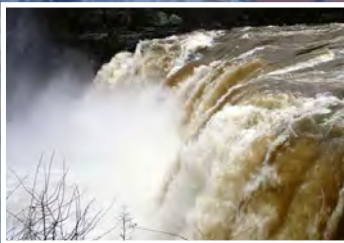




Flood Mitigation / Stormwater Management Plan

City of Birmingham



October 2004

Prepared by:

URS

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1.0 INTRODUCTION

1.1 Background

Recognized as a center for medical research, health services, engineering and financial services, the City of Birmingham located in Jefferson County in north, central Alabama, serves a population of over 243,000 citizens. Between 1995 and 2003 there have been



nine major flood events which have affected the city and its population, two of which were Presidential declared disasters. Historically, prior to 1995, the floodplains within the City have routinely flooded. Due to historical and more recent flood events, the City has taken a comprehensive approach to flood mitigation / stormwater management. Much of the existing mitigation and management efforts have focused on regulatory efforts in addition to property acquisitions (i.e. buyouts).

On March 16, 1981 the City of Birmingham joined the National Flood Insurance Program (NFIP). Further, in December 1993 Birmingham joined the Community Rating System (CRS), a voluntary program that involves establishing floodplain management programs that exceed National Flood Insurance Program minimum requirements. Currently the city is rated a Class 7, resulting in a 15% reduction in flood insurance premiums to citizens of Birmingham. As a CRS program participant, the City actively pursues a broad range of mitigation and management activities including:

- Outreach Projects (Flood Protection brochures, Town Hall meetings, Project Impact Community Awareness Day)
- Mapping Information, including digital mapping of floodplain areas and flood events
- Regulations and Ordinances (Zoning Ordinance Provisions for Floodplain Zones, Soil Erosion & Sediment Control Ordinance, Subdivision Regulations and Design Regulations, and Parking Ordinance)

While the City's efforts to date have gone a long way to improve flood mitigation / stormwater management and to minimize the impacts of flooding, there is still room for improvement. This Flood Mitigation / Stormwater Management Plan is intended to be an umbrella type study, providing direction and identifying the actions necessary to advance the numerous aspects of the City of Birmingham's overall Flood Mitigation and Stormwater Management Program efforts.

1.2 Flood Mitigation / Stormwater Management Planning Committee

The floodplain and stormwater management planning process is most effective when the citizens and stakeholders within the community are actively engaged. An extensive community involvement process was initiated in the study through use of a Flood Mitigation / Stormwater Management Planning Committee, hereinafter referred to as the Stakeholder Committee, as well as public meetings.

This Flood Mitigation / Stormwater Management Plan was developed under the oversight and guidance of a Technical Advisory Board (TAB). The TAB was made up of persons knowledgeable of the City of Birmingham's flood mitigation and stormwater management history as well as its capabilities. The TAB consisted of:

- Mr. William Gilchrist; Department of Planning, Engineering and Permits (PEP), Director
- Mr. Randy Kemp; PEP, Acting City Engineer
- Mr. Victor Blackledge; PEP, Urban Design Administrator
- Mr. Edwin Revell; PEP, Floodplain Administrator
- Ms. Denise Pruitt; PEP, Project Planner
- Mr. Tom Magee; PEP, Chief Planner
- Mr. Stephen Fancher; Department of Public Works, Director
- Mr. Jim Fenstermaker; Community Development Department, Director
- Ms. Carol Clarke; Mayor's Office of Economic Development, Director
- Consultant Team

The Technical Advisory Board (TAB) met on seven occasions during the course of the study:

- February 4, 2004,
- May 20, 2004,
- June 24, 2004,
- July 22, 2004,
- August 19, 2004,
- August 20, 2004, and
- September 2004

As noted previously, in addition to the TAB, a Stakeholder Committee was established. Half of the Stakeholder Committee members were from the public including residents, businesses, and property owners in the known flood hazard areas as well as non-profit organizations and civic groups from other parts of the community. The remainder was staff from the local governments and interested organizations that will likely be responsible for implementing the plan. The membership of the Stakeholder Committee included:

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- All members of the Technical Advisory Board (9 representatives)
- Local neighborhood associations or Citizens Advisory Board members from areas having been flooded or having a high probability of flooding (40 representatives)
- Business / Commercial representatives from flood prone areas (10 representatives)
- Developers (1 representative)
- Home Builders (1 representative)
- Storm Water Management Authority (1 representative)
- Jefferson County (1 representative)
- Jeffco Emergency Management Agency (1 representative)
- United States Army Corps of Engineers (1 representative)
- Alabama Department of Environmental Management (1 representative)
- City of Birmingham Fire Department (1 representative)
- City of Birmingham Police Department (1 representative)
- City of Birmingham Schools (1 representative)
- City of Birmingham Airport Authority (1 representative)
- Alabama Department of Transportation (ALDOT) (1 representative)
- Representatives for cities adjoining the City of Birmingham (1 representative)
- Member of the Zoning Board (1 representative)
- Representative of Cahaba River Society (1 representative)
- Representative of Black Warrior River Clean Water Partnership (1 representative)
- Birmingham Water and Sewer Board (1 representative)
- Planning Commission (1 representative)
- Alabama EMA (1 representative)
- Regional Planning Commission of Greater Birmingham (1 representative)
- Chamber of Commerce (1 representative)
- Representative of Village Creek Society

For specific names and affiliation refer to **Appendix A**.

During the development of this plan, the Stakeholder Committee (Flood Mitigation / Stormwater Management Planning Team) met 5 times:

- May 20, 2004,
- June 24, 2004,
- July 22, 2004, and
- August 19, 2004
- September 23, 2004

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The Stakeholder Committee was involved in reviewing the data collected, compiled and analyzed for this plan, as well as in providing technical feedback. Additionally, the committee provided invaluable input on the problem identification, goals and objectives, and mitigation actions and strategies for the plan. Members of the committee were able to verify the flood data that was obtained for this report with their personal knowledge and experiences of where the flooding occurs in the city and what they considered to be the causes.

The Stakeholder Committee meetings were utilized to involve the members in the following key steps of the planning process:

- Assess the hazard
- Assess the problem
- Set goals
- Review possible activities
- Draft an action plan

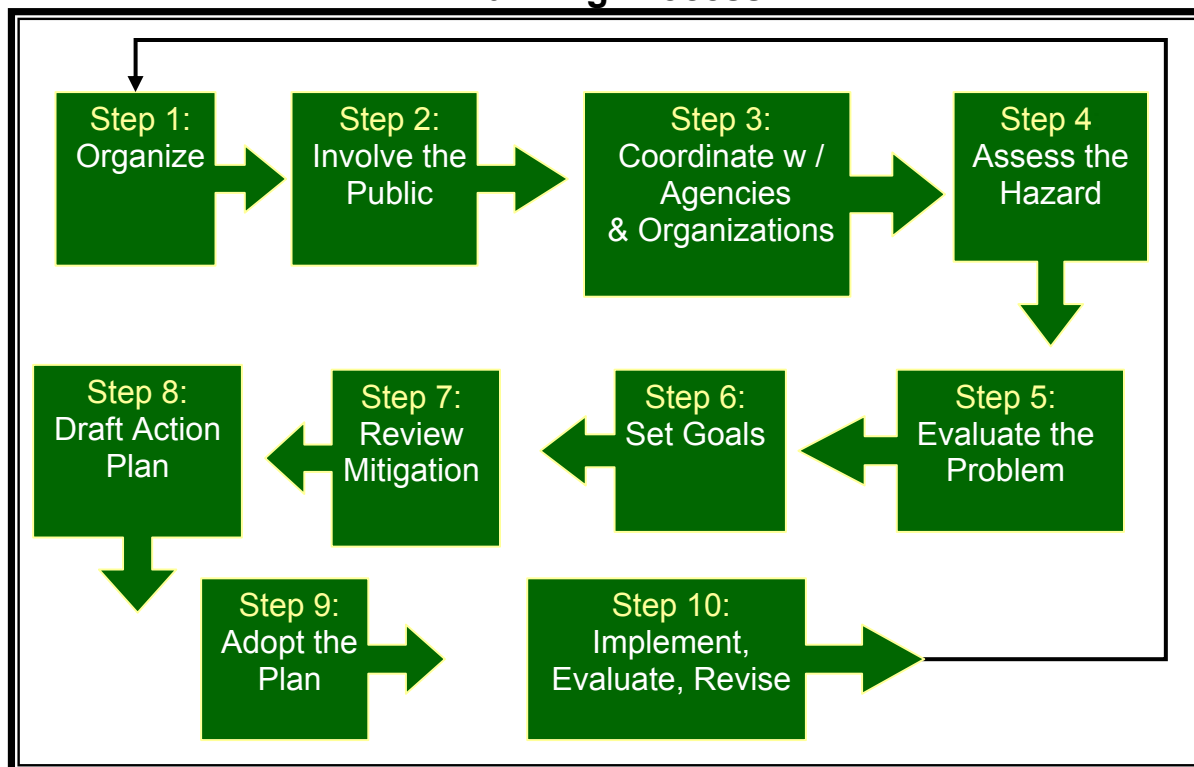
These key steps were broken into sections that were individually presented at the Stakeholder meetings. The breakdown of information presented, by Stakeholder meeting, follows:

Stakeholder Meeting	Key Planning Session	Individual Topics Covered
May 20, 2004	<ul style="list-style-type: none">• Assess the Hazard• Assess the Problem• Set Goals	<ul style="list-style-type: none">• Historic affects of flooding and locations were presented and additional locations identified• Discussion relevant to the apparent causes of identified flooding and magnitude• Sample Goals and Objectives were presented for consideration
June 24, 2004	<ul style="list-style-type: none">• Assess the Problem• Set Goals• Review Possible Activities / Actions	<ul style="list-style-type: none">• Finalization of assessing the hazard.• Discussion of Goals and Objectives• Presentation of Problem Statement• Causes of flooding were finalized by the committee• Prevention• Property Protection• Public Education & Outreach• Structural Projects
July 22, 2004	<ul style="list-style-type: none">• Review Possible Activities / Actions	<ul style="list-style-type: none">• Natural Resource Protection• Emergency Services• Post Disaster Recovery Actions• City of Birmingham & the CRS Program
August 19, 2004	<ul style="list-style-type: none">• Draft an Action Plan	<ul style="list-style-type: none">• Draft Action Plan

1.3 Planning Approach

A comprehensive planning approach, in accordance with requirements established by the Federal Emergency Management Agency's (FEMA), was implemented by the Stakeholder Committee. The 10-step planning approach is summarized in **Figure 1.1**.

Figure 1.1
Planning Process



Throughout the development of this plan opportunities were provided to the citizens of Birmingham to participate in the planning process. Local neighborhood associations whose neighborhoods have been impacted by flooding or have a high probability of being flooded were invited to provide a representative to the Stakeholder Committee. This direct representation and participation allowed the Mitigation Team to gain insight into current and past neighborhood specific flood issues and possible mitigation actions.



In addition to the local participation on the Stakeholder Committee, the Mitigation Planning Team held two Public Meetings. The first public meeting was held early in the process on May 20th, 2004 and second was held September 23, 2004. Opportunities were provided at these meetings for the general public to speak with representatives from the Project Study Team regarding their comments, questions and concerns. The responses and comments recorded are summarized in **Appendix B**.

The questionnaire distributed at the public meeting requested information regarding:

- Location of home or business
- Flood History of the Property (frequency and severity)
- Flood History of the Street/ Neighborhood (frequency and severity)
- Identification of causes of flooding in the area, if the respondent was aware of them.
- Use of flood insurance as a protection measure
- Suggestions on how to eliminate or reduce flood problems, including personal actions taken to protect themselves and their property from flooding

Responses to the public meeting questionnaire were primarily from citizens in neighborhoods that frequently flooded including, Five Points West, Woodlawn, Roebuck, East Birmingham, and South Pratt. Half of the responding citizens stated that their homes or businesses have flooded in the past. During these past flood events, the depth of flooding in the structures ranged from a few inches to a few feet. Half also responded that the local streets flood. Roughly one third stated that the catch basins in the streets were not clear of debris on a routine basis and was a possible cause of flooding. Only one respondent indicated that they had flood insurance for their property. Another respondent specifically noted that because they were not required to have flood insurance, they did not obtain it. Furthermore, it was suggested by the citizen respondents that the existing drainage system be corrected so that it handles flood waters appropriately or more adequate drainage be provided in order to handle the flood waters.

The public meetings were publicized through various advertising means including the notification of neighborhood organizations serving on the Stakeholder Committee, mail outs to the citizens of Birmingham and through local television and news coverage.

1.4 Agency Coordination

Extensive coordination with key agencies was instituted throughout the planning process. As was discussed in Section 1.2, the makeup of the Stakeholder Committee was comprised of not only residents and local business owners, but also local, State and Federal government agencies. Representative cooperating agencies included:

- City of Birmingham Department of Planning, Engineering and Permits (PEP)
- City of Birmingham Department of Public Works

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- City of Birmingham Community Development Department
- City of Birmingham Mayor's Office of Economic Development
- Storm Water Management Authority (SWMA)
- Jefferson County
- Jefferson County Emergency Management Agency
- United States Army Corps of Engineers
- Alabama Department of Environmental Management
- City of Birmingham Fire Department
- City of Birmingham Police Department
- City of Birmingham Schools
- City of Birmingham Airport Authority
- Alabama Department of Transportation
- City of Birmingham Zoning Board
- Cahaba River Society
- Black Warrior Clean Water Partnership
- Birmingham Sewerage and Water Board
- Regional Planning Commission of Greater Birmingham
- Chamber of Commerce
- Village Creek Society
- Alabama Emergency Management Agency

Cooperating agencies participated throughout the planning process including the hazard assessment phase, development of goals, objectives and strategies and development of the Draft Action Plan. In addition it should be noted that several members of the Stakeholder Committee also participated in the development of other local and statewide plans that have an impact on this Flood Mitigation/ Stormwater Management Plan, such as the Jefferson County, Alabama, Natural Hazard Mitigation Plan and the Alabama State Hazard Mitigation Plan. Moreover, the members imparted their first hand knowledge of these other ongoing efforts to the Flood Mitigation Team and the effects that those planning efforts may have on this project.

During each of the 4 stakeholder meetings, information was solicited from participating stakeholders and agencies regarding ongoing local, city and state efforts that should be coordinated with this plan. Specifically, in May 2004, questionnaires were developed and distributed at the stakeholder meeting. The questionnaire distributed to the Stakeholder Committee (See Appendix B) asked the agency, citizen, business or representative to:

- Identify areas of flooding that affect their agency
- Identify known causes of flooding
- Identify current projects/ programs in the funding pipeline to address the problem area(s)
- Identify the role their agency/ group has in flood mitigation, operations and maintenance, and post-disaster response

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- Provide suggestions/ recommendations for ways to eliminate, minimize or mitigate the identified flooding problem

A total of 19 responses to the Stakeholder Committee Questionnaire were received. These responses validated the areas of flooding previously identified by the City of Birmingham. The areas most often identified in the questionnaire included Village Creek, Valley Creek, Five Mile Creek, Shades Creek, and the adjacent and surrounding neighborhoods. Stakeholder Committee members went on to identify development of the floodway and floodplain; inadequate design/ capacity and maintenance of the natural and man-made storm sewer system as the primary reasons for flooding in the identified areas. It was suggested that efforts to alleviate flooding problems should be solution driven, not crisis management driven. To that end, suggestions were made by the respondents of the Stakeholder Committee questionnaire to: establish new design standards for design and construction in the floodplain; continue with existing floodway/plain acquisition projects, including repetitive loss properties; establish a better response based maintenance program for the natural and man-made storm sewer system; establish proactive measures for the routine maintenance of said system; and educate the community employing flood prevention and protection measures, including obtaining flood insurance, and the proper response to flood warning notifications when they do arise.

In addition to agency coordination efforts at the Technical Advisory Board and Stakeholder meetings, additional meetings and coordination efforts were initiated with the Alabama Office of Water Resources, the Alabama Emergency Management Agency, USACE consultants, the Stormwater Management Authority and Jefferson County EMA. Issues discussed and coordinated at the meeting with the Alabama Office of Water Resources included the Map Modernization Program and the State NFIP program. Meetings and discussions with the Alabama Emergency Management Agency centered on the ongoing development of the Statewide Hazard Mitigation Plan and the FEMA grants administered by the State. Project team members met with the USACE consultant regarding the ongoing Village Creek and Upper Shades Creek Feasibility Studies. Detailed discussions of H&H model status and proposed structural improvements for the other major streams in Birmingham were also included. In a meeting with the Stormwater Management Authority, ongoing coordination efforts between Jefferson County, the State of Alabama, and the City of Birmingham were discussed. Their role in the NPDES permitting process for the City was discussed as well as ongoing GIS initiatives. The proposed model flood plain ordinance was also discussed. Coordination efforts with Jefferson County EMA focused on the Jefferson County, Alabama Natural Hazards Mitigation Plan, the flood warning system, "ALERT", and post-disaster recovery efforts.

1.5 Consistency with Community Rating System Floodplain Management Planning Process

In December 1993, the City of Birmingham began its participation in the Community Rating System (CRS). The CRS program is a voluntary program under the National Flood Insurance Program (NFIP) that provides participating jurisdictions discounts on flood insurance premiums for establishing floodplain management programs that exceed the NFIP minimum requirements. Participating jurisdictions are rated by CRS classes. These classes range from Class 1, which requires the most credit points for providing the largest reduction in insurance premiums, to Class 10, which receives no reduction in insurance premiums (see

Table 1.1). To obtain the necessary credit points to achieve lower CRS class ratings, communities implement a broad range of programs aimed at addressing the three goals of the CRS program:



1. Reduce flood losses,
2. Facilitate accurate insurance ratings, and
3. Promote the awareness of flood insurance.

Generally these goals are accomplished through a mix of more stringent regulations, additional property acquisitions and relocations, floodproofing of flood prone buildings, preservation of natural resources such as open space, and other measures that protect natural resources. Currently, the City of Birmingham has a CRS rating of Class 7, resulting in a 15% reduction of flood insurance premiums for citizens that participate in the National Flood Insurance Program.

Table 1.1
Community Rating System Classes and
Insurance Premium Reductions

Credit Points	Class	Premium Reduction	
		SFHA *	Non-SFHA
4,500+	1	45%	10%
4,000 – 4,499	2	40%	10%
3,500 – 3,999	3	35%	10%
3,000 – 3,499	4	30%	10%
2,500 – 2,999	5	25%	10%
2,000 – 2,499	6	20%	10%
1,500 – 1,999	7	15%	5 %
1,000 – 1,499	8	10%	5%
500 – 999	9	5%	5%
0 – 499	10	0	0

* Special Flood Hazard Area

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There are numerous ways that communities can accumulate credit points under the CRS program. The CRS program has a total of 15 activities where communities can accumulate points toward their rating. These activities include:

- 310 – Elevation Certificates (162 points max)
- 320 – Map Information (140 points max)
- 330 – Outreach Projects (315 points max)
- 340 – Hazard Disclosure (81 points max)
- 350 – Flood Protection Information (66 points max)
- 360 – Flood Protection Assistance (71 points max)
- 410 – Additional Flood Data (1,373 points max)
- 420 – Open Space Preservation (900 points max)
- 430 – Higher Regulatory Standards (2,720 points max)
- 440 – Flood Data Maintenance (231 points max)
- 450 – Stormwater Management (670 points max)
- 510 – Floodplain Management Planning (309 points max)
- 520 – Acquisition and Relocation (3,200 points max)
- 530 – Flood Protection (2,800 points max)
- 540 – Drainage System Maintenance (330 points max)
- 610 – Flood Warning Program (225 points max)
- 620 – Levee Safety (900 points max)
- 630 – Dam Safety (175 points max)

One way to accumulate CRS credit is to develop a Flood Mitigation/Stormwater Management Plan. While the CRS program does not dictate what has to be in a Flood Mitigation Stormwater Management Plan, it credits plans prepared and updated consistent with the standard planning process outlined in the FEMA CRS Coordinator's Manual. This document is intended to be consistent with the FEMA A guidelines and serves as the City of Birmingham's Flood Mitigation / Stormwater Management Plan for CRS credit under Activity 510. For information purposes, the point breakdown for the Development of a Flood Mitigation / Stormwater Management Plan follows.

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<u>Step</u>	<u>Max Points</u>
1. Organize to prepare the plan	10
2. Involve the public	72
3. Coordinate with other agencies	18
4. Assess the hazard	20
<ul style="list-style-type: none"> A map of known flood hazards (REQUIRED) A description of known flood hazards, including source of water, depth of flooding, velocities, and warning time, where data is available (REQUIRED) A discussion of past floods, where data is available (REQUIRED) 	5
NOTE: To receive points for this step, all 3 items must be addressed.	
<ul style="list-style-type: none"> The plan needs to include a map, description and history of other natural hazards, such as erosion, tsunamis, earthquakes, and hurricanes. It should identify all natural hazards identified in the State's hazard mitigation plan. 	15
5. Risk Assessment	35
<ul style="list-style-type: none"> Overall summary of each hazard identified in the hazard assessment and its impact on the community (REQUIRED) 	2
<ul style="list-style-type: none"> Description of the impact that the hazards identified in the hazard assessment have on life, safety, and health and the needed procedures for warning and evacuating residents and visitors 	5
<ul style="list-style-type: none"> Description of the impact that the hazards identified in the hazard assessment have on critical facilities and infrastructure. 	5
<ul style="list-style-type: none"> Identification of number and types of buildings subject to the hazards identified in the hazard assessment. 	5
<ul style="list-style-type: none"> A review of all properties that have received flood insurance claims (in addition to the repetitive loss properties) or an estimate of the potential dollar losses to vulnerable structures. 	4
<ul style="list-style-type: none"> Description of areas that provide natural and beneficial functions, such as wetlands, riparian areas, sensitive areas, and habitat for rare or endangered species 	4
<ul style="list-style-type: none"> Description of development, redevelopment, and population trends and a discussion of what the future brings for the development and redevelopment in the community, the watershed, and natural resource areas. 	5
<ul style="list-style-type: none"> Summary of the impacts of each hazard on the community's economy and tax base. 	5
6. Set Goals	2
7. Review possible activities	30
8. Draft an action plan	70
9. Adopt the plan	2
10. Implement, evaluate, and revise	35
Total Available Points	294

Source: FEMA - 510 Floodplain Management Planning

1.6 Consistency with Disaster Mitigation Act of 2000

The Disaster Mitigation Act of 2000 (DMA 2000) amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988. Among its main features, the DMA 2000 authorized the creation of a pre-disaster mitigation program that makes

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mitigation grants available to States, local and tribal governments providing they have a FEMA approved hazard mitigation plan in effect prior to the time of the disaster. DMA 2000 established a November 1, 2004 deadline for Federal approval of the hazard mitigation plans.

In accordance with the DMA 2000, all 67 counties in the State of Alabama, as well as the State of Alabama itself, are in the process of preparing a Hazard Mitigation Plan. As of April 2004, Jefferson County, Alabama, Natural Hazards Mitigation Plan was in a FEMA approvable format. The Jefferson County plan, which the City of Birmingham adopted on June 15, 2004, is a multi-jurisdictional plan, for which the City of Birmingham receives credit with the Federal government due to their active participation in the development and adoption of the plan.

Key elements of disaster mitigation plans include the identification of natural hazards, an assessment of risks associated with those natural hazards, and proposed actions and strategies to mitigate the identified risks. The Jefferson County, Alabama Natural Hazards Mitigation Plan identifies the following hazards (listed in order from greatest to least risk for the City of Birmingham):

- Flooding
- Tornadoes
- Hurricanes
- Winter Storm / Freezes
- Severe Storms
- Land Subsidence
- Wild Fires
- Landslides
- Droughts / Heat Waves
- Earthquakes
- Dam / Levee Failures

Thus, according to the Jefferson County, Alabama, Natural Hazards Mitigation Plan the natural hazard that the City of Birmingham is most vulnerable to is flooding. This risk assessment was based on multiple factors including local geology, topography and density of development. The Risk Analysis is performed during the development of the local hazard mitigation plan also included an evaluation of the risk associated with critical facilities. The mitigation strategies and actions proposed in the County mitigation plan pertaining specifically, but not limited to, flooding have been closely reviewed, evaluated and integrated into the development of this Flood Mitigation / Stormwater Management Plan to insure consistency between the two planning efforts and the Disaster Mitigation Act of 2000. Also members of the Jefferson County Hazard Mitigation Planning Team were included in the Technical Advisory Board and Stakeholder Committee for development of the City of Birmingham's Flood Mitigation / Stormwater Management Plan.

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In addition, once the Flood Mitigation / Stormwater Management Plan has been completed, in the future the Jefferson County, Alabama Natural Hazards Mitigation Plan will need to be updated to include any new and pertinent information from this document. By Federal law, local hazard mitigation plans are required to be updated at a minimum of every 5 years, so at some point prior to December 2009; the Jefferson County Hazard Mitigation Plan will be updated and should include the results of this Floodplain Mitigation Plan.

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2.0 PROBLEM DESCRIPTION

2.1 Sources of Flooding

The City of Birmingham is affected by two main types of flooding events; flash flooding resulting from rising creeks / rivers during a storm event and localized flooding due to inadequate capacity or maintenance of the storm sewer drainage systems. According to the National Oceanographic and Atmospheric Administration (NOAA), the normal rainfall for the City of Birmingham is approximately 53.99 inches per year. This average rainfall amount is spread out over the course of a year and varies from event to event.

Flash flooding is dependent on the amount and duration of the rainfall as well as the condition of the watershed. High amounts of rain received over relatively short periods of time (usually hours) result in fast rising waters. The condition of the watershed also plays an important role in how local waterways react to storm events. Previously saturated areas or land covered by impervious materials, such as asphalt, will produce higher runoff rates, contributing a larger volume of water reaching the local waterways.

The risk of flooding is often associated with the terms, base floodplain and 100-Year Floodplain. The Federal Emergency Management Agency, through the National Flood Insurance Program (NFIP) and the development of Flood Insurance Rate Maps (FIRM) has delineated the 100-Year floodplain for communities participating in the NFIP. The base floodplain, or 100-Year floodplain is the area of land that would be inundated by a 1-percent-annual-chance flood. It is used by FEMA as the basis for administering their floodplain management programs, through regulatory requirements as well as for settings for flood insurance rates.

2.2 Birmingham Watersheds

The City of Birmingham sits in the western foothills of the Appalachian Mountains. Here, the general flow of ground water is westward, away from the higher points in the City, towards the Black Warrior and Cahaba Rivers. Other major creeks in the area include the Shades and Little Shades Creeks which drain into the Cahaba River and Five Mile, Valley, and Village Creeks which drain into the Black Warrior River.

The previously named creeks and rivers, and their tributaries, along with additional waterways, contribute to the make up of the 10 watersheds that have some portion located within the city limits of Birmingham. The 10 watersheds are:

- Cane Creek
- Valley Creek
- Turkey Creek
- Five Mile Creek

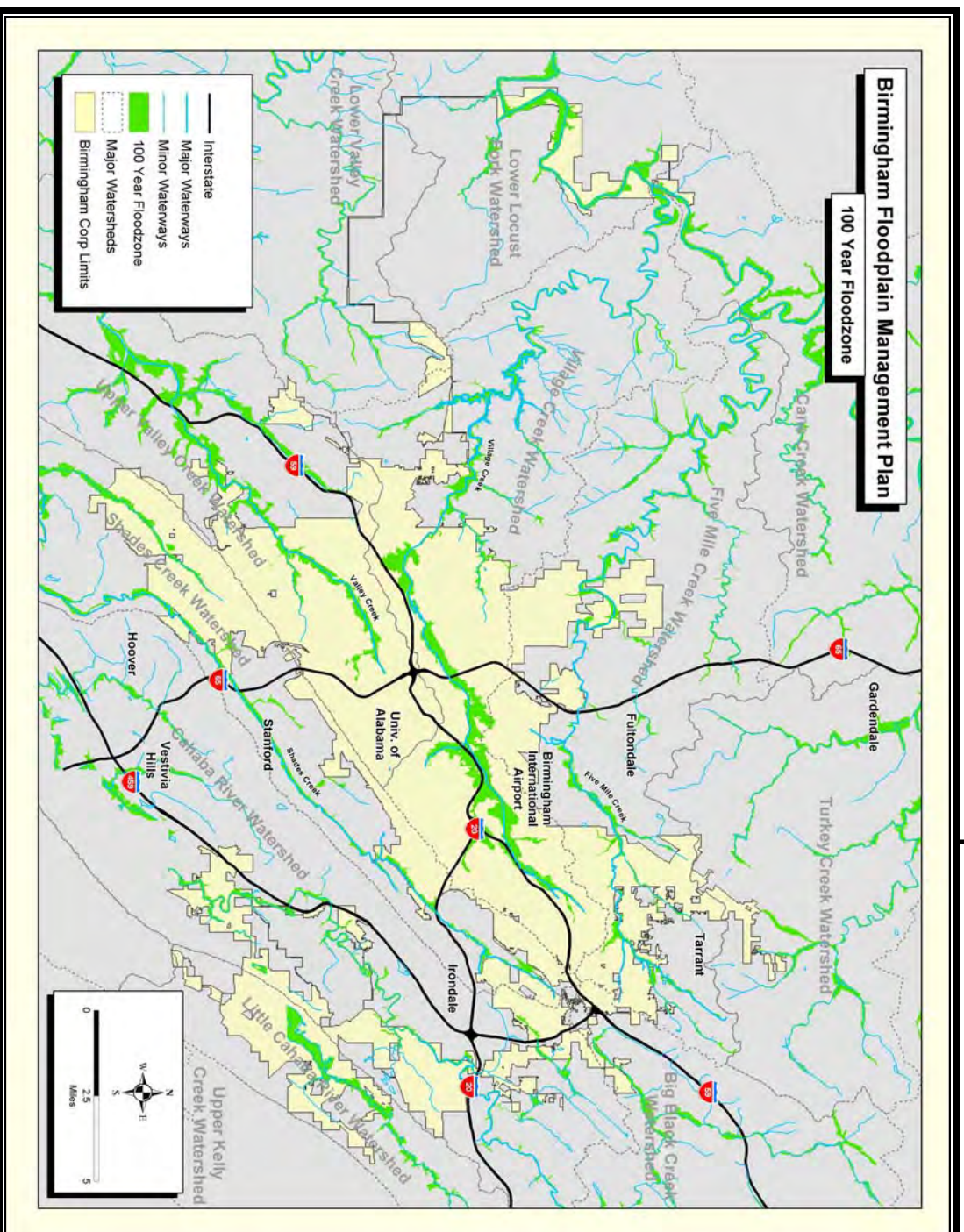
- Village Creek
- Little Shades Creek
- Shades Creek
- Big Black Creek
- Cahaba River
- Little Cahaba River

Figure 2.1 indicates the boundaries of each watershed, the 100 Year floodplain, the city limits and the major waterways.

Each of the 10 watersheds contains at least some portion of 100-Year floodplain. In the city limits of Birmingham, approximately 8,000+ acres of the 100-Year floodplain are located within the boundaries of the 10 identified watersheds.

Large portions of the Five Mile Creek, Village Creek and Valley Creek watersheds contain highly urbanized areas. Nearly all of the land in the urbanized portions of the three watersheds has been developed. All three watersheds are characterized by a mix of land uses. Village Creek includes the populated neighborhoods of Ensley, East Lake, Collegeville, and South Pratt where there are large numbers of single and multi-family dwellings; municipal areas such as the Birmingham International Airport; and more rural type areas like that of Bayview Lake, an industrial water uses lake. Upper Valley Creek is similar to Village Creek in that there are numerous neighborhoods such as Rising-West Princeton, Germania Park, Jones Valley and Roosevelt City. In addition, the Village Creek watershed is comprised of land uses in addition to residential, including large areas of commercial in downtown Birmingham and Public / Institutional, with the University of Alabama at Birmingham. Finally, the Five Mile Creek Watershed follows a similar land use pattern to that of the other two. This watershed contains the neighborhoods of Roebuck and Huffman, just to name a few. There are also industrial and commercial land uses located throughout this watershed. The City of Birmingham, as well as these watersheds is located in the Cumberland Plateau. Also known as the Appalachian Plateau, the Cumberland Plateau is marked by rolling terrain and flat areas, with altitudes in the City ranging from the lowest point of 538 feet to the highest of 1,200 feet.

FIGURE 2.1
Watersheds and 100-Year Floodplain



2.3 Historical Flooding

Historically, flooding has been one of the most common natural disasters to affect the City of Birmingham. Between 1970 and 2003 there have been 15 Presidential Declarations of Disasters that included the City of Birmingham following severe storms, hurricanes and flood events. In addition, the City of Birmingham's Department of Planning, Engineering and Permits compiled a list of significant flood events over approximately the last 8 years (1995 – 2002). The flood events are shown in **Table 2.1** along with event frequency and damage / loss information.

Table 2.1
Flooding within the City of Birmingham, 1995-2002

Date	Storm Event	Damage (Dollars)	Damages	Comments
10/3/95	25 Yr	\$571,000	200 Homes, 25 businesses, 100 families	2 Shelters activated
1/26/96	10 Yr	\$39,000	97 Homes	Some evacuations
3/6/96	25 Yr	\$65,000	111 Homes, 9 businesses	Some evacuations
3/18/96	10 Yr	\$38,000	65 Homes, 10 businesses	45 families evacuated
1/8/98	25 Yr	\$67,000	208 Homes	Families evacuated, 2 shelters activated
6/14/99	25 Yr	\$250,000	100+ Homes	Evacuation and emergency services provided
3/10/00	25 Yr	N/A	50+ Homes	Evacuation and water rescues provided
7/12/02	10 Yr	N/A	25+ Properties	Evacuation and clean up provided
9/22/02	10-25 Yr	N/A	50+ Properties	Emergency services and temporary relocation provided.

Source: City of Birmingham, Department of Planning, Engineering and Permits

The flood of May 2003 also affected the city and subsequently there was a Presidential declaration of disaster for the event. During this storm, the National Weather Service recorded as much as 12 inches of rain in a just a few hours in some areas of Jefferson County, including portions of the City of Birmingham. Roads were impassable, two schools received flood damage, and fast moving water resulted in the evacuation of another. Approximately \$3,346,525 worth of damage was incurred within the City, of which, \$2,198,393 was purely structural damage.

Through researching historical and recent storm events, NFIP Claim Data, and other available information pertaining to flooding in the City of Birmingham, the main problem has been identified as the significant flooding of homes, businesses, automobiles, yards

and roadways resulting in considerable property damage and disruption of services. The City maintains an extensive GIS database recording flood hotspots as reported by the community as well as based on damage assessments following major flood events. **Figure 2.2** indicates areas of flooding from the last 2 major flood events in the city, as well as properties identified by the City as flooding 'hotspots'. **Figure 2.3** identifies NFIP Repetitive Loss Structures.

Neighborhoods containing clusters of hotspots, repetitive loss properties, and/or large areas of identified flooding in the recent events were presented to the Stakeholder Committee at the May 20th, 2004 meeting. With input from the Stakeholder Committee, the following neighborhoods were identified as areas largely affected by flooding:

- Echo Highlands (Five Mile Creek Watershed)
- Pratt / Ensley / South Pratt (Village Creek Watershed)
- East Birmingham, near 10th & 11th Avenue North (Village Creek Watershed)
- East Thomas @ Village Creek (Village Creek Watershed)
- Crestline along Mountaindale Road (Shades Creek Watershed)
- East Lake / Wauhoma (Village Creek Watershed)
- Roebuck (Five Mile Creek Watershed)
- Center Point Parkway (Five Mile Creek Watershed)
- Roosevelt City / Valley Creek (Valley Creek Watershed)
- Highway 11 near Mary Taylor Road (Cahaba River Watershed)
- North Birmingham / Collegeville (Village Creek Watershed)
- Jones Valley Creek near 31st and 32nd Street (Valley Creek Watershed)

It is important to note most areas identified by the Stakeholder Committee were consistent with City identified and recorded flooding sites, as indicated on **Figure 2.2**.

Figure 2.2
Recent Flood Event and Hotspot Data

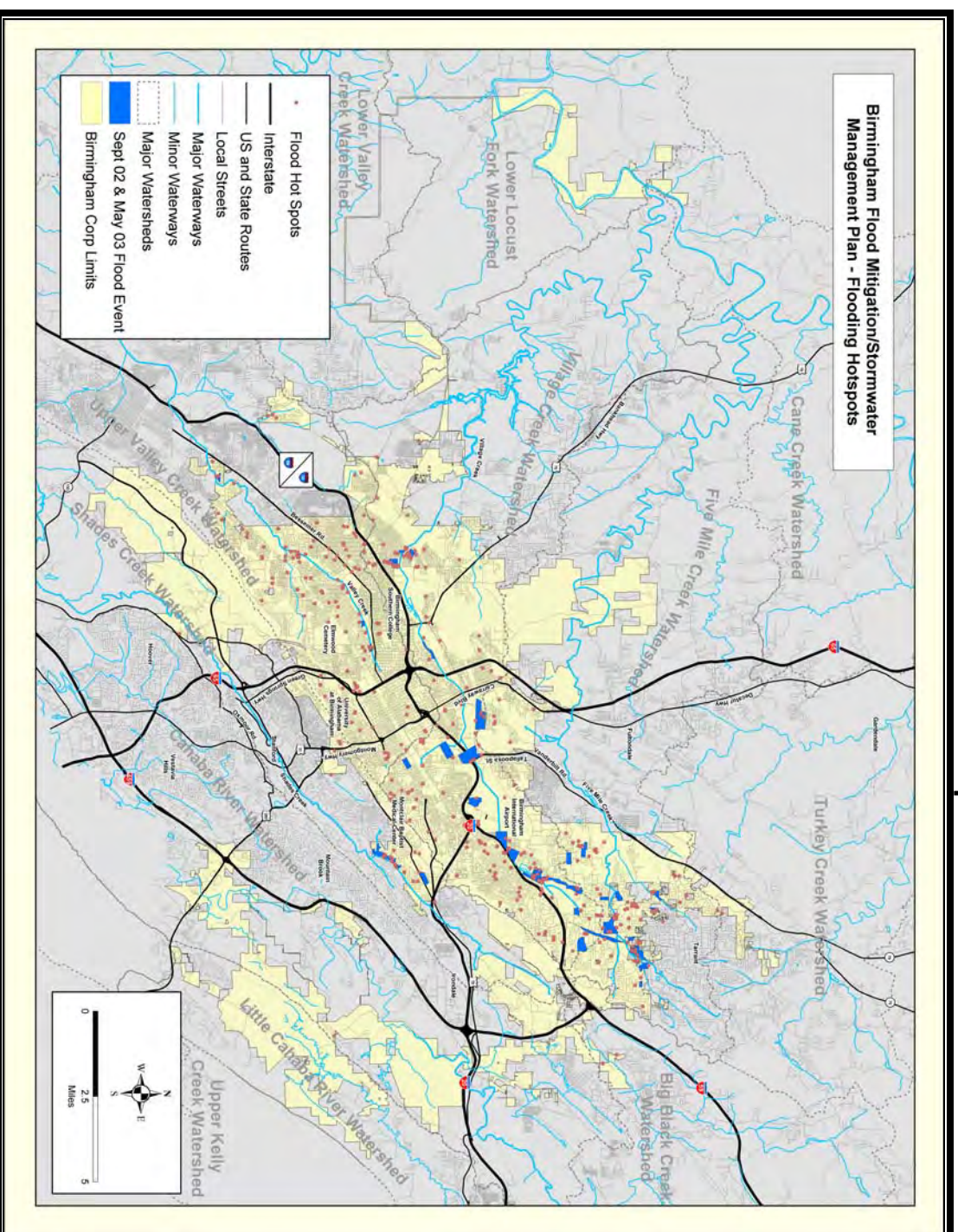
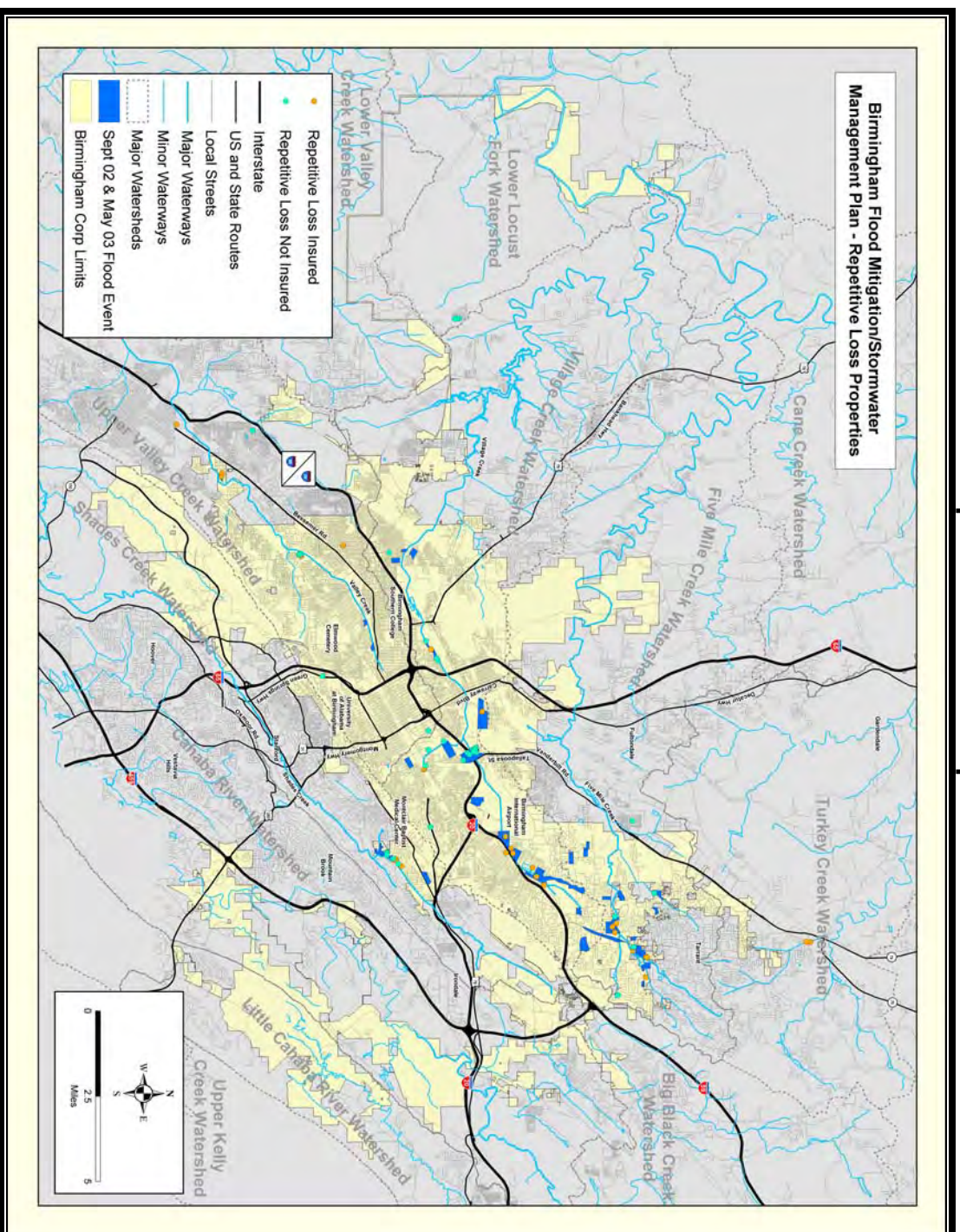


Figure 2.3
NFIP Repetitive Loss Properties



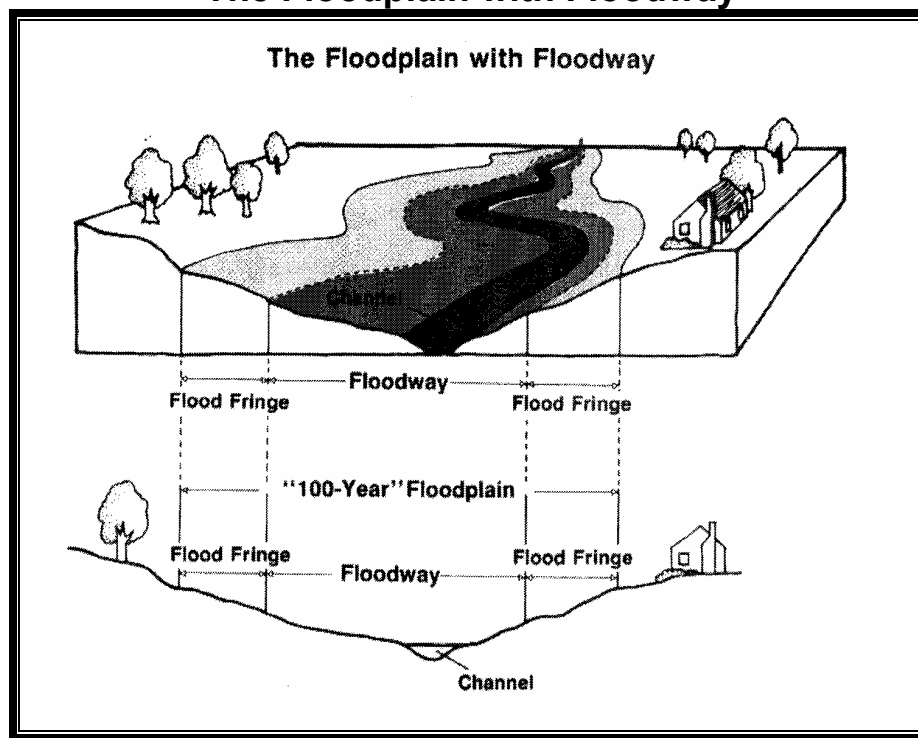
2.4 Flood Data

2.4.1 Background

Published by FEMA, the Flood Insurance Rate Maps (FIRMs) are the official floodplain maps for the City of Birmingham. Many of the City's floodplain management policies and regulations are based on the floodplain limits delineated in those maps. As part of FEMA's Map Modernization Program, Alabama's Department of Economic and Community Affairs, Office of Water Resources, has developed a business plan outlining a program to handle the future updates of the FIRMs, including those for Birmingham.

Including the floodplain areas delineated on FIRMs and other flood prone areas, there are over 8,000 acres of floodplains and over 1,000 acres of floodways in the City of Birmingham. Floodplains are level lands that have been or may be inundated by flood waters. A floodway is the central part of the floodplain (see **Figure 2.4**). It is the stream channel and the portion of the floodplain that has to remain open / clear to allow the flow of the base flood. Generally, the center of the floodway has the deepest and fastest moving waters. The fringe area, the outer edges of the floodplain, tends to have shallower and slower moving water.

Figure 2.4
The Floodplain with Floodway



Source: Floodplain Management in the United States: An Assessment Report, Volume 1. FEMA, 1992.

2.4.2 Flood Hazard-Damage Relationship

As previously mentioned, flood waters in different areas of a floodplain will move at different speeds. Why is this important to mitigation efforts? The greater the water velocity, or how fast the water moves, the more pressure the water exerts on a structure, ultimately leading to the erosion of a stream bank or the scouring of the ground surrounding a structure. Flood waters also vary in depth within the floodplain. The depth of the flood waters, combined with the velocity of the moving waters can cause significant damage. Slow moving, deep waters can cause as much, if not more damage than fast moving shallow flood waters due to the larger area of influence of the flood waters for a greater length of time. Other factors affecting the potential damage caused by a flood include the rate of rise and duration of the flood. The rate of rise, or how quickly flood waters rise, is an indicator of the type of flood. Flooding where waters rise quickly, known as flash flooding, often occurs in hilly areas or in urban environments where much of the watershed is covered in pavement or other impervious materials. The geographical positioning and urban development associated with the City of Birmingham make the city highly susceptible to flash flooding. Finally, the length of time that flood waters stay elevated, the duration of the flood, has a large effect on the amount of damage that occurs. The longer the flood waters stay elevated, the more damage is done through soaking of materials, repetitive currents associated with swift moving water and secondary effects. Secondary effects are usually felt following long duration floods. Businesses and infrastructure shut down while flood waters are high, resulting in loss revenues and traffic problems, in addition to any structural damage caused by the flood.

2.4.3 Existing Studies and Data

Over the last 20 to 30 years, numerous studies have been performed to estimate the extent of flooding throughout the city. Many of these studies have been conducted by or in association with the United States Army Corps of Engineers (USACE). In order to estimate the potential flooding in a drainage basin, a flood modeling technique called Hydrologic and Hydraulic (H&H) Modeling is used. In the hydrologic portion of the modeling, the peak discharges of the area are computed using estimated rainfall amounts, basic watershed characteristics (such as soil types, terrain slope, land use, etc.) and flood routing or direction of the flow. For hydraulic modeling, the output garnered from the hydrologic modeling portion (i.e., the peak discharge), is utilized along with accurate topographic information to establish surface water velocities, elevations and to compute flood profiles and boundaries.

In association with the various studies, Hydrologic and Hydraulic (H&H) Modeling has been established to some degree for all 5 major basins within the City of Birmingham (i.e., Village Creek, Five Mile Creek, Turkey Creek, Shades Creek and Valley Creek). The USACE originally studied Village Creek in 1984-1985. That study and associated model was later updated in 1999 by FEMA. In addition, a recent USACE model based on the FEMA model was developed for Village Creek as part of the Birmingham Watershed Study. The Village Creek model is in good condition. Five Mile Creek was

studied in the 1970's, restudied in the 1980's and the study was republished in 1999. The Shades Creek and Valley Creek Studies were originally performed and modeled in circa 1970's / 1980's and the FEMA models were updated in 1999. While these FEMA models were updated in 1999, there is still significant room for improvement in delineating the limits of the base flood elevation. Specifically improved flood flow methods and updated, more accurate topography maps are now available. These methods and data if used could potentially improve model calibration and prediction capabilities.

In addition to the existing flood studies, the City of Birmingham has established an extensive electronic GIS database for mapping purposes. The GIS database contains extensive data including the following data:

- Flooding Hotspots
- City Limits
- County Roads
- Flood Zones
- Historic Areas
- Hydrology
- Neighborhoods
- Parks
- Railroads
- Zoning
- Enterprise areas
- Existing structures

2.5 Safety and Health Hazards

Slow-moving, as well as fast-moving flood waters can create significant health and safety hazards. During or after any flood event, care must be taken when entering the waters, either in a vehicle or by foot. High waters can hide dangerous roadway conditions that can leave an automobile disabled and eventually more susceptible to the flood waters. Moreover, emergency rescue assistance may be required to remove an individual from a vehicle disabled by high flood waters. In addition to dangerous road conditions that may be hidden by the flood waters, power lines may be down and obscured by the flooding. The combination of electricity and water can prove deadly. Finally, there are secondary effects on safety resulting from flooding, including damage to gas lines, structures, etc, that may make it unsafe for emergency operations.

The health of Birmingham's population needs to be of concern following a flood event. After a flood, persons often face exposure to unsanitary conditions where health hazards and breeding grounds for diseases abound. Flood waters carry whatever is on the ground at the time of the flood, including fertilizers, animal waste, trash, etc. The ground can become saturated with flood waters and this contaminated water, eventually makes its way into the storm and sanitary sewer lines and the wastewater treatment

plants. Boil Orders may be instituted by the City if the potable water supply has been, or has thought to have been, contaminated. Private water wells would need to be tested to make sure that they are free from contamination. Furthermore, during floods the overloaded sewer system can back up into homes and low lying areas, creating a breeding ground for bacteria. Once flood waters have receded, stagnant pools of water can become breeding grounds for mosquitoes while mold and mildew can develop in parts of buildings that have not been cleaned and/or dried out. Also, if a ventilation system has been inundated by flood waters, dirt and sediment can be left in the heating and air ducts. When the air system is once again functioning, the dirt and sediment would be blown throughout the building, creating possible respiratory problems. Finally, there are also psychological impacts due to seeing damage caused to one's home, business, personal belongings, etc., by a flood. Unprepared and uninsured persons often times can feel increased pressures due to all that accompanies the aftermath of a flood.

2.6 Flood Prone Buildings

During and after a flood, buildings can experience flood-related damages. A building can be damaged by the pressure from standing water during a flood or from the water soaking the building materials. The former can cause walls to collapse due to the increased lateral pressure, while the latter can cause the materials in a building to swell, change their shape, and then crack, warp or split when they are drying out. Due to the porous nature of walls, or the material that they are made of, they can serve as a "wick" for water, ultimately pulling it higher than the actual high water mark from the flood, increasing the extent of structural damage.

There are over 5,000 insurable structures located in floodplain and/or flood prone areas in the City of Birmingham, of these 5,000 structures approximately 50 of them are listed as Repetitive Loss Properties (RLPs).

Repetitive loss properties, as defined by FEMA, are properties, i.e. buildings, that are currently insured for which two or more National Flood Insurance Program losses (occurring more than 10 days apart) of at least \$1000 each have been paid within any 10-year period since 1978. Currently there are 50 insured structures inside the city limits of Birmingham that are considered to be Repetitive Loss properties.

Repetitive loss properties place a financial burden on the National Flood Insurance Program, as well as the community, year after year. The following costs in **Tables 2.2** and **2.3** were obtained for repetitive losses in the City of Birmingham and summarized by year.

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Table 2.2
Repetitive Loss Property Claim Data 1978-2003

Year	Amount Paid for Building	Amount Paid for Contents	Total Amount Paid Out
2003	\$557,842.60	\$288,390.73	\$846,233.33
2002	\$97,334.08	\$292,131.25	\$389,465.33
2001	\$39,144.19	\$38,640.36	\$77,784.55
2000	\$157,426.36	\$44,720.42	\$202,146.78
1999	\$34,353.17	\$3,053.82	\$37,406.99
1998	\$14,691.25	\$0.00	\$14,691.25
1996	\$26,215.78	\$0.00	\$26,215.78
1995	\$195,120.08	\$64,675.42	\$259,795.50
1994	\$3,073.97 \$0.00		\$3,073.97
1984	\$0.00	\$2,068.52	\$2,068.52
1983	\$34,065.54	\$328,400.83	\$362,466.37
1982	\$7,556.02	\$121,697.43	\$129,253.45
1979	\$782.06	\$118,667.65	\$119,449.71
1978	\$0.00	\$9,483.38	\$9,483.38
Total	\$1,129,605.10	\$1,311,939.81	\$2,441,544.91

Source: Alabama Policy Claim Data, State of Alabama

For smaller flood events in the City of Birmingham, roughly in the total insurance claim range of \$1,000 to \$400,000 dollars, repetitive loss properties constitute a significant portion of all claims. As shown in **Table 2.3**, repetitive loss property claims represent as much as 66%-88% of all claims for the smaller events. On larger flood events, repetitive loss claims make up roughly 25% of the claims. If the number of repetitive properties can be reduced, the impacts of the smaller floods can be reduced, possibly eliminating all or minimizing the number of claims. Also, by reducing or eliminating the number of repetitive loss properties incurring damage, the losses associated with the larger floods can be cut by up to a quarter.

Table 2.3
Claims made for the 9 Major Flooding Events 1995-2003 (in \$1000s)

EVENT	ALL CLAIMS			REPETITIVE LOSS CLAIMS			% OF ALL CLAIMS THAT ARE REPETITIVE
	BUILDING	CONTENT	TOTAL	BUILDING	CONTENT	TOTAL	
5/7/2003	\$2,198	\$1,148	\$3,347	\$540	\$287	\$827	24.7%
9/27/2002	\$95	\$239	\$335	\$41	\$234	\$275	82.1%
7/12/2002	\$59	\$26	\$86	\$49	\$26	\$75	87.9%
3/10/2000	\$204	\$71	\$275	\$142	\$43	\$185	67.3%
6/14/1999	\$235	\$54	\$289	\$34	\$3	\$37	12.9%
1/7/1998	\$21	\$0	\$21	\$7	\$0	\$7	30.9%
3/6/1996	\$42	\$7	\$49	\$11	\$0	\$11	22.7%
1/26/1996	\$53	\$7	\$60	\$15	\$0	\$15	25.1%
10/4/1995	\$301	\$416	\$727	\$157	\$65	\$222	30.5%

Source: Alabama Policy Claim Data, State of Alabama

2.7 Critical Facilities

The Federal Emergency Management Agency (FEMA) defines critical facilities as facilities that are critical to the health and welfare of the population and that are especially important following hazard events. Critical facilities can be broken into 5 categories.

Essential Facilities

Essential facilities are critical to the health and welfare of the population and are especially important following a hazard event. Typically hospitals and other medical facilities, police and fire stations, evacuation shelters, emergency operation centers and schools are considered to be essential buildings or facilities. **Table 2.4** lists the type and number of essential facilities in Birmingham.

Table 2.4
Essential Facilities

Facility Type	Number in the City of Birmingham
Medical Centers / Hospitals	14
Emergency Centers	1
Fire Stations	24
Police Stations	25
Schools	177

Source: HAZUS Critical Facilities Database

Lifeline Utility Systems

Lifeline utility systems are facilities that are critical to basic day to day living operations. These include potable water facilities, wastewater, oil, natural gas, electric power, and communication systems. BellSouth, a major communication provider, and Alabama Power Company, a major electric service provider, have offices located in the City of Birmingham.

Transportation Systems

These facilities include major transportation infrastructure such as airfields, highways, waterways, and railways. Airports, heli ports, bridges, tunnels, overpasses, locks, canals, harbors / ports, rail yards, trackage, and transfer centers are all examples of critical transportation facilities. Being a metropolitan area of substantial size, the transportation infrastructure located throughout the City of Birmingham is quite extensive. Birmingham International Airport is serviced by 6 major airlines, 12 cargo carriers and is home to a U.S. Customs Office. The airport serves as an air transportation hub for Central Alabama. In association with the major roadway network in and around the city, two main Interstate highway s cross the metropolitan area; Interstate 59/20 and Interstate 65. Finally, the Greyhound Bus Company operates a terminal in downtown Birmingham, providing passenger bus service to citizens.

High Potential Loss Facilities

Facilities or buildings in this category would carry the potential for both high physical and monetary losses. High potential loss facilities would include, but are not limited to, nuclear power plants, dams, and military installations.

Hazardous Materials Facilities

Facilities in this subcategory include buildings that house industrial / hazardous materials such as corrosives, explosives, flammable materials, radioactive materials and toxins.

2.8 Economic Impact

The economic impact of flood events goes beyond damages to structures. Following a flood, businesses often close down for days at a time to repair damages and restock inventory lost during the flood. Insurance exists to cover loss of revenue and flood damage, but many small businesses do not carry these policies. It is then very difficult for these smaller businesses to fully recover from a major flood event. Often times, small businesses affected by a major flood event never reopen due to the inability to fully recover from both structural, inventory and revenue losses.

As stated in **Section 2.6**, Repetitive loss properties also have an adverse economic impact. Over time, as properties are repeatedly damaged, they begin to decline resulting in the surrounding area property values beginning to decline. In addition, as repetitive loss properties continue to file claims against the National Flood Insurance Program, area insurance rates have to be adjusted and may subsequently rise for all insured in the area.

2.9 Other Natural Hazards

The City of Birmingham faces other natural hazards besides flooding. Jefferson County has developed a plan to address all natural hazards affecting the county. This plan, entitled, Jefferson County, Alabama Natural Hazard Mitigation Plan, fulfills the requirement by FEMA for local counties and/or municipalities to have a hazard mitigation plan, approved by FEMA and adopted by the jurisdiction(s), dealing directly with natural hazards, by November 1, 2004. This allows the county and all municipalities participating in the plan, including the City of Birmingham, to be eligible for future federal hazard mitigation funding.

The following are the descriptions of the other natural hazards that Jefferson County and subsequently, the City of Birmingham face. For detailed information regarding risks and mitigation actions relevant to these natural hazards refer to the Jefferson County, Alabama Natural Hazards Mitigation Plan, April 2004.

Tornadoes

A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud. It is spawned by a thunderstorm (or hurricane) and produced when cool air overrides a layer of warm air, forcing the warm air to rise rapidly. 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. Over 80 percent of all tornadoes strike between noon and midnight. Since 1950 there have been 63 tornadoes documented in Jefferson County that resulted in 86 deaths and 808 injuries.

The damage from a tornado is a result of the high wind velocity and wind-blown debris. Tornado winds can approach speeds as high as 300 miles per hour, travel distances over 100 miles and reach heights over 60,000 feet above ground. The potential damage resulting from a tornado is directly correlated to the strength of the particular tornado. The tornado strength is measured utilizing the Fujita Tornado Scale. Based on wind speeds the Fujita Tornado Scale assigns numerical values and categorizes tornadoes from 0-5. The letter "F" often precedes the numerical value.

Due to the potential for hurricanes and the number of thunderstorms Jefferson County / City of Birmingham experiences per year, there is a significant risk of tornadoes. Based on information available from the National Oceanographic and Atmospheric Administration (NOAA), Jefferson County / City of Birmingham can expect

a tornado once every year with expected damage of \$5.3 million per year. Although one can extract data and probability of occurrence from historical information, the risk of a tornado occurring and the location of damage are random.

Severe Storms

A severe thunderstorm is a storm containing damaging winds of 58 miles per hour or more, or hail that measures three-fourths of an inch in size or greater. All severe thunderstorms contain lightning. Another by-product of severe thunderstorms is straight-line winds or downburst winds. These winds can be strong and concentrated. Falling rain and sinking air create the strong winds. They can reach speeds of 125 mph.

With the exception of tornadoes and flooding which are caused by severe thunderstorms, thunderstorms can cause considerable damage from both straight-line winds and lightning. Both lightning and high winds can cause the loss of life and considerable property damage. Since 1975 severe thunderstorms were involved in 327 federal disaster declarations. The power of lightning's electrical charge and intense heat can electrocute on contact, split trees, ignite fires, and cause electrical failures.

The probability of a severe thunderstorm occurring depends on certain atmospheric and climatic conditions. Based on the National Weather Service data comparing the number of events per year with other regions of the country, Jefferson County / City of Birmingham is at risk of 57.6 days of thunderstorms per year, although few are severe.

Winter Storms / Freezes

Winter Storms and blizzards originate as mid-latitude depressions or cyclonic weather systems, sometimes following the meandering path of the jet stream. A blizzard combines heavy snowfall, high winds, extreme cold, and ice storms. The origins of the weather patterns that cause severe winter storms are primarily from four sources in the continental United States. Winter storms in the southeast region are usually a result of Canadian and Arctic cold fronts from the north and Midwestern states combining with tropical cyclonic weather systems in the Gulf of Mexico.

Jefferson County frequently experiences winter storms and extreme colds. Jefferson County averages 1.14 inches of snowfall per year. The greatest single event (since 1950) occurred in 1993 with a total of 13 inches of snowfall within 24 hours. Since 1995 there have been 10 recorded events. In addition to snow, the lowest daily minimum temperature was recorded in January 1985 at -6° F.

Risks associated with winter storms are a direct correlation to the strength of the storm and the region's ability to handle a storm. The risks include loss of life due to cold and disruption of transportation routes, loss of electricity for extended periods, and impact

on agriculture. Jefferson County / City of Birmingham have a considerably high risk of winter storms occurring and have a high threat of winter storms.

Precise locations of these events are not available. The NWS maintains location data at the county level.

Based on historical information, the county can expect an average of one winter storm event per year. Although one can extract data and probability of occurrence from historical information, the risk of a winter storm occurring and the location of damage are random.

Hurricanes

A “tropical cyclone” is a generic term for cyclonic, low-pressure system over tropical or sub-tropical waters. Tropical cyclones with maximum strength winds of less than 39 mph are called tropical depressions. A tropical storm is a cyclone with maximum sustained winds greater than 39 mph but less than 74 mph and a tropical storm with winds that have reached a constant speed of 74 miles per hour or more becomes a hurricane.

Since 1994, 9 hurricanes / tropical storms have affected the state of Alabama. Although not all had an impact on Jefferson County or the City of Birmingham, it is difficult to estimate how many severe thunderstorms and tornadoes may have been caused by a tropical storm or hurricane. All of the tropical systems are (typically) well below tropical storm strength when they affect Jefferson County or the City of Birmingham.

Risks associated with coastal storms include storm tide, inland flooding, water force, wind velocity and coastal erosion. A tropical storm can also produce numerous thunderstorms and tornadoes. Jefferson County is susceptible to the effects of coastal storms. Since Jefferson County is inland, the primary risk is the impact of high winds, the formation of tornadoes and flooding.

Hurricanes and tropical storms have a county-wide impact. Based on historical information, the County can expect some impact from at least one hurricane / tropical storm per year. Although one can extract data and probability of occurrence from historical information, the risk of a hurricane or tropical storm and the location of damage are random.

Droughts / Heat Waves, Landslides, Land Subsidence, and Earthquakes have a much smaller chance of occurring in Jefferson County and the City of Birmingham than the other hazards listed above. For hazard descriptions, profiles, community impacts, location and extents, and probability of future occurrences on these remaining natural hazards, refer to **Section 4** of the Jefferson County, Alabama Natural Hazard Mitigation Plan, April 2004.

2.10 Natural and Beneficial Floodplain Functions

Floodplains serve an invaluable function in the day to day maintenance of natural lands, waters and wildlife. There are three general areas of natural and beneficial floodplain functions; water resources, biological / ecological resources, and cultural resources. These functions are briefly outlined in **Table 2.5**, Floodplain Resources.

The floodplain functions that provide a benefit to the hydrologic cycles on the earth's surface and below the ground are referred to as water resources. These floodplain resources provide natural flood and erosion control, through the reduction of flood velocities and peaks. A major benefit of the natural flood control provided by floodplains is the reduction in potential damages and loss of life as a result of flooding. Natural water quality maintenance is also performed by floodplains. Large natural floodplains can serve as filters for surface water, reducing sediment loads, naturally processing chemical and organic wastes and reducing nutrient overloads that would eventually flow into the waterways. Undisturbed floodplains can also serve to sustain ground water recharge, helping to reduce the frequency and effects of low flow periods.

Biological / ecological resources are the floodplain functions that provide a benefit to the variety of flora, fish and wildlife in the area. Floodplains are one of the most dynamic ecosystems on the earth. They can contain wetlands and riparian areas, some of the most diverse habitat for flora and fauna.

Finally, cultural resources are the functions of the floodplain that benefit society. The location of floodplains adjacent to waterways creates situations where the floodplains are used as a means to access the waterways, both historically and in present times. As a result of historic use of these locations, many floodplains contain archeological sites, providing enormous scientific research value. Current use of the floodplains by society is often associated with recreational pursuits, especially in conjunction with the nearby waterways. These open, natural areas also provide aesthetic and scenic value to the community at large. Finally, floodplains can provide agricultural and aquacultural value to society by allowing for the harvesting of natural products within its boundaries.

Table 2.5
Floodplain Resources

Natural and Cultural Resources of Floodplains	
Water Resources	
<i>Natural Flood Control and Erosion Control</i>	<i>Surface Water Quality Maintenance</i>
<ul style="list-style-type: none"> • Reduce flood velocities • Reduce flood peaks • Reduce wind and wave impacts • Stabilize soils 	<ul style="list-style-type: none"> • Reduce sediment loads • Filter nutrients and impurities • Process organic and chemical wastes • Moderate temperatures of water
<i>Maintain Groundwater Supply and Quality</i>	
<ul style="list-style-type: none"> • Promote infiltration and aquifer recharge • Reduce frequency and duration of low flows; i.e. increase / enhance base flow 	
Living Resources	
<i>Support Flora</i>	<i>Provide Fish and Wildlife Habitat</i>
<ul style="list-style-type: none"> • Maintain productivity of natural forests • Maintain natural crops • Maintain high biological productivity of floodplain and wetland vegetation • Maintain natural genetic diversity 	<ul style="list-style-type: none"> • Maintain breeding and feeding grounds • Create and enhance waterfowl habitat • Protect habitat for rare and endangered species
Cultural Resources	
<i>Maintain Harvest of Natural and Agricultural Products</i>	<i>Provide Opportunities for Recreation</i>
<ul style="list-style-type: none"> • Create and enhance agricultural lands • Provide areas for cultivation of fish and shellfish • Create and enhance forest lands • Provide harvest of fur resources 	<ul style="list-style-type: none"> • Provide open space values • Provide areas for active and consumptive uses • Provide areas for passive activities • Provide aesthetic values
<i>Provide Areas for Scientific Study and Outdoor Exploration</i>	
<ul style="list-style-type: none"> • Provide opportunities for ecological study • Provide historical and archeological sites 	

Source: Floodplain Management in the United States: An Assessment Report, Volume 1 Summary Report. FEMA.

2.11 Future Development

One of the primary root causes of flood damage within the Birmingham area has been the historical development and encroachment upon the floodplains of the major waterway within the region. While historical developments have had an impact, future unconstrained development can continue to have a significant impact on floodplains. In order to offset or mitigate any negative impacts to the floodplains from future development it is critical to know what the development trends are and where they are

forecasted for potential location with respect to the floodplains. To date, much of central / downtown Birmingham is fully developed. Any future expansion and/or new development in the city will most likely be out towards the “fringes” of the city.

It is important to attempt to keep floodplains from becoming overdeveloped. Once the area inside the floodplain begins to overdevelop, the amount of permeable lands diminish with the construction of new buildings, land cover and sewer systems. Ultimately, this results in increasing stormwater runoff rates, higher flows and a greater potential for damage as a result of flooding.

So, the question arises, how is the development of floodplains kept in check, while not stifling economic growth. It is a delicate balance between restrictions on future development of the remaining floodplain areas and economic and social goals. The City of Birmingham does have a *Zoning Ordinance Provision for Floodplain Zones* currently in place to manage floodplain developments. However, Jefferson County has a Model Floodplain Ordinance currently being considered. The Jefferson County Model Ordinance would create a higher, i.e. wider, regulatory floodplain. It goes on to propose a flood protection elevation that would be 3 feet above the base flood elevation. For new development, the ordinance would not allow filling within the 100-Year floodplain, except for roadways or other public works. Within a Special Flood Hazard Area (SFHA), structures would be required to be on piers or columns, with no enclosures or crawlspaces below the proposed flood protection elevation. While the Jefferson County ordinance may be too restrictive considering economic and other development goals for the City of Birmingham, similar concepts for the City of Birmingham may need to be considered. Finally, coordination between municipalities experiencing future upstream development and the city is critical, because water from areas upstream eventually make their way into the city.

2.12 Conclusions

Section 2 is a summary of the existing natural conditions and flood problems in the City of Birmingham. All information discussed was based on the latest available data. Some key conclusions follow:

1. The area contained within the city limits of Birmingham contains a portion of 10 different watersheds and over 8,000+ acres of the 100-Year Floodplain.
2. Since 1995, there have been 10 flood events. The most recent and severe occurring in May 2003. A Presidential Disaster Declaration was issued following the May 2003 flood. While flooding can not always be predicted, it is known that the city is susceptible to flash flood events and mitigation measures should be planned accordingly.
3. Health and safety following a flood are paramount. Flooding causes safety concerns due to the rising and moving waters. In addition, health problems can arise due to

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the transportation of trash and waste by flood waters and stagnant water serving as breeding grounds for bacteria and mosquitoes.

4. Critical facilities are especially important following a hazard event. The City of Birmingham has critical facilities, such as the East Police Precinct and the Birmingham International Airport, that are at risk of flooding. It is important to develop mitigation strategies that pertain directly to the operations of critical facilities pre and post flood event.
5. 50 insured properties within the city are considered to be repetitive loss properties by the National Flood Insurance Program. A reduction in the number of repetitive loss properties can have a significant effect on reducing future flood insurance claims.
6. Birmingham is susceptible to other natural hazards including tornadoes, severe storms, winter storms, and hurricanes. Flood events often occur in conjunction with these other natural hazards. When establishing mitigation measures for flooding, it is necessary to consider the effect that these other hazards could have on a potential flood mitigation measure.
7. Floodplains have natural and beneficial functions, including natural flood control, water quality maintenance, the support of flora and fauna, and providing opportunities for scientific study, outdoor exploration and recreation.
8. Unregulated future development will only serve to worsen the City's flooding situation. Improved floodplain and stormwater management regulations are needed to control the impact that new development will have on the existing floodplains.

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3.0 GOALS

3.1 Findings from Flood Hazard Assessment

Through researching historical and recent storm events, NFIP Claim Data, and other available information pertaining to flooding in the City of Birmingham, the main problem has been identified as the significant flooding of homes, businesses, automobiles, yards and roadways resulting in considerable property damage and disruption of services. Primary types of flooding include riverine (flash flooding) and flooding due to inadequate or poorly maintained urban drainage systems in the developed area. The City maintains an extensive GIS database recording flood hotspots as reported by the community as well as based on damage assessments following major flood events. **Figure 2.2** indicates areas of flooding from the last 2 major flood events in the city, as well as properties identified by the City as flooding 'hotspots'.

Neighborhoods containing clusters of hotspots, repetitive loss properties, and/or large areas of identified flooding in the recent events were presented to the Stakeholder Committee at the May 20th, 2004 meeting. With input from the Stakeholder Committee, the following neighborhoods / areas were identified as areas largely affected by flooding:

- Echo Highlands
- Pratt / Ensley / South Pratt
- East Birmingham, near 10th & 11th Avenue North
- East Thomas @ Village Creek
- Crestline along Mountaindale Road
- East Lake / Wauhoma
- Roebuck
- Center Point Parkway
- Roosevelt City / Valley Creek
- Highway 11 near Mary Taylor Road
- North Birmingham / Collegeville
- Jones Valley Creek near 31st and 32nd Street SW

It is important to note most areas identified by the Stakeholder Committee were consistent with City identified and recorded flooding sites, as indicated on **Figure 2.2**.

Flooding in each of these areas appears to be related to one of two issues: development in the floodplain and associated riverine type flooding and the inadequate capacity and/or maintenance of the existing urban drainage system. Floodplain development has several factors that contribute to the severity of the flooding problem. Filling and development in the 100-Year floodplain reduce the natural flood capacity of

the floodplain. Rapid growth in suburban areas increases impervious surfaces such as driveways, parking lots and roofs, ultimately resulting in increased runoff. As development continues, there is often a lack of coordination between municipalities. This lack of coordination can have a direct impact on floodplains in neighboring municipalities, as negative impacts are often magnified downstream. Limits of the floodplains often times are not accurate due to outdated Flood Insurance Rate Maps (FIRMs). Further, the regulations and design criteria that are developed based on the floodplain boundaries are then rendered inadequate. Finally, there is often inadequate capacity in the existing natural and man-made storm drainage systems. Restrictions, including bridges and box culverts, exist in the natural drainage ways, reducing the overall capacity of the natural drainage system.

The second contributing factor to flooding is the maintenance of the existing natural and man-made drainage system. Inadequate maintenance or lack of resources to maintain the drainage system can lead to, as well as, compound existing flooding problems. Trash and debris illegally dumped into the system or washed into the system during flooding restricts flows. Lack of access to maintain and clean some of the drainage ways also appears to be a problem. As flows and erosion have increased in and along ditch banks, ditch sections are becoming unstable. Unstable ditch sections can eventually collapse effectively blocking the drainage system. In addition, effectively controlling vegetative growth within the drainage system could provide some benefits. Vegetative growth can stabilize ditches and aid in the natural benefits of a floodplain, but unchecked, it can also clog and restrict drainage ways.

3.2 Goals

The goals of this plan are generally the City of Birmingham's long-range targets for the Flood Mitigation / Stormwater Management Program. Initially, project team members reviewed the findings from the flood hazard assessment and developed five sample goals that were presented to the Stakeholder Committee at the May 20, 2004 meeting. The following sample goals were presented:

1. Protect life and health from flooding.
2. Mitigate the effects of flooding on existing development.
3. Protect new development from damage by the base flood.
4. Improve the quality of life in the city.
5. Secure the resources needed to implement the recommendations of the Floodplain Mitigation / Stormwater Management Plan.

During the May 20, 2004 Stakeholder Committee meeting, members commented on the goals and objectives that had been presented. The comments focused on three main

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areas: losses of population and housing, buyouts and relocations as a form of mitigation and funding. First, it was proposed that mitigation measures should attempt to limit losses for population and housing within the City of Birmingham. Secondly, there was discussion regarding the mitigation measure of buyout and relocation programs. It was suggested by the committee that for buyout programs, comprehensive plans to identify future land use and housing opportunities within the City of Birmingham should be developed to accommodate any buyouts or relocations. It was further suggested that education on alternatives to buyouts and relocations should be emphasized due to the sometimes conflicting nature of stabilizing the tax base within the city. Next, the discussion on goals moved towards the funding arena. Members of the committee suggested that structural mitigation measures should concentrate on realistic and affordable engineering solutions. Furthermore, the action plans should consider various funding options and be consistent with projected funding and available funding resources.

Having received the Stakeholder Committee's comments, the project study team reviewed and modified the Flood Mitigation / Stormwater Management Plan goals. The Draft Goals for the Plan were presented at the June 24, 2004 Stakeholder Meeting. The goals and objectives include:

1. Protect life, health and property from flooding.
2. Mitigate the effects of flooding on existing development.
 - a. Mitigation measures should attempt to limit losses for population and housing when feasible.
 - b. Develop comprehensive plans for relocation sites within the City.
3. Protect new development from damages by the 100-Year flood event.
4. Secure the resources to perform maintenance at a level that maximizes efficiency of the existing drainage system.
5. Secure the resources needed to implement the flood mitigation / stormwater management plan.
6. Develop an action plan that is consistent with reasonable, achievable funding levels and resources.

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4.0 PREVENTIVE MEASURES

Preventative measures attempt to keep a potential problem from occurring or worsening. There are 7 categories that generally encompass preventative measures.

1. Planning;
2. Open Space Preservation;
3. Zoning;
4. Subdivision Regulations;
5. Building Codes;
6. Floodplain Development Regulations; and
7. Stormwater Management.

Planning, open space preservation initiatives and zoning ordinances are all ways to address the hazard areas of the floodplain so as to eliminate or minimize damage to susceptible development. Subdivision Regulations, Building Codes, and Floodplain Development Regulations are measures aimed at regulating what is developed in the hazard area or watershed and how it is developed. Finally, Stormwater Management is a tool utilized to address stormwater runoff in an area, as well as how that runoff is handled by the storm sewer system. Generally, Stormwater Management addresses existing runoff as well as runoff generated from proposed developments from both a quantity and quality standpoint.

4.1 Planning

Comprehensive Planning is an all-inclusive process aimed at guiding the future growth of a community. The main focus of this type of planning is how existing and future land use patterns relate to issues affecting a community. Community issues can include housing conditions, population, roadways / infrastructure, educational facilities, recreation and government facilities.

A Comprehensive Plan usually serves only as a guide to the city and has limited enforcement capabilities. It generally steers the city's capital and operating budgeting process. The City of Birmingham's Comprehensive Plan was completed in 1994. It is currently in the process of being updated. The City's present plan (1994) has a section dedicated to environmental management that includes some specific action strategies for planning. The Director of Planning, Engineering and Permits and the Flood Plain Administrator for the City of Birmingham are members of the Technical Advisory Board.

for development of the Flood Mitigation / Stormwater Management Plan and also participated in the development of the Jefferson County hazard mitigation plan. The ongoing comprehensive plan effort is being coordinated with the current Flood Mitigation / Stormwater Management Plan and the county hazard mitigation plan and will integrate key recommended hazard mitigation planning concepts from both studies.

Financial constraints of cities all over the United States are well known. Planning efforts that take into account budgetary constraints are often addressed through a Capital Improvement Program. A Capital Improvement Program is a program outlining a community's future financial commitments to public projects in their community. The time frame for a Capital Improvement Program is usually 5-20 years in the horizon. The Department of Planning, Engineering and Permits oversees the City of Birmingham's Capital Improvement Program.

The City of Birmingham recently approved a bond issue to fund a Capital Improvement Program. Approximately \$12 million of this bond issue has been dedicated to drainage related improvements. A listing of these projects is included in **Appendix C**. In addition, as part of this Flood Mitigation / Stormwater Management Plan, a program of strategies and action items will be developed and prioritized to address flood mitigation and stormwater management. Applicable strategies and actions will then be recommended for consideration in the City Capital Improvement Program with funding alternatives.

4.2 Open Space Preservation

Historically, floodplains have been a prime area for development due to their location near waterways. In contrast to this natural inclination to develop on or near the water is the desire to limit and/or eliminate development in the floodplain in order to reduce flood damages to development both in and out of the floodplain.

Maintaining open, natural floodplain functions can have a significant, beneficial effect on flooding and water quality in the area. Open space preservation throughout the City, not just in the floodplain, is essential to limiting flooding. The current Comprehensive Plan discusses action strategies regarding open space preservation. These include the pursuit of purchasing and developing open space with funding support from the National Parks Service or other national organizations such as the Nature Conservancy and Rails to Trails. One example where Open Space Preservation can be accomplished through a Best Management Practice is through the use of Cluster Developments. (See **Section 8.4**)

The Park and Recreation Board of the City of Birmingham has over 150 properties, encompassing over 2,000 acres of the City, including parklands, golf courses, softball fields, swimming pools, tennis courts, and other recreational facilities. Currently there are numerous acres of the floodplain that have been set aside as open space.

(parklands / recreational use) through their designation as part of the City of Birmingham Parks System.

Greenways are corridors of protected, undeveloped land in and around cities that are designed for recreational or conservation uses. They can be publicly or privately owned and some are the results of public / private partnerships. As large areas of managed open space, greenways can function as natural floodplains. In addition to the water storage capacity, greenways can aid in stream bank stabilization through the reduction in soil erosion due to the use of native vegetation as well as natural filters for water quality. The current Comprehensive Plan for the City of Birmingham lists one of its action strategies as the “proposing of zoning requirements that assure appropriate preservation and development of parks, greenways, and open space.”

The City of Birmingham in cooperation with supporting agencies such as the Black Warrior / Cahaba Rivers Land Trust is actively pursuing open space preservation through the Greenways Program.

4.3 Zoning

Zoning is the partitioning of land into smaller parcels that are reserved for specific activities. This partitioning is accomplished through the zoning ordinance, or the municipality's legal means of prescribing the specified land use. Zoning ordinances can encourage down-zoning or low density zoning in floodplains, wetlands, landslide zones and other environmentally sensitive areas. It can be used to create open space areas as well as recreation and parks.

The City of Birmingham currently maintains a zoning ordinance defining allowable land uses by zoning designation. Effective March 25, 1995, the City adopted “*Zoning Ordinance Provisions for Floodplain Zones*”. In **Section 10**, Flood Plain Zone Districts, the ordinance states: “It is the purpose of this Section to promote the public health, safety and general welfare and to minimize public and private losses due to flood conditions in specific areas by the following provisions designed to:

- a. Restrict or prohibit uses which are dangerous to health, safety and property due to water or erosion hazards, or which result in damaging increases in erosion or in flood heights or velocities;
- b. Require that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;
- c. Control the alteration of natural floodplains, stream channels, and natural protective barriers which are involved in the accommodation of flood waters;
- d. Control filling, grading, dredging and other development which may increase erosion or flood damage; and

- e. Prevent or regulate the construction of flood barriers which will unnaturally divert flood waters or which may increase flood hazards to other lands.”

This zoning ordinance provision is applicable to all Special Flood Hazard Areas (SFHA) within the corporate limits of the City of Birmingham, which are designated as per the Flood Insurance Rate Maps (FIRMs). Some key stipulations within the ordinance include:

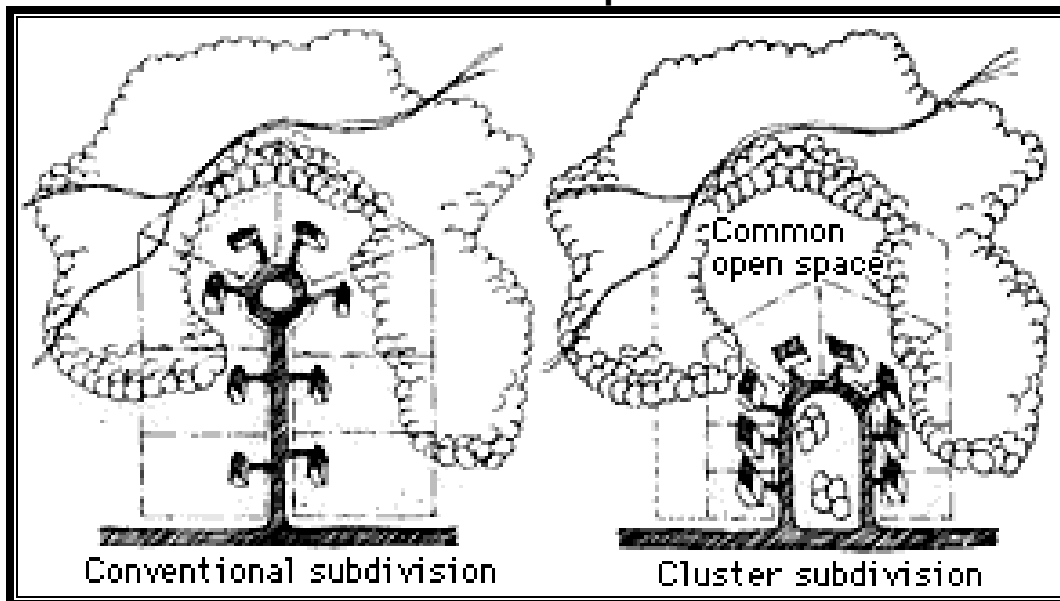
- Requires a floodplain development permit
- The lowest floor must be 1 foot above the base flood elevation (BFE)
- Precludes finishing living spaces below the BFE
- Encroachments occurring in the “floodway” shall not result in any increase in flood levels during occurrence of the base flood discharge.

4.4 Subdivision Regulations

Subdivision regulations control how developable land will be subdivided into smaller, individual lots. They can have a significant effect on stormwater management. In general, regulations should consider limiting the subdivision of floodway and floodplain lots, minimize impervious surfaces, and promote Best Management Practices (BMPs) in land planning and site planning.

These regulations can have a significant role in the reduction of impacts associated with floodplain development. The use of pervious pavements for sidewalks and other walkways could be considered in subdivision regulations. In an effort to minimize the amount of impervious pavement, floodplain friendly subdivision regulations could include consideration in minimizing the number of residential cul-de-sacs and/or require landscaped areas in the cul-de-sac, while still meeting standards to accommodate emergency and maintenance vehicles. The combination of these efforts is demonstrated in the BMP known as Cluster Developments. (See **Figure 4.1**)

Figure 4.1
Cluster Developments



Source: [www.extension.umn.edu/distribution/naturalresources/components/7059\[1f01\].html](http://www.extension.umn.edu/distribution/naturalresources/components/7059[1f01].html)

To reduce the amount of impervious materials, residential street widths can be reduced to the minimum required width to accommodate the travel-way, the sidewalk and vegetative channel openings.

Another tool available for use in subdivision regulations is vegetative channels. Where feasible, the use of vegetative channels, in lieu of curbs and gutters, could be encouraged since they provide the drainage that subdivisions need, while still allowing the natural vegetation to filter and slow down stormwater runoff.

City of Birmingham's Engineering Design Guidelines for Subdivisions or Commercial Developments was last updated in 1999. The policy of the City of Birmingham regarding Stormwater Detention is that the post-development runoff must equal the pre-development runoff. However, the City does not require specific methods to achieve this requirement. Regulations also indicate that emergency spillways for detention facilities shall be designed to a higher rainfall event, i.e., 100-Year return, without causing catastrophic damage to downstream areas. The Storm Sewer Collection System minimum design return period is a 10-year storm event with a 25-year event required for box culverts and pipes larger than 60 inches in diameter.

4.5 Building Codes

All buildings are subject to building codes. Construction of new structures or the repair and update of older and/or damaged structures provides an opportune time for the introduction of flood mitigation measures into the design. This integration of flood mitigation measures into the building code update process allows for new and repaired

structures to be brought to the higher standard. An example of this process would be when the building codes are being updated; those codes that affect structure foundations should be modified such that the code states that structure foundations in flood prone areas should be able to withstand the lateral forces produced by floodwaters. The result of this is that all new buildings in flood prone areas built to code have foundations that can withstand the forces of floodwaters.

The City currently employs the standards in the Standard Building Code put forth by the Southern Building Code Congress International. The Standard Building Code is one of three model building code programs in the United States, but they do not contain all the necessary flood protection requirements needed to meet the minimum NFIP floodplain requirements. The 2000 International Codes on the other hand contain extensive flood protection measures that meet the NFIP floodplain development requirements. For that reason, the City of Birmingham should consider adopting the 2000 International Codes.

Finally, the City could consider requiring a Certificate of Occupancy or Completion, whichever is applicable, be issued for all floodplain building and utility developments. Currently, as part of the Floodplain Development Permit process a certification of elevation and flood proofing is required for development in Special Flood Hazard Areas.

4.6 Floodplain Development Regulations

Floodplain development regulations usually result from a community that has had a history of flood problems. It is because of this history of flood problems that many communities elect to participate in the National Flood Insurance Program (NFIP).

As discussed earlier in **Section 1**, the National Flood Insurance Program is a federal insurance program that sets minimum requirements for the participating jurisdictions, relevant to flooding. Federal legislation requires that a community participating in the NFIP adopt and enforce a floodplain ordinance that meets or exceeds the minimum NFIP requirements, in order for an individual to receive flood insurance on their property. The City of Birmingham joined the NFIP on March 16, 1981.

Communities participating in the NFIP are required to regulate development in the Special Flood Hazard Area (SFHA). Development is defined by FEMA as: "any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials." As previously noted, as part of their ongoing regulatory efforts, the City of Birmingham requires a Floodplain Development Permit application to be submitted prior to an owner commencing with any development in a SFHA.

In addition to the requirements pertaining to the SFHA, the NFIP has a requirement that affects Pre-FIRM buildings. This is done to ensure that these Pre-FIRM buildings receive the necessary protection from flooding. A building improvement is considered

to be a “Substantial Improvement” if the costs of the improvements to the home or business, i.e. the structure, are equal to or greater than 50% of the pre-improvement market value. A building is considered to be “Substantially Damaged” if the cost of restoring it is equal to or greater than 50% of the market value of the building prior to it incurring the damage. Substantially improved and substantially damaged buildings must meet the minimum requirements of the NFIP. More detailed information regarding the City of Birmingham floodplain ordinance, which is a provision within the existing zoning ordinance, is included in **Section 4.3 Zoning**.

The City of Birmingham also participates in the Community Ratings System (CRS) program, under the NFIP. CRS credits communities that have programs exceeding the minimum floodplain management requirements under the National Flood Insurance Program. As stated earlier, in **Section 1.4**, participation in the CRS program can lead to a reduction in flood insurance premiums for policy holders.

4.7 Stormwater Management

Effects on downstream communities can be severe if development in the watershed goes unchecked. As development in a watershed occurs, the natural means of managing stormwater diminish. Impervious materials begin to replace grass and other natural vegetation. Due to the fact that the stormwater flows at a faster rate over the impervious materials than over natural vegetation, runoff rates begin to increase. Increases in runoffs can lead to scour and erosion problems along stream banks and waterways, as well as contribute to flash flooding.

A common means of dealing with drainage in a development is to implement a sub-surface drainage system, often times replacing the open ditch systems that are in existence. Subsurface drainage systems “shuttle” the water out of an area to an outfall area. Since the water is flowing through pipes made of impervious materials, generally on greater slopes than open ditches, the flow rate will be higher. Also, by transporting the stormwater through the pipe system, there is not as much opportunity for the water to infiltrate back into the ground and recharge the ground water aquifers. Development in the watershed can also have an effect on the water quality, through the loss of natural vegetation; a natural means of filtering the water is lost.

Birmingham’s *Subdivision Regulations* require that adequate stormwater drainage systems be provided for each Subdivision. *Engineering Design Guidelines for Subdivisions and Commercial Developments* go on to require that a 10-year design storm be used, at the minimum, for the design of all storm sewer collection systems. If Box Culverts or pipes larger than 60” in diameter are required, the design storm should be modified to 25-years, at a minimum. The policy of the City of Birmingham relative to stormwater detention / retention is that the post-development runoff rate shall equal the pre-development rate.

Relevant to Preventative Measures and Stormwater Management, there are 3 other City documents which provide or could provide related guidance.

- Soil Erosion and Sediment Control Ordinance
- Parking Ordinance
- Landscaping Requirements

The *Soil Erosion and Sediment Control Ordinance* was adopted by the City to address issues related to the Clean Water Act as well as certain provisions of the NPDES permit process. While NPDES permits are primarily the responsibility of the Stormwater Management Authority, the City requires a Soil Erosion and Sediment Control Permit to regulate substantial land disturbing activities. The permit requires submittal of a “control plan” including a Best Management Practices plan, and specifications as well as a drainage plan for sites located wholly or partially within a 100-year floodplain or other hazard area.

The ordinance provides a good method at the City level for enforcing utilization of Soil Erosion and Sediment Control techniques during construction related land disturbing activities. However, consideration of methods for long term Erosion Control and Stormwater Management may need to be given more consideration. Also, similar Erosion Control and Stormwater Management practices during the planning phases of project development could be highly beneficial.

The *Parking Ordinance* and *Landscape Requirements* can also affect Stormwater management. Large impervious parking surfaces can increase runoff rates and negatively affect water quality. Modification to the Parking Ordinance that could result in reduced impervious surfaces and better filtration through landscaping requirements should be considered. The current Landscaping Requirements do not encourage or address utilization of landscaping to reduce runoff rates, filter Stormwater runoff or other beneficial uses.

4.8 Conclusions

1. The City of Birmingham utilizes a number of techniques to promote and implement preventative measures including Comprehensive Planning, Open Space Preservation through Greenway development, enforcement of the *Zoning Ordinance Provision for Floodplain Zones*, *Engineering Design Guidelines for Subdivisions and Commercial Development*, *Subdivision Regulations*, and the *Soil Erosion and Sediment Control Ordinance*.
2. The City’s NFIP program meets the minimum NFIP requirements pertaining to new development in SFHA.
3. The City, through its zoning ordinance has adopted a *Zoning Ordinance Provision for Floodplain Zones*. A few key requirements of the provision include:

- a. New or substantially renovated buildings must be elevated one foot or more above the 100-Year Base Flood Elevation (BFE).
 - b. That a Floodplain Development Permit application be submitted for the development in the SFHA.
 - c. Severely restricts development in the floodway.
 - d. Precludes finishing living spaces below the BFE.
4. Subdivision regulations and associated engineering design guidelines require that post-development runoff must equal the pre-development runoff. They require that stormwater drainage be addressed for new development and provide minimum design criteria. However, they do not encourage or recommend to a significant degree implementation of flood mitigation strategies and best management practices during the master / land planning, and site planning phases of project development.
5. The City of Birmingham does have an adopted *Soil Erosion and Sediment Control Ordinance* requiring a permit for land disturbing activities during the construction phase of a project.

4.9 Recommendations

1. Comprehensive Plan

The City of Birmingham is currently in the process of updating the City's Comprehensive Plan. Close coordination between the two parallel planning processes should continue and strategies from the Flood Mitigation / Stormwater Management Plan should be considered and incorporated where possible including: open space preservation concepts especially in the SFHA, down zoning (reduced density) in the SFHA, instituting greenway projects and associated conservation easements / natural buffers adjacent to natural and man made drainage ways.

2. Zoning Ordinance / Zoning Ordinance Provisions for Floodplain Zones

- a. Relevant to the Zoning Ordinance, provisions regarding enhanced open space requirements for residential, commercial, and mixed use development uses should be considered. Emphasis should be placed on developers to designate SFHA, jurisdictional wetlands, and other sensitive environments as open space for conservation and/or recreation use. Requirements to maintain vegetated buffers along natural streams and major drainage ways should also be considered.
- b. For planned unit developments, especially those development tracts with substantial SFHA designated areas, cluster development concepts should be

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emphasized, whereby increasing allowable densities in areas most suitable for development and preserving SFHA and other environmentally sensitive areas.

- c. The City is currently reviewing the Model Floodplain Ordinance proposed by Jefferson County. The City could choose to adopt this model ordinance, which would supercede the existing “*Zoning Ordinance Provisions for Floodplain Zones*”. While the model ordinance does provide excellent preventative measures relevant to floodplain management and flood hazard mitigation, it would significantly increase the regulatory floodplain management area within the City of Birmingham and requires substantial increases in building elevation requirements above the base flood elevation (BFE).

Obviously the City will make the final decision whether to adopt or not to adopt the proposed model ordinance. However, if the City decides not to adopt the model ordinance, they should seriously consider modifying the existing “*Zoning Ordinance Provisions for Floodplain Zones*” or develop a new model floodplain / stormwater management ordinance consistent with City goals and objectives. Key general provisions / modifications that should be considered for inclusion relevant to floodplain management include:

- i. Increasing the flood protection elevation for new construction from 1'-0" to 1.5' - 2'-0" above the base flood elevation.
 - ii. Severely restrict development in the “floodway” by not allowing the placement of fill in the floodway and limiting development to conservation / open space / passive recreation uses and flood control / utility needs.
 - iii. For developments within designated Special Flood Hazard Areas outside of the “floodway”, restrict development by requiring no net loss of flood storage capacity, in turn severely limiting placement of fill in the SFHA. Also minimum lot sizes of 1 to 2 acres should be considered to limit density of development within the floodplain. Provisions for providing a maximum percent of impervious cover should also be considered by type use.
- d. An important component to developing an effective Floodplain Management Program is to have a clear and accurate delineation of the special flood hazard areas including the base flood elevation, and floodway limits. The City in coordination with the State of Alabama, Department of Economic and Community Affairs, Office of Water Resources, and FEMA is currently proceeding with a Floodplain Map Modernization Program (FMMP). An interim update using best available data is to be completed in 2005. Once the interim update is complete, the City and State should proceed with a more detailed Flood Map Modernization effort for major drainage basins within the City of Birmingham through improved, calibrated hydrologic and hydraulic (H & H) model development and the use of

improved topographic data. A more detailed plan of action to address this issue will be included in the Flood Mitigation / Stormwater Management Action Plan.
(Section 10.10)

3. Soil Erosion and Sediment Control Ordinance

The current Soil Erosion and Sediment Control Ordinance is comprehensive, requiring a Soil Erosion and Sediment Control Permit which must be accompanied by a "control plan", BMP plan and specific actions for all permits, and a drainage plan for flood prone or designated Special Flood Hazard Areas. The ordinance is geared toward land disturbing activities during the construction phase. While implementing best management practices and erosion control techniques during the construction phase is critical and beneficial, consideration should be given to incorporating stormwater and associated best management practice strategies to the planning, design and long term operation phases of the project.

- a. A Stormwater Management / BMP Handbook identifying best management practices for the various stages of project development could be developed. The handbook would address BMPs for:

- i. Master Planning, Land Planning, and Site Planning Phases;
- ii. Design Phase;
- iii. Construction Phase; and
- iv. Long Term Operations / Maintenance.

Guidance documents such as *Subdivision Regulations*, the *Soil Erosion and Sediment Control Ordinance* and *Design Guidelines* could reference the BMP Manual requiring design and construction professionals to consider such strategies. In the review and permitting process it would be incumbent upon the developer to document that a reasonable effort has been made to consider and incorporate appropriate BMPs.

4. *Subdivision Regulations and Engineering Design Guidelines for Subdivisions and Commercial Development*

- a. Consideration should be given to including a more detailed section in the Subdivision Regulations regarding treatment of Special Flood Hazard Areas (SFHA) and environmentally sensitive areas including SFHAs, wetlands, etc. Natural vegetated buffers should be required adjacent to natural creeks and rivers. Methods, such as *cluster type development*, allowing for open space preservation of jurisdictional wetlands and SFHA should be emphasized and rewarded.

Reference should be made to the Stormwater Management / BMP Handbook for guidance on master planning, land planning and site planning techniques relevant to flood mitigation planning and stormwater management which will

provide long term flood mitigation and water quality benefits.

A review mechanism should also be instituted within the Planning, Engineering and Permits Department to make sure every reasonable effort has been made to incorporate BMP planning phase strategies as outlined in the handbook for the proposed development.

- b. The Design Guidelines for drainage and storm sewer systems are generally consistent with most metropolitan areas through the southeast, specifying a minimum design return period for a 10-Year storm event, with a 25-Year event return period for box culverts and pipes larger than 60". In light of this and in order to reduce urban flooding due to storm sewer system capacity limitations, the City should consider requiring all development outside of the SFHA to be elevated a minimum of 1'-0" to 1'-6" above the crown of the adjacent roadway.
- c. Other Stormwater Management considerations for inclusion include:
 - i. Require landscaped center sections for cul-de-sacs so as they can still effectively accommodate emergency vehicles.
 - ii. Utilization of pervious surfaces for sidewalks.
 - iii. Reduce minimum street width to 24' for local streets.
 - iv. Encourage use of open drainage swales in lieu of closed storm sewer systems especially in the SFHA.

5. Building Codes

The current building code adopted by the City (Standard Building Code) in conjunction with the "Zoning Ordinance Provisions for Floodplain Zones" meets or exceeds the NFIP requirements. However, the City may want to consider adoption of the "2000 International Codes" due to the more aggressive requirements relevant to natural hazard mitigation.

6. Parking Ordinance

The City does have a parking ordinance in place. Parking lots can encumber large areas with impervious surfaces and have negative effects such as increased runoff rates and harmful water quality impacts. The City has made strides to address these issues; however in the next update of the ordinance, the following issues should be considered:

- a. Encouraging pervious surfaces in all situations, both inside and outside designated SFHA and reducing the amount of impervious surfaces.
- b. Specifying both minimum and maximum parking requirements.
- c. Requiring that overflow parking be pervious surfaces.

- d. Promote vertical parking where reasonable and feasible, encouraging, "Green Roofs" for such solutions.
- e. Reference the Stormwater Management / BMP Handbook (if developed) section regarding parking lot planning and design and require associated BMPs be considered and instituted where reasonable and feasible.
- f. Specify landscaping requirements (per cent to be landscaped) for parking lots.

7. Landscaping Requirements

The current City *Landscaping Requirements* do not address flood mitigation or stormwater management issues. However, strategically placed landscaping, and utilizing appropriate plant materials can provide excellent stormwater management functions. Concepts such as natural buffer zones and filter strips adjacent to rivers, streams, and parking lots can be effective. Wet pond concepts taking advantage of the natural filtering process of wetland vegetation is another example.

Consideration should be given to updating the *Landscaping Requirements* to address flood mitigation and stormwater management issues. Many of these strategies are closely related to the ones which would be defined in the Stormwater Management / BMP Handbook. Due to this, reference should be made to the handbook and appropriate reviews of site plans and landscape plans to ensure reasonable efforts have been made to institute these strategies.

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5.0 PROPERTY PROTECTION

As flooding continues to cause repetitive damage to structures, methods have been developed to counter the effects that the floodwaters may have with the ultimate goal to protect life and property. Generally, these methods include the relocation of a structure out of harm's way, the acquisition of a property, retrofitting a property and the purchase of flood insurance for the property. Retrofitting a property is comprised of modifying an existing building in order to protect it from the flood hazard. Retrofitting measures for a structure can include:

- Elevation of a building
- Creation of barriers, i.e. floodwalls or levees
- Dry Floodproofing
- Wet Floodproofing
- Sewer Backup Protection

The first 3 methods, relocation, acquisition and elevation, result in the most disruption to a structure or property. The remaining activities are less disruptive, with the purchase of flood insurance having the least disruptive impact on the structure itself.

Initially a decision has to be made as to what level of protection the structure will require. Will the retrofitting protect against the 100-year flood, a 500-year flood, or some other local flood level? This decision is often based on local regulatory requirements. In the case of the City of Birmingham, it is regulated by the City's *Zoning Ordinance Provisions for Floodplain Zones* that requires protection up to a minimum of 1 foot above the base flood elevation (BFE).

If the repairs or improvements made to a structure equal or exceed 50% of the pre-improved market value of the structure, that structure is considered to be substantially improved. As a substantial improvement, the ordinance requires that the structure be treated as new construction, subject to elevation and floodproofing requirements. New residential structures are required to be elevated one foot or more above the 100-year base flood elevation. New non-residential structures (commercial, industrial, etc), are required to be elevated or floodproofed to one foot or more above the 100-Year base flood elevation.

5.1 Relocation

The relocation of a structure involves moving it out of the flood hazard or floodplain to higher ground where it will no longer be vulnerable to the effects of flooding. This method is the most effective retrofitting method at significantly reducing the risk of flooding because the structure will no longer be in an area that is susceptible to flooding. However, this method can become expensive. Smaller, single story buildings

on raised foundations are probably the easiest and least expensive to move. Costs begin to increase as the structures increase in size.

Relocation is similar to elevation in that the structure itself is jacked up off of the foundation. The differences begin when the structure is then placed on a wheeled vehicle and moved to a new location. At the new location, a new foundation is required and the foundation at the previous site is destroyed. Due to the additional steps involved in this process, it is generally more expensive than elevation. Cost is often times a prohibitive factor for this method, however many structures have been relocated throughout the State of Alabama.

5.2 Acquisition

The property protection measure of Acquisition is similar to relocation in the fact that it removes the threat of damage from flooding. It should be noted that this method is as effective as relocation.

Most often in the acquisition process, flood-prone structures are acquired, demolished and then removed, allowing for the land to be maintained as open space or for uses such as a park or for recreation. Acquisition is most appropriate for areas that are subject to flash flooding, deep flood waters or severe flood hazards where other protection measures such as relocation and/or flood proofing have proven unfeasible.

Those involved with community programs aimed at acquiring flood prone structures need to be cognizant of some basic considerations that can have a great affect on the program. These considerations include but are not limited to the fact that communities should understand property costs may be lower following a flood; communities can try and recoup some of the acquisition costs by selling the actual structure for scrap or other material; and that careful attention must be paid to the overall property acquisition plan being put forth by a community so that a checkerboard effect does not result from the acquisition process.

Acquisition programs have been implemented across the City of Birmingham. During the period from 1999 – 2001 the City of Birmingham completed the acquisition of six repetitive loss properties in the Mountandale area. At a total cost of approximately \$1 million, these six repetitive loss acquisitions were funded through the Flood Mitigation Assistance (FMA) Program. The Shades Creek Floodway Acquisition Project resulted in the acquisition of six properties, removing them from the flood hazard zone, with funding made available through the Hazard Mitigation Grant Program (HMGP) and Flood Mitigation Assistance Program. Again using HMGP funds, the City of Birmingham completed the \$7 million buyout (\$5 million Federal share) in association the Village Creek Flood Plain Acquisition Project. This buyout resulted in 250 properties in the City being acquired. Over the last 20 years, the combined efforts of the State, Federal and local governments have resulted in more than 850 structures (a total of 950 properties) being acquired in the Village Creek flood plain. Currently in the Ensley

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Acquisition Area, the Village Creek Floodplain Acquisition project of isolated floodplain structures is moving forward with a FEMA grant in the amount of \$120,000. This grant will allow for up to 4 properties, of the remaining 75 properties in the Ensley acquisition area, to be purchased. The remaining properties in this area are targeted for acquisition under the Black Warrior / Cahaba Rivers Land Trust. Approximately, \$1 million has been earmarked for this effort. Other ongoing projects include: City of Birmingham Floodway Property Acquisition Project, Village Creek Floodplain Acquisition & Demolition Project and Valley Creek Floodplain Acquisition and Demolition project. These FEMA awarded projects total more than \$10 million and will allow for the acquisition of approximately 200 properties located in the SFHAs of Village Creek, Valley Creek, Shades Creek, and Five Mile Creek.

Table 5.1
Summary of City of Birmingham Acquisition Projects

Acquisition Project	Location	# of Properties	Cost	Timeline
Repetitive Loss	Mountandale	6	\$1,000,000	1999-2001
Shades Creek Floodway Acquisition Project	Shades Creek	6	\$1,000,000	2000-2002
Village Creek Floodplain Acquisition Project	Village Creek Study Area	250	\$7,600,000	1995-2003
Village Creek Floodplain Acquisition Project	Village Creek Study Area	650	\$21,900,000	1988– 1993
Village Creek Floodplain Acquisition Project	Ensley	4	\$120,000	Ongoing
City of Birmingham Floodway Property Acquisition Project	City of Birmingham Village Creek Valley Creek	Total of 200+	Total of \$10,000,000	Ongoing
Village Creek Floodplain Acquisition & Demolition Project				
Valley Creek Floodplain Acquisition & Demolition Project				

It should be noted that while acquisitions may some times be the best solution and an effective way of mitigating flood damages, it can result in loss of population and reduction in the tax base to a community. To offset such concerns, comprehensive planning for each buyout program should be undertaken to identify options to relocate displaced persons within the city limits.

5.3 Building Elevation

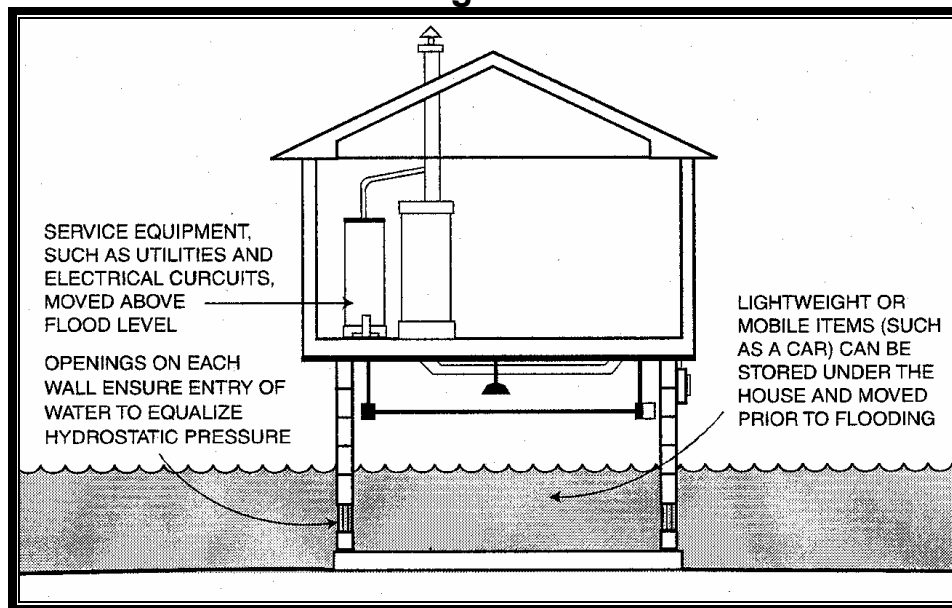
Elevation is another effective method for retrofitting a flood prone structure. The goal of elevation is to raise the lowest existing floor elevation such that it is at or above the base flood (100-Year) elevation.

The elevation process is dependent on the construction type of the building. Usually, during the elevation process the structure is separated from the existing foundation and raised via hydraulic jacks to the new, desired elevation. While the hydraulic jacks are serving as temporary supports for the structure, a new foundation is constructed. This new area below the original floor level can be wet proofed and used as a garage, or storage area.

Elevating does not stop the area below from flooding; it just raises the “living space” out of harm's way. Even with a house elevated, it may not be able to be occupied during a flood. There can be a loss of power or water and/or other dangerous scenarios outside of the house that make it unsafe.

The cost of elevating is often a prohibitive factor. Typically to elevate a frame structure the cost per square foot of house footprint ranges from \$17/ S.F. for a structure with a basement or crawlspace to \$47/S .F. for a structure having an existing slab on grade foundation.

Figure 5.1
Building Elevation

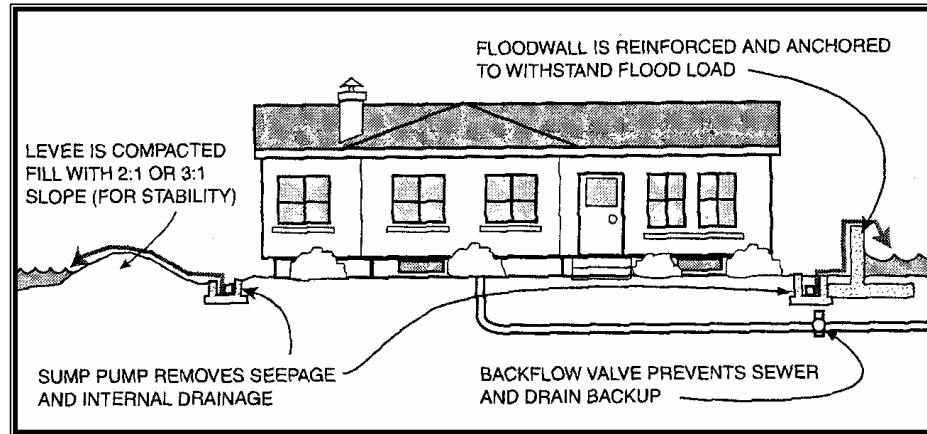


Source: FEMA. Homeowner's Guide to Retrofitting

5.4 Local Barriers

Barriers keep floodwaters from reaching a structure. There are generally two types of local barriers; levees and floodwalls. A levee is a barrier commonly constructed from compacted soil materials, while a floodwall is constructed of engineered materials such as concrete or steel. Both types of barriers are depicted in **Figure 5.2**.

Figure 5.2
Local Barriers



Source: FEMA. Homeowner's Guide to Retrofitting

There are differences in the construction of levees and floodwalls. Levees generally consist of a fore slope, levee crown (i.e. the top) and a back slope. The fore and back slopes are usually constructed on a 3:1 slope. A 3:1 slope means that for every foot the slope elevates / rises, it must traverse 3 feet along the ground. To construct the minimum levee situation of a 1 foot vertical barrier, where there is no levee crown, a minimum width of 6 feet is required. A floodwall requires less overall area for construction. Due to the construction materials used, floodwalls are generally vertical walls. The practical height for a levee is 6 feet and a flood wall is 4 feet. Whether constructing a levee or a floodwall, 1 foot of freeboard should be provided. Freeboard is the additional clearance provided above the flood elevation. It provides an additional factor of safety.

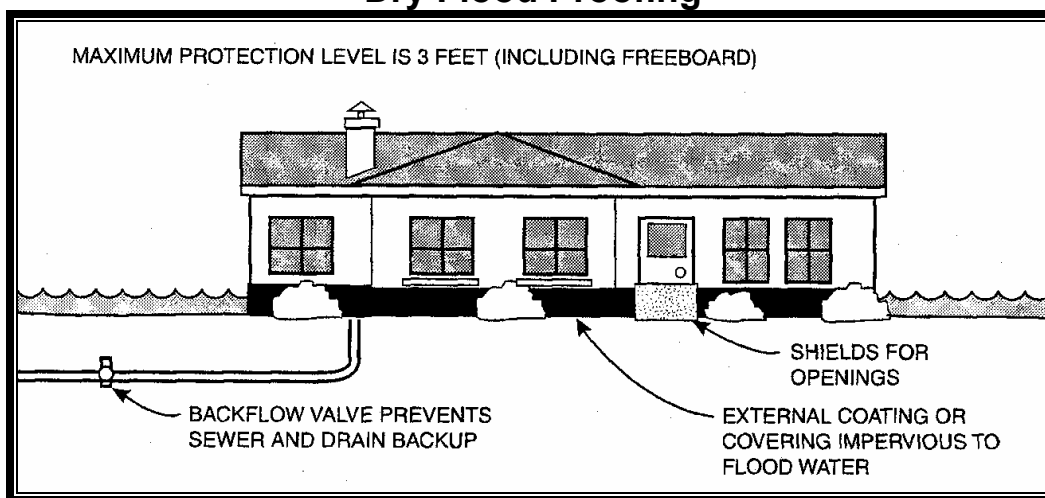
A major concern associated with barriers is drainage. The protected area behind the barrier must continue to drain and not accumulate water. If ground and/or weather conditions do not allow for the natural absorption of water, additional drainage mechanisms must be put into place to drain the area. These mechanisms can include a drain and/or a sump pump. The sump pump facilitates pumping the water up and over the levee or floodwall. Sump pumps are generally required on floodwalls.

The cost of a barrier system can be relatively low in comparison to some of the other retrofitting measures. Typically, the costs of a levee range from \$37 – 115 per linear foot for heights ranging from 2 – 6 feet. Floodwall costs range from \$85 - \$124 per linear foot for heights from 2 – 4 feet. Additional costs, such as sump pumps must be included. A typical drainage system can cost around \$5,000 lump sum.

5.5 Dry Flood Proofing

Dry Flood Proofing is the act of making a building or structure watertight below the flood protection elevation (FPE). With this property protection measure floodwaters are not allowed to enter the structure. This technique requires the sealing of walls with waterproof sealants and materials or extra layers of concrete and bricks. Openings such as windows, doors and vents are closed and/or covered with removable shields. In addition, sewer lines must be equipped with back flow (check) valves (See **Figure 5.3**). A back flow or check valve allows water to flow in one direction but closes when the flow reverses.

Figure 5.3
Dry Flood Proofing



Source: FEMA. Homeowner's Guide to Retrofitting

Dry Flood Proofing is usually not appropriate for protecting a building from floodwaters deeper than 3 feet. It is important to know the average duration of flooding in the area because seepage can begin to occur through the sealants after prolonged periods of exposure to floodwaters. For areas where floodwaters are known to carry debris, this technique should not be used. The different sealants and membranes can be punctured by the debris, resulting in flood waters entering the structure.

While the technique's goal is to keep flood waters out of the structure, the structure should not be occupied during a flood. Important community services such as power, water, garbage removal, etc. may be interrupted during and after a flood, making the structure isolated and unusable. Flood emergency response or preparedness plans may also be required for use of this method.

The cost for this method is dependent on several factors including the size of the structure, type of materials used, chosen flood protection elevation, and the number of pipes requiring check valves.

5.6 Wet Flood Proofing

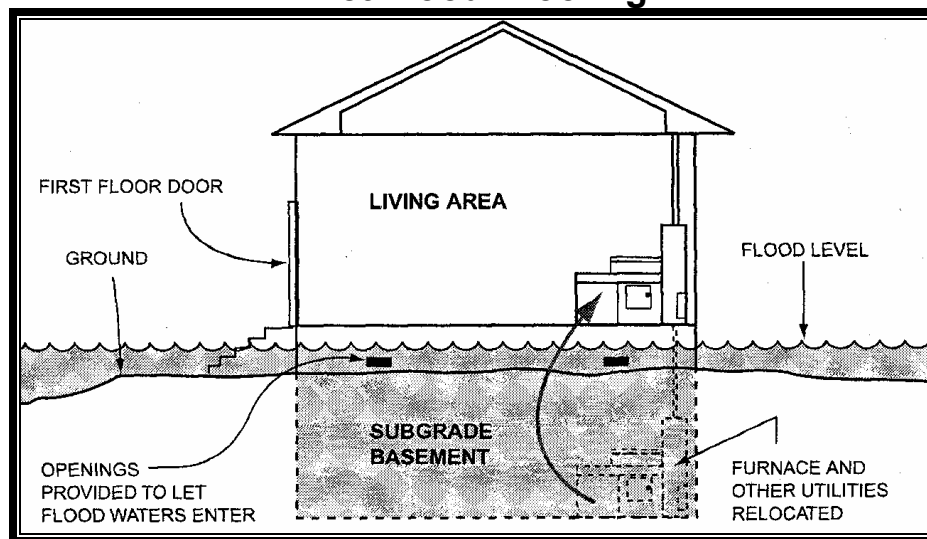
Modifying the uninhabited parts of a building / house such that floodwaters can enter but will not cause a major amount of damage to the building or their content is known as wet flood proofing. Why let flood waters enter the building? The answer is that it helps to equalize the pressure exerted on the structure's walls, reducing damage to the structure.

Personal belongings and other valuables in the uninhabited area will need to be relocated out of harm's way. The major drawback associated with this method is the fact that it will not work for one story homes.

Materials used below the Flood Proofing Elevation (FPE) must be resistant to flood damage. Service equipment, such as a furnace or hot water heater that is located below the FPE need to be protected (See **Figure 5.4**). To do this, the equipment can be elevated or protected with an interior flood wall. Infrastructure that supplies the building, i.e. utilities, will still be exposed during a flood.

This technique may be used to bring substantially damaged or substantially improved houses into compliance with the local floodplain management ordinance if the areas of the house below the Base Flood Elevation are only used for parking, storage and/or building access.

Figure 5.4
Wet Flood Proofing



Source: FEMA. Homeowner's Guide to Retrofitting

It should be noted that as with the case of dry flood proofing, when flooding does occur, the building may not be able to be occupied. Extensive cleanup efforts may be required following a flood.

In comparison to the other methods discussed, this method is often the least expensive. Costs range from \$1.70/sf - \$10.00/sf for 2 – 10 feet of wet flood proofing of a basement. For wet flood proofing a crawl space, the costs range from \$1.30/sf - \$3.25/sf for 2 – 4 feet of flood proofing.

5.7 Sewer Back-up Protection

During a flood, cross connections between sanitary sewer pipes and storm sewer pipes can lead to an overload of the sanitary system. These connections should be disconnected. Examples of these types of connections are downspouts, footing drain tile, and sump pumps.

When the sanitary sewer system becomes overloaded by flooding, water can flow backward through the lines and out through such places such as toilets, tubs and drains. There are 4 approaches to protecting against sewer backup. The first two approaches, Floor Drain Plugs and Floor Drain Stand Pipes, keep water flowing from the lowest point in the building, usually a floor drain. They are generally inexpensive and cost less than \$25 each. The last 2 approaches, Overhead Sewers and Backflow Protection Valves, offer more security at a significantly higher price; in the range of \$3,000-4,000.

Backflow valves come in three types: check valves, gate valves and dual backflow valves. Check valves have automatic operation that allows waste water to flow from the house to the main sewer line. A flap or other mechanism in the valve prevents water from flowing back in the reverse direction. Gate valves require manual operation. They provide a much better seal, but are more expensive. A dual backflow valve combines the benefits of the check and gate valves. Gate and Dual Backflow valves are generally installed outside of the house.

5.8 Insurance

Flood insurance is a way to protect against the damages caused by floods. It does not prevent the damage from occurring, but allows for the recovery from the damage with some level of comfort.

Most homeowner insurance policies do not cover flood events. Separate coverage under the National Flood Insurance Program is usually required. Flood insurance can only be provided / written for structures in communities participating in the NFIP. Under the NFIP there is both building and contents coverage. **Table 5.2** lists the general items covered under both types of policies.

Table 5.2
NFIP Policy Coverage

BUILDING COVERAGE <ul style="list-style-type: none">• Built-in appliances like dishwashers, stoves, etc.• Service equipment, i.e. hot water heaters, central a/h• Permanently installed cabinets, shelves• Permanently installed carpeting over unfinished floors
CONTENTS COVERAGE <ul style="list-style-type: none">• Portable appliances• Washers & Dryers• Window A/C units or Portable units• Carpet (not permanently installed or installed over finished floors)• Grills

Coverage can also be applied to a detached garage, while 10% of the primary structure's insurance value can be used for the garage, but it reduces the amount of coverage by the same amount for the main structure. Flood insurance does not cover loss of access to the insured property, loss of use of the property or loss from interruption of business or production at the property.

There is an additional policy coverage that is included in all flood policies. It is called "Increased Cost of Compliance" (ICC) Coverage. This policy comes into play when the damage to a property is severe enough that the property owner will incur additional costs in order to bring the structure into compliance with all regulations and codes. ICC funds up to \$30,000 are applied to the additional incurred costs of bringing the structure into compliance.

A 30-day waiting period follows the purchase of a new policy before it goes into effect. The waiting period discourages the purchasing of insurance directly before a hazard event and encourages continual coverage by the property owner.

As a community participating in the CRS Program, with a CRS Class 7 rating, residents of the City of Birmingham that purchase flood insurance receive a 15% discount on premiums.

5.9 City's Role

Property protection ultimately is the responsibility of individual property owners. The City can, and should, take an active role in property protection because it helps to reduce flood losses.

A large part of the City's role is in providing Public Information. As described later in Chapter 9, dissemination of information on various protection measures is done in coordination with the overall public information program. Workshops, publications, and

public service announcements are all ways to spread the word and publicize the available protection measures and their benefits.

In addition to providing information to the public, the City can assist in providing various forms of financial assistance for property protection. Retrofitting projects can be paid for by communities, just like communities pay for flood control projects. There is a range of financial assistance that the City can provide, including helping citizens locate sources of funding for their projects, securing Federal grants to fund such efforts, to providing full funding for projects. Other less expensive programs that a community can undertake to help fund protective measures include: low interest loans, forgivable low interest loans and rebates. A forgivable loan is a loan that does not need to be repaid if the owner does not sell the house for a specified period of time. These other measures usually do not fully fund projects, but are used to defray the costs of the measures. As noted above, funding sources outside the community can also be used. Some examples include, but are not limited to:

- NFIP Flood Insurance Claims
- The Increased Cost of Compliance (ICC) of the NFIP. Payment is increased to the property owner in order to cover flood protection measures that are required as a condition of rebuilding and bringing the structure into compliance.
- FEMA Disaster Assistance – for public property / buildings
- FEMA Hazard Mitigation Grant Program (HMGP)
- FEMA Flood Mitigation Assistance (FMA) Program
- FEMA Pre Disaster Mitigation Grant Program
- Small Business Administration Disaster Loans
- Community Development Block Grants (CDBGs)

5.10 Conclusions

1. Several successful ways have been identified to protect an individual's property from the effects of flooding. There are advantages and disadvantages to each as well as scenarios where each method would be more successful.
2. Implementation of many of these measures may cost very little to the property owners and yet results in significant benefits. However, some measures do have significantly higher costs. It is important to accurately assess what measure would work the best for each property due to the large cost differential between some measures.
3. The City can and has promoted the different property protection measures and has supported the citizens of Birmingham in the implementation of property protection measures.

5.11 Recommendations

1. Property owners should be more aware of the available protection measures that can help to reduce flood losses. In order to promote and support this awareness of available protection measures, the City can enhance the following programs.
 - a. Public Information Program (as discussed in more detail Chapter 9) including:
 - i. Community workshops and flood audits for individual properties targeted for property protection measures.
 - b. The identification of outside funding sources and support through the funding process. (Discussed in **Section 10.9**, Potential Funding Sources.)
2. For buyout and relocation programs the City should institute a program level planning process designed to minimize the loss of population and tax base and maximize the benefit of the acquired property to the general public. Basic steps may include:
 - a. Identify locations / structures for buyout and relocation.
 - b. Identify comparable housing alternatives within the City.
 - c. Identify incentive programs to relocate within the City and develop a relocation plan.
 - d. Develop alternative land use plans for acquired property such as conservation, recreation, parklands, etc.; consistent with FEMA guidelines.

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6.0 EMERGENCY SERVICES

Emergency services protect and assist people during and after a flood. The four main areas of emergency services include:

- Flood Detection
- Flood Warning
- Flood Response
- Critical Facilities Protection

Jefferson County Emergency Management Agency (EMA) coordinates these efforts for the City of Birmingham. In times of emergency, Jefferson County and the City of Birmingham operate under the Jefferson County Comprehensive Emergency Management Plan, 2002.

6.1 Flood Detection

It is critical, for response efforts, to have knowledge of an impending flood. Detection of flooding is the first step in flood response. Threat detection / flood warning is a responsibility shared between the City of Birmingham, Jefferson County and the National Weather Service (NWS). NWS is part of the National Oceanographic and Atmospheric Administration (NOAA). The NWS oversees flood predictions on the large rivers in the region.

The NWS operates two river gages in and/or near the City of Birmingham. They are the Cahaba River gage, near Cahaba Heights and the Village Creek gage at Avenue W in Ensley. Two levels of public notification are used by the NWS to disseminate warnings regarding flood conditions. A Flood Watch indicates that conditions are right for flooding, while a Flood Warning indicates that a flood has started or is imminent. The NWS can also issue more specific warnings relevant to flash flooding that follow the same pattern laid out under the flood watch / warning system. A flash flood watch indicates that ponding and small stream flooding will likely occur with the forecasted amount of rain, while a flash flood warning indicates that this localized form of flooding is currently happening. The latter is rarely issued because of the rapid onslaught associated with flash flooding. The NWS broadcasts watches, warnings, forecasts and other information via the NOAA Weather Radio (NWR), 24 hours a day.

Jefferson County, in association with the City of Birmingham, administers the predictions on other primary rivers / creeks within the City. The system currently utilized by Jefferson County is the ALERT system. The ALERT System includes a series of river gages (water level elevation), rain gages and weather stations along major drainage basins within the City and county. This real time information on water levels in rivers / creeks, amount of rainfall and current weather conditions is transmitted back to the Jefferson County Emergency Operations Center (EOC). This real time data is used

to predict potential hazardous situations relevant to flooding. Currently for Village Creek, this real time information is fed into a predictive hydrologic and hydraulic model to predict flood levels and areas to be impacted. At the time of this report, only Village Creek was fully equipped with a predictive model. However, four of the other major drainage basins within the City were instrumented with gages and development of predictive models in those basins is under consideration.

6.2 Flood Warning

Once a flood threat or emergency has been detected and relayed to the emergency management coordinator, the next step is notification of the public. Staffs of critical facilities also need to be notified of an impending threat. The earlier the warning is disseminated, and the more specific the information the warning contains, the better people can react and implement the necessary protection measures.

There are numerous ways that flood warnings can be broadcast. Some ways include:

- Warning Sirens (outdoor)
- Commercial and/or public radio stations
- Commercial and/or public television stations
- Cable TV emergency inserts
- NOAA Weather Radio
- Siren equipped and/or public address vehicles
- Telephone trees
- Door to door contact

Redundant warning systems have been found to be the most effective. Outdoor sirens, generally speaking, have the largest range in reaching people. One disadvantage to outdoor sirens is that they just alert to the fact that there is a hazard, but do not explain what the hazard is. Television and Radio warning announcements allow for the opportunity to provide citizens with a lot of information regarding the potential or impending hazard. The disadvantage to this method is that the television or radio has to be turned on for people to receive the warning.

Existing Alert / Warning / Notification Systems in Birmingham are administered by the Jefferson County EMA. Two concerns play a role in notifying the citizens of Birmingham. The first is that warnings should be issued only when necessary. Otherwise, people may begin to disregard them if they feel that they are issued when hazards are not imminent. This has become known as the "Cry-Wolf Effect". The second concern is making sure that citizens know what the warnings mean. The following are the warning systems employed by Jefferson County EMA and utilized in the City of Birmingham.

- National Weather Service (NWS) – Radio broadcasts are received via the NOAA Weather Radio. It broadcasts from Birmingham.

- Sirens – Sirens are located strategically throughout Jefferson County and Birmingham. When activated, it warns of a hazard, but does not indicate what type of hazard the notification is for.
- School Warning System – A warning system has been established between the Jefferson County Emergency Operations Center and all schools in the City of Birmingham.
- Flood Warning System – A network of rain and river gages has been established by the NWS, and Jefferson County EMA at select sites throughout the City of Birmingham in order to collect data relevant to flood warning.

The Jefferson County EOC issues flood watches and flood warnings for Birmingham through TV and radio broadcasts. Since the EOC maintains 24-hour, direct contact with the NWS, it can provide the latest flood threat information. If needed, the Center also can override the local cable broadcasts to provide flood threat information; send siren-equipped vehicles to critical facilities, such as hospitals, nursing homes, schools and other public places; and send mobile address units and personnel for door-to-door warning evacuation.

6.3 Flood Response

Proper response to flood situations leads to the protection of life and property. At the same time that the NWS is detecting and issuing flood warnings, the community is taking responsive actions. Actions that are typical for flood response include (with responsible party):

- Activation of the Emergency Operations Center (Jefferson County EMA);
- The closing of streets, bridges, or underpasses (Birmingham Police / Fire);
- Shutting off power to threatened areas (Utility Company);
- Evacuation Order (Mayor of Birmingham);
- Keeping children at school or releasing them (School District in association with Jefferson County EMA);
- Opening and operation of evacuation shelters (American Red Cross);
- Security & Protection Measures (Police);
- Repair and clean out of drainage system (Department of Public Works); and
- Monitoring of water levels (Planning, Engineering, and Permits & EMA).

Developed in coordination with agencies and offices identified in the Jefferson County Comprehensive Emergency Management Plan (CEMP), a Flood Response or Emergency Action Plan details what response activities are necessary and appropriate for an expected flood event. The CEMP contains the various responsibilities of the coordinating agencies and departments. Specific standard operating procedures are also detailed.

The flood response system is tested by either actual emergencies or EMA scheduled drills / exercises. These “tests” evaluate the City’s capabilities for handling most

emergency situations, provide participants an opportunity to fully understand their duties in action and allow for continual improvement of the system. Emergency Operation Procedures for the City of Birmingham are outlined in the Jefferson County Emergency Management Agency's 1997 Comprehensive Emergency Management Plan (CEMP) and CEMP Field Operating Guide.

Flood response can be greatly improved with predictive models on all the rivers and streams, similar to the ALERT System in place on Village Creek. EMA Staff would be able to notify those in a potentially affected area when the crest would occur and residents could respond appropriately, in a timely manner. Birmingham and Jefferson County are continuing to work towards expanding the ALERT System to enhance capabilities on the other major rivers and streams in the area.

6.4 Critical Facilities Protection

The responsibility for the protection of critical facilities falls to the individual owner, whether it is a state or private facility. Planning appropriately for the protection of critical facilities can benefit the community as a whole. If a critical facility is adversely impacted by a flood, for example a local school is flooded that is used as a shelter in times of emergency, that affects the community.

As part of ongoing planning efforts associated with the Disaster Mitigation Act of 2000, the State of Alabama and Jefferson County are developing Hazard Mitigation Plans. These plans identify critical facilities and include mitigation planning relevant to the facilities. However, under the Community Rating System (CRS), credit is geared more towards participating communities providing assistance to individual facilities in developing hazard specific emergency plans.

6.5 Conclusions

1. Currently, the ALERT System, is in place and fully operational with predictive modeling and mapping capabilities on Village Creek.
2. While monitoring equipment is present on other rivers and streams in the Birmingham area, there are no predictive models in place to allow for more accurate prediction of threat detection, crest and timing predictions.
3. The Jefferson County Comprehensive Emergency Management Plan (CEMP) and CEMP Field Operating Guide outline operating procedures in the case of a hazard threat, including flooding.
4. Currently Jefferson County EMA issues flood watches and warnings through TV and Radio broadcasts. EMA can also override local cable broadcasts to provide flood threat information, send siren-equipped vehicles to critical facilities and send mobile address units and personnel for door to door warning evaluation.

5. Hazard Mitigation Planning is currently ongoing throughout the State and the County, including planning for Critical Facilities. This information can be tied into flood response planning.
6. The CEMP has information pertaining to Recovery efforts following an event, including overviews of the local, State and Federal response; Federal disaster assistance; Human Services, i.e. Individual Assistance; Infrastructure or Public Assistance; the National Flood Insurance Program; and the Hazard Mitigation Program. See **Section 12** Post Disaster Recovery Action Plan for more information.

6.6 Recommendations

1. Full integration and automation of the ALERT System to develop predictive models on all major rivers and streams in the Birmingham area should be undertaken.
2. Add stream gages and weather stations where necessary, at strategic locations to enhance the effectiveness of the ALERT System. Consideration of adding video cameras to selected gage sites should be given for verification.
3. Predictive and real time flood information / data should be linked to the Geographic Information System (GIS) in order to create real-time maps of flooded areas in high hazard locations.
4. Evaluate and develop improved methods and define process and protocols for real time information dissemination to the public consistent with development of the ALERT System.
5. Identify and prioritize critical facilities located in flood hazard areas with highest risks. Initiate process and aid in the development of hazard specific emergency plans for prioritized critical facilities. Also develop a model hazard specific emergency plan for critical facilities.

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7.0 STRUCTURAL PROJECTS

Traditional uses of structural projects include keeping floodwaters at bay, regulating the flow of flood waters and regulating the water surface elevation of water bodies. Structural projects are often recognized as solutions to resolve all flooding problems, but there are shortcomings. They are designed and built to protect up to a specific storm event. If a larger storm occurs, the project could be overwhelmed and flood damage result. Structural projects are often expensive. Due to this, costs for these types of projects are often shared with Federal Agencies like the United States Army Corps of Engineers (USACE), Natural Resources Conservation Service (NRCS) and the Federal Emergency Management Agency (FEMA). Examples of structural projects include:

1. Reservoirs;
2. Levees & Floodwalls;
3. Channel modifications;
4. Dredging; and
5. Drainage System Improvements and Maintenance

Construction of these projects can also destroy natural habitats through the disruption of land and/or natural flow patterns. To be truly effective and provide protection up to their designed level, structural projects require the performance of regular maintenance.

7.1 Reservoirs

Reservoirs often work in conjunction with a dam. Water is stored behind the dam or in a storage basin. Over a period of time or following a rain event, the water is gradually released so that downstream can handle the regulated flow. The reservoir itself can be



used for recreational purposes. For instance, according to the USACE, “the Addicks and Barkers reservoirs in western Houston, Texas, are flood water detention reservoirs protecting urban Houston. Operated by Galveston District, U.S. Army Corps of Engineers, the reservoirs are often dry and their flood retention areas house parks and recreation facilities.” (See **Figure** at left).

Source: www.swg.usace.army.mil/items/whatwedo/11.asp

An appropriate use for a reservoir is protecting existing development downstream of the reservoir. Generally, they can be built at a reasonable distance from the area to be protected. The protected areas are typically not disturbed since improvements are not built in close proximity to the protected areas.

The most efficient use of a reservoir generally occurs on small streams and rivers that have less water to store, or in a valley where there is a greater capacity for storage. Reservoirs can be built on large rivers and in flat areas, but it is often an expensive process due to the large amount of property that has to be purchased in order to secure enough storage capacity. The implementation of a reservoir is not the most cost effective measure in the latter two circumstances.

With reservoirs and dams, there is always the risk of a dam failure and extreme flooding downstream. There are ways of limiting dam failure and one includes not using a dam. Some geographical locations have abandoned quarries that are suitable for use as a reservoir. Since a quarry is a large, dug out area, it is self-containing and does not require a dam. Parks, recreational areas, and open space areas can serve double duty as retention and detention basins. Currently, the City of Birmingham is considering the latter option for the area near the Airport. It would involve utilizing an existing golf course, with possible modifications, as a retention basin.

7.2 Levees

A structural barrier constructed from soil that is used to keep floodwaters out is called a levee. For FEMA to recognize a levee as providing protection from the base flood it must meet minimum design, operation and maintenance standards as outlined in the National Flood Insurance Program (NFIP).

Design criteria for levee systems can include, but is not limited to freeboard requirements, requirements for closure devices, embankment protection, minimum embankment and foundation stability, minimum / maximum settlement amounts and interior drainage accommodations. Operations and maintenance plans are required. An operations plan may include the following, but is not limited to procedures regarding closures, interior drainage systems, and emergency measures. Maintenance plans should outline a time frame and efforts required to maintain the integrity of the levee.

Land requirements for the construction of a levee are relatively substantial. Slopes are generally 3:1. What that means is, for every 3 feet the levee slope travels horizontally, it can climb 1 foot. When there is not enough room for a levee, a concrete or steel floodwall can be constructed. Costs of levees can be high, but floodwalls are generally more expensive.

Maintenance is critical to the life of a levee. If a levee fails, serious damage to the protected area occurs. All the water that the retaining system was holding back can flow openly and flood an area.

There are a few shortcomings associated with levees and floodwalls. They may not be constructed in the regulatory floodway. Compