> **Benefits and Costs estimates should be based on these categories:**

- Less than \$100,000 = Low
- \$100,000 - \$500,000 = Medium
- More than \$500,000 = High

# **Appendix G**

## **Crosswalk**

# LOCAL MITIGATION PLAN REVIEW CROSSWALK: City of Frankfort Flood Mitigation Plan

## LOCAL MITIGATION PLAN REVIEW SUMMARY

The plan cannot be approved if the plan has not been formally adopted. Each requirement includes separate elements. All elements of the requirement must be rated "Satisfactory" in order for the requirement to be fulfilled and receive a score of "Satisfactory." Elements of each requirement are listed on the following pages of the Plan Review Crosswalk. A "Needs Improvement" score on elements shaded in gray (recommended but not required) will not preclude the plan from passing. Reviewer's comments must be provided for requirements receiving a "Needs Improvement" score.

Prerequisite(s) (Check Applicable Box)	NOT MET	MET
1. Adoption by the Local Governing Body: §201.6(c)(5) OR	<input type="checkbox"/>	<input type="checkbox"/>
2. Multi-Jurisdictional Plan Adoption: §201.6(c)(5)	<input type="checkbox"/>	<input type="checkbox"/>
<b>AND</b>		
3. Multi-Jurisdictional Planning Participation: §201.6(a)(3)	<input type="checkbox"/>	<input type="checkbox"/>
<b>Planning Process</b>		
	N	S
4. Documentation of the Planning Process: §201.6(b) and §201.6(c)(1)	<input type="checkbox"/>	<input type="checkbox"/>
<b>Risk Assessment</b>		
	N	S
5. Identifying Hazards: §201.6(c)(2)(i)	<input type="checkbox"/>	<input type="checkbox"/>
6. Profiling Hazards: §201.6(c)(2)(i)	<input type="checkbox"/>	<input type="checkbox"/>
7. Assessing Vulnerability: Overview: §201.6(c)(2)(ii)	<input type="checkbox"/>	<input type="checkbox"/>
<b>8. Assessing Vulnerability: Addressing Repetitive Loss Properties. §201.6(c)(2)(ii)</b>	<input type="checkbox"/>	<input type="checkbox"/>
9. Assessing Vulnerability: Identifying Structures, Infrastructure, and Critical Facilities: §201.6(c)(2)(ii)(B)	<input type="checkbox"/>	<input type="checkbox"/>
10. Assessing Vulnerability: Estimating Potential Losses: §201.6(c)(2)(ii)(B)	<input type="checkbox"/>	<input type="checkbox"/>
11. Assessing Vulnerability: Analyzing Development Trends: §201.6(c)(2)(ii)(C)	<input type="checkbox"/>	<input type="checkbox"/>
12. Multi-Jurisdictional Risk Assessment: §201.6(c)(2)(iii)	<input type="checkbox"/>	<input type="checkbox"/>

\*States that have additional requirements can add them in the appropriate sections of the *Local Multi-Hazard Mitigation Planning Guidance* or create a new section and modify this Plan Review Crosswalk to record the score for those requirements.

## SCORING SYSTEM

Please check one of the following for each requirement.

**N – Needs Improvement:** The plan does not meet the minimum for the requirement. Reviewer's comments must be provided.

**S – Satisfactory:** The plan meets the minimum for the requirement. Reviewer's comments are encouraged, but not required.

Mitigation Strategy	N	S
13. Local Hazard Mitigation Goals: §201.6(c)(3)(i)	<input type="checkbox"/>	<input type="checkbox"/>
14. Identification and Analysis of Mitigation Actions: §201.6(c)(3)(ii)	<input type="checkbox"/>	<input type="checkbox"/>
<b>15. Identification and Analysis of Mitigation Actions: NFIP Compliance. §201.6(c)(3)(ii)</b>	<input type="checkbox"/>	<input type="checkbox"/>
16. Implementation of Mitigation Actions: §201.6(c)(3)(iii)	<input type="checkbox"/>	<input type="checkbox"/>
17. Multi-Jurisdictional Mitigation Actions: §201.6(c)(3)(iv)	<input type="checkbox"/>	<input type="checkbox"/>
<b>Plan Maintenance Process</b>		
	N	S
18. Monitoring, Evaluating, and Updating the Plan: §201.6(c)(4)(ii)	<input type="checkbox"/>	<input type="checkbox"/>
19. Incorporation into Existing Planning Mechanisms: §201.6(c)(4)(ii)	<input type="checkbox"/>	<input type="checkbox"/>
20. Continued Public Involvement: §201.6(c)(4)(iii)	<input type="checkbox"/>	<input type="checkbox"/>
<b>Additional State Requirements*</b>		
Insert State Requirement	<input type="checkbox"/>	<input type="checkbox"/>
Insert State Requirement	<input type="checkbox"/>	<input type="checkbox"/>
Insert State Requirement	<input type="checkbox"/>	<input type="checkbox"/>

## LOCAL MITIGATION PLAN APPROVAL STATUS

**PLAN NOT APPROVED**   
**See Reviewer's Comments**  
**PLAN APPROVED**

**LOCAL MITIGATION PLAN REVIEW CROSSWALK: City of Frankfort Flood Mitigation Plan**

**Local Mitigation Plan Review and Approval Status**

<b>Jurisdiction:</b> City of Frankfort, Kentucky	<b>Title of Plan:</b> Frankfort Flood Mitigation Plan	<b>Date of Plan:</b> June, 2011
<b>Local Point of Contact:</b> Gary Muller	<b>Address:</b> Department of Planning and Building Codes City of Frankfort 315 W. Second Street Frankfort, Kentucky 40601	
<b>Title:</b> Director		
<b>Agency:</b> Department of Planning and Building Codes		
<b>Phone Number:</b> 502-352-2100	<b>E-Mail:</b> <a href="mailto:gmuller@frankfort.ky.gov">gmuller@frankfort.ky.gov</a>	

<b>State Reviewer:</b>	<b>Title:</b>	<b>Date:</b>
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<b>FEMA Reviewer:</b>	<b>Title:</b>	<b>Date:</b>
<b>Date Received in FEMA Region [Insert #]</b>		
<b>Plan Not Approved</b>		
<b>Plan Approved</b>		
<b>Date Approved</b>		

<b>Jurisdiction:</b>	<b>DFIRM</b>		<b>NFIP Status*</b>			
	<b>In Plan</b>	<b>NOT in Plan</b>	<b>Y</b>	<b>N</b>	<b>N/A</b>	<b>CRS Class</b>
1. City of Frankfort, Kentucky	X		X			8
2.						
3.						
4.						
5.						

\* Notes:                    Y = Participating                    N = Not Participating                    N/A = Not Mapped

**LOCAL MITIGATION PLAN REVIEW CROSSWALK: City of Frankfort Flood Mitigation Plan**

PREREQUISITE(S)

**1. Adoption by the Local Governing Body**

**Requirement §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).

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			NOT MET	MET
A. Has the local governing body adopted the <b>new or updated</b> plan?	Section 1.1; Appendix A			
B. Is supporting documentation, such as a resolution, included?	Appendix A			
<b>SUMMARY SCORE</b>				

**2. Multi-Jurisdictional Plan Adoption**

**Requirement §201.6(c)(5):** For multi-jurisdictional plans, each jurisdiction requesting approval of the plan **must** document that it has been formally adopted.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			NOT MET	MET
A. Does the <b>new or updated</b> plan indicate the specific jurisdictions represented in the plan?	N/A – Single Jurisdiction			
B. For each jurisdiction, has the local governing body adopted the <b>new or updated</b> plan?	N/A – Single Jurisdiction			
C. Is supporting documentation, such as a resolution, included for each participating jurisdiction?	N/A – Single Jurisdiction			
<b>SUMMARY SCORE</b>				

**3. Multi-Jurisdictional Planning Participation**

**Requirement §201.6(a)(3):** Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process ... Statewide plans will not be accepted as multi-jurisdictional plans.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			NOT MET	MET
A. Does the <b>new or updated</b> plan describe <b>how</b> each jurisdiction participated in the plan's development?	Section 1.2			
B. Does the <b>updated</b> plan identify all participating jurisdictions, including new, continuing, and the jurisdictions that no longer participate in the plan?	N/A – First Plan			
<b>SUMMARY SCORE</b>				

**LOCAL MITIGATION PLAN REVIEW CROSSWALK: City of Frankfort Flood Mitigation Plan**

**PLANNING PROCESS:** §201.6(b): *An open public involvement process is essential to the development of an effective plan.*

**4. Documentation of the Planning Process**

**Requirement §201.6(b):** *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.*

**Requirement §201.6(c)(1):** *[The plan shall document] 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.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the plan provide a narrative description of the process followed to prepare the <b>new or updated</b> plan?	Section 1.2			
B. Does the <b>new or updated</b> plan indicate who was involved in the <b>current</b> planning process? (For example, who led the development at the staff level and were there any external contributors such as contractors? Who participated on the plan committee, provided information, reviewed drafts, etc.?)	Section 1.2			
C. Does the <b>new or updated</b> plan indicate how the public was involved? (Was the public provided an opportunity to comment on the plan during the drafting stage and prior to the plan approval?)	Section 1.2			
D. <b>Does the new or updated plan discuss the</b> opportunity for neighboring communities, agencies, businesses, academia, nonprofits, and other interested parties to be involved in the planning process?	Section 1.2			
E. Does the planning process describe the review and incorporation, if appropriate, of existing plans, studies, reports, and technical information?	Section 1.3			
F. Does the <b>updated</b> plan document how the planning team reviewed and analyzed each section of the plan and whether each section was revised as part of the update process?	N/A – First Plan			
<b>SUMMARY SCORE</b>				

**LOCAL MITIGATION PLAN REVIEW CROSSWALK: City of Frankfort Flood Mitigation Plan**

**RISK ASSESSMENT:** §201.6(c)(2): *The plan shall include 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.*

**5. Identifying Hazards**

**Requirement §201.6(c)(2)(i):** *[The risk assessment shall include a] description of the type ... of all natural hazards that can affect the jurisdiction.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the <b>new or updated</b> plan include a <b>description</b> of the types of <b>all natural hazards</b> that affect the jurisdiction?	Sections 2.1 & 3			
<b>SUMMARY SCORE</b>				

**6. Profiling Hazards**

**Requirement §201.6(c)(2)(i):** *[The risk assessment shall include a] description of the ... 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.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the risk assessment identify the <b>location</b> ( <i>i.e.</i> , geographic area affected) of each natural hazard addressed in the <b>new or updated</b> plan?	Section 2.0; Figure 3			
B. Does the risk assessment identify the <b>extent</b> ( <i>i.e.</i> , magnitude or severity) of each hazard addressed in the <b>new or updated</b> plan?	Sections 2.3 & 2.4			
C. Does the plan provide information on <b>previous occurrences</b> of each hazard addressed in the <b>new or updated</b> plan?	Section 2.2			
D. Does the plan include the <b>probability of future events</b> ( <i>i.e.</i> , chance of occurrence) for each hazard addressed in the <b>new or updated</b> plan?	Section 2.5			
<b>SUMMARY SCORE</b>				

**LOCAL MITIGATION PLAN REVIEW CROSSWALK: City of Frankfort Flood Mitigation Plan**

**7. Assessing Vulnerability: Overview**

**Requirement §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.

Element	Location in the Plan (section or annex and page #)	Reviewer’s Comments	SCORE	
			N	S
A. Does the <b>new or updated</b> plan include an <b>overall summary</b> description of the jurisdiction’s <b>vulnerability</b> to each hazard?	Section 2.6			
B. Does the <b>new or updated</b> plan address the <b>impact</b> of each hazard on the jurisdiction?	Section 2.3			
<b>SUMMARY SCORE</b>				

**8. Assessing Vulnerability: Addressing Repetitive Loss Properties**

**Requirement §201.6(c)(2)(ii):** [The risk assessment] **must** also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged floods.

Element	Location in the Plan (section or annex and page #)	Reviewer’s Comments	SCORE	
			N	S
A. Does the <b>new or updated</b> plan describe vulnerability in terms of the types and numbers of <b>repetitive loss properties</b> located in the identified hazard areas?	Section 2.6.3	<b>Note: This requirement becomes effective for all local plans approved after October 1, 2008.</b>		
<b>SUMMARY SCORE</b>				

**9. Assessing Vulnerability: Identifying Structures**

**Requirement §201.6(c)(2)(ii)(A):** The plan **should** describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area ... .

Element	Location in the Plan (section or annex and page #)	Reviewer’s Comments	SCORE	
			N	S
A. Does the <b>new or updated</b> plan describe vulnerability in terms of the <b>types and numbers</b> of <b>existing</b> buildings, infrastructure, and critical facilities located in the identified hazard areas?	Section 2.7.4	<b>Note: A “Needs Improvement” score on this requirement will not preclude the plan from passing.</b>		
B. Does the <b>new or updated</b> plan describe vulnerability in terms of the <b>types and numbers</b> of <b>future</b> buildings, infrastructure, and critical facilities located in the identified hazard areas?	Section 2.8	<b>Note: A “Needs Improvement” score on this requirement will not preclude the plan from passing.</b>		
<b>SUMMARY SCORE</b>				

**LOCAL MITIGATION PLAN REVIEW CROSSWALK: City of Frankfort Flood Mitigation Plan**

**10. Assessing Vulnerability: Estimating Potential Losses**

**Requirement §201.6(c)(2)(ii)(B):** [The plan **should** describe vulnerability in terms of 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 ... .

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the <b>new or updated</b> plan estimate <b>potential dollar losses</b> to vulnerable structures?	Sections 2.7.2, 2.7.4, Table 10	<b>Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.</b>		
B. Does the <b>new or updated</b> plan describe the <b>methodology</b> used to prepare the estimate?	Section 2.7.4	<b>Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.</b>		
<b>SUMMARY SCORE</b>				

**11. Assessing Vulnerability: Analyzing Development Trends**

**Requirement §201.6(c)(2)(ii)(C):** [The plan **should** describe vulnerability in terms of] 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.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the <b>new or updated</b> plan describe land uses and development trends?	Section 2.6.1	<b>Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.</b>		
<b>SUMMARY SCORE</b>				

**12. Multi-Jurisdictional Risk Assessment**

**Requirement §201.6(c)(2)(iii):** For multi-jurisdictional plans, the risk assessment **must** assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the <b>new or updated</b> plan include a risk assessment for each participating jurisdiction as needed to reflect unique or varied risks?	Section 2.7			
<b>SUMMARY SCORE</b>				

**LOCAL MITIGATION PLAN REVIEW CROSSWALK: City of Frankfort Flood Mitigation Plan**

**MITIGATION STRATEGY:** §201.6(c)(3): *The plan shall include 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.*

**13. Local Hazard Mitigation Goals**

**Requirement §201.6(c)(3)(i):** *[The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.*

Element	Location in the Plan (section or annex and page #)	Reviewer’s Comments	SCORE	
			N	S
A Does the <b>new or updated</b> plan include a description of mitigation <b>goals</b> to reduce or avoid long-term vulnerabilities to the identified hazards?	Section 2.9.2			
<b>SUMMARY SCORE</b>				

**14. Identification and Analysis of Mitigation Actions**

**Requirement §201.6(c)(3)(ii):** *[The mitigation strategy shall include 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.*

Element	Location in the Plan (section or annex and page #)	Reviewer’s Comments	SCORE	
			N	S
A. Does the <b>new or updated</b> plan identify and analyze a <b>comprehensive range</b> of specific mitigation actions and projects for each hazard?	Section 2.9.3 & Appendix F			
B Do the identified actions and projects address reducing the effects of hazards on <b>new</b> buildings and infrastructure?	Section 2.9.3 & Appendix F			
C. Do the identified actions and projects address reducing the effects of hazards on <b>existing</b> buildings and infrastructure?	Section 2.9.3 & Appendix F			
<b>SUMMARY SCORE</b>				

**LOCAL MITIGATION PLAN REVIEW CROSSWALK: City of Frankfort Flood Mitigation Plan**

**15. Identification and Analysis of Mitigation Actions: National Flood Insurance Program (NFIP) Compliance**

**Requirement: §201.6(c)(3)(ii):** [The mitigation strategy] must also address the jurisdiction's participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan describe the jurisdiction (s) participation in the NFIP?	Section 2.6.2	<i>Note: This requirement becomes effective for all local mitigation plans approved after October 1, 2008.</i>		
B. Does the mitigation strategy identify, analyze and prioritize actions related to continued compliance with the NFIP?	Sections 2.9.4 & 2.9.6	<i>Note: This requirement becomes effective for all local mitigation plans approved after October 1, 2008.</i>		
<b>SUMMARY SCORE</b>				

**16. Implementation of Mitigation Actions**

**Requirement: §201.6(c)(3)(iii):** [The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) 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.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated mitigation strategy include how the actions are prioritized? (For example, is there a discussion of the process and criteria used?)	Section 2.9.4			
B. Does the new or updated mitigation strategy address how the actions will be implemented and administered, including the responsible department, existing and potential resources and the timeframe to complete each action?	Section 2.9.6 & Appendix F			
C. Does the new or updated prioritization process include an emphasis on the use of a cost-benefit review to maximize benefits?	Section 2.9.5			
D. Does the updated plan identify the completed, deleted or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (i.e., deferred), does the updated plan describe why no changes occurred?	N/A – First Plan			
<b>SUMMARY SCORE</b>				

**LOCAL MITIGATION PLAN REVIEW CROSSWALK: City of Frankfort Flood Mitigation Plan**

**17. Multi-Jurisdictional Mitigation Actions**

**Requirement §201.6(c)(3)(iv):** For multi-jurisdictional plans, there **must** be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the <b>new or updated</b> plan include identifiable <b>action items</b> for each jurisdiction requesting FEMA approval of the plan?	Appendix F			
B. Does the <b>updated</b> plan identify the completed, deleted or deferred mitigation actions as a benchmark for progress, and if activities are unchanged ( <i>i.e.</i> , deferred), does the updated plan describe why no changes occurred?	N/A – First Plan			
<b>SUMMARY SCORE</b>				

PLAN MAINTENANCE PROCESS

**18. Monitoring, Evaluating, and Updating the Plan**

**Requirement §201.6(c)(4)(i):** [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.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the <b>new or updated</b> plan describe the method and schedule for <b>monitoring</b> the plan, including the responsible department?	Section 4.1.1			
B. Does the <b>new or updated</b> plan describe the method and schedule for <b>evaluating</b> the plan, including how, when and by whom ( <i>i.e.</i> the responsible department)?	Section 4.1.2			
C. Does the <b>new or updated</b> plan describe the method and schedule for <b>updating</b> the plan within the five-year cycle?	Section 4.1.3			
<b>SUMMARY SCORE</b>				

**LOCAL MITIGATION PLAN REVIEW CROSSWALK: City of Frankfort Flood Mitigation Plan**

**19. Incorporation into Existing Planning Mechanisms**

**Requirement §201.6(c)(4)(ii):** [The plan **shall** include 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.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the <b>new or updated</b> plan identify other local planning mechanisms available for incorporating the mitigation requirements of the mitigation plan?	Section 4.2			
B. Does the <b>new or updated</b> plan include a process by which the local government will incorporate the mitigation strategy and other information contained in the plan (e.g., risk assessment) into other planning mechanisms, when appropriate?	Section 4.2			
C. Does the <b>updated</b> plan explain how the local government incorporated the mitigation strategy and other information contained in the plan (e.g., risk assessment) into other planning mechanisms, when appropriate?	N/A – First Plan			
<b>SUMMARY SCORE</b>				

**Continued Public Involvement**

**Requirement §201.6(c)(4)(iii):** [The plan maintenance process **shall** include a] discussion on how the community will continue public participation in the plan maintenance process.

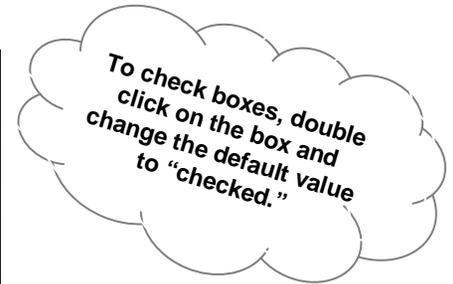
Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the <b>new or updated</b> plan explain how <b>continued public participation</b> will be obtained? (For example, will there be public notices, an on-going mitigation plan committee, or annual review meetings with stakeholders?)	Section 4.3			
<b>SUMMARY SCORE</b>				

**LOCAL MITIGATION PLAN REVIEW CROSSWALK: City of Frankfort Flood Mitigation Plan**

**MATRIX A: PROFILING HAZARDS**

This matrix can assist FEMA and the State in scoring each hazard. Local jurisdictions may find the matrix useful to ensure that their plan addresses each natural hazard that can affect the jurisdiction. **Completing the matrix is not required.**

**Note: First, check which hazards are identified in requirement §201.6(c)(2)(i). Then, place a checkmark in either the N or S box for each applicable hazard. An “N” for any element of any identified hazard will result in a “Needs Improvement” score for this requirement. List the hazard and its related shortcoming in the comments section of the Plan Review Crosswalk.**



Hazard Type	Hazards Identified Per Requirement §201.6(c)(2)(i)	A. Location		B. Extent		C. Previous Occurrences		D. Probability of Future Events	
	Yes	N	S	N	S	N	S	N	S
Avalanche	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coastal Erosion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coastal Storm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dam Failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Drought	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Earthquake	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Expansive Soils	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Levee Failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hailstorm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hurricane	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Land Subsidence	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Landslide	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Severe Winter Storm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tornado	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tsunami	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Volcano	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wildfire	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Windstorm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Legend:

§201.6(c)(2)(i) Profiling Hazards

- A. Does the risk assessment identify the location (*i.e.*, geographic area affected) of each hazard addressed in the **new or updated** plan?
- B. Does the risk assessment identify the extent (*i.e.*, magnitude or severity) of each hazard addressed in the **new or updated** plan?
- C. Does the plan provide information on previous occurrences of each natural hazard addressed in the **new or updated** plan?
- D. Does the plan include the probability of future events (*i.e.*, chance of occurrence) for each hazard addressed in the plan?

**LOCAL MITIGATION PLAN REVIEW CROSSWALK: City of Frankfort Flood Mitigation Plan**

**MATRIX B: ASSESSING VULNERABILITY**

This matrix can assist FEMA and the State in scoring each hazard. Local jurisdictions may find the matrix useful to ensure that the new or updated plan addresses each requirement. **Completing the matrix is not required.**

*Note: First, check which hazards are identified in requirement §201.6(c)(2)(i). Then, place a checkmark in either the N or S box for each applicable hazard. An “N” for any element of any identified hazard will result in a “Needs Improvement” score for this requirement. List the hazard and its related shortcoming in the comments section of the Plan Review Crosswalk. Note: Receiving an N in the shaded columns will not preclude the plan from passing.*

*To check boxes, double click on the box and change the default value to “checked.”*

Hazard Type	Hazards Identified Per Requirement §201.6(c)(2)(i)	A. Overall Summary Description of Vulnerability				B. Hazard Impact				A. Types and Number of Existing Structures in Hazard Area (Estimate)				B. Types and Number of Future Structures in Hazard Area (Estimate)				A. Loss Estimate				B. Methodology			
	Yes	N		S		N		S		N		S		N		S		N		S		N		S	
Avalanche	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coastal Erosion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coastal Storm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dam Failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Drought	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Earthquake	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Expansive Soils	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Levee Failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hailstorm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hurricane	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Land Subsidence	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Landslide	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Severe Winter Storm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tornado	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tsunami	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Volcano	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wildfire	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Windstorm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Legend:**

§201.6(c)(2)(ii) Assessing Vulnerability: Overview

- A. Does the **new or updated** plan include an overall summary description of the jurisdiction’s vulnerability to each hazard?
- B. Does the **new or updated** plan address the impact of each hazard on the jurisdiction?

- B. Does the **new or updated** plan describe vulnerability in terms of the types and numbers of future buildings, infrastructure, and critical facilities located in the identified hazard areas?

§201.6(c)(2)(ii)(A) Assessing Vulnerability: Identifying Structures

- A. Does the **new or updated** plan describe vulnerability in terms of the types and numbers of existing buildings, infrastructure, and critical facilities located in the identified hazard areas?

§201.6(c)(2)(ii)(B) Assessing Vulnerability: Estimating Potential Losses

- A. Does the **new or updated** plan estimate potential dollar losses to vulnerable structures?
- B. Does the **new or updated** plan describe the methodology used to prepare the estimate?

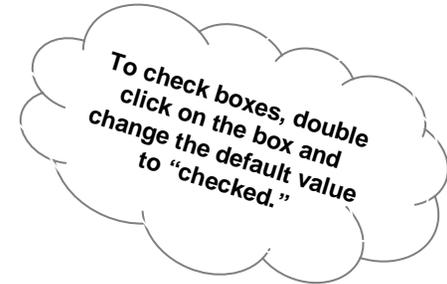
**LOCAL MITIGATION PLAN REVIEW CROSSWALK: City of Frankfort Flood Mitigation Plan**

**MATRIX C: IDENTIFICATION AND ANALYSIS OF MITIGATION ACTIONS**

This matrix can assist FEMA and the State in scoring each hazard. Local jurisdictions may find the matrix useful to ensure consideration of a range of actions for each hazard. **Completing the matrix is not required.**

*Note: First, check which hazards are identified in requirement §201.6(c)(2)(i). Then, place a checkmark in either the N or S box for each **applicable** hazard. An “N” for any identified hazard will result in a “Needs Improvement” score for this requirement. List the hazard and its related shortcoming in the comments section of the Plan Review Crosswalk.*

Hazard Type	Hazards Identified Per Requirement §201.6(c)(2)(i)	A. Comprehensive Range of Actions and Projects	
	Yes	N	S
Avalanche	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coastal Erosion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coastal Storm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dam Failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Drought	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Earthquake	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Expansive Soils	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Levee Failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hailstorm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hurricane	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Land Subsidence	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Landslide	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Severe Winter Storm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tornado	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tsunami	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Volcano	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wildfire	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Windstorm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



**Legend:**

§201.6(c)(3)(ii) Identification and Analysis of Mitigation Actions

A. Does the **new or updated** plan identify and analyze a comprehensive range of specific mitigation actions and projects for each hazard?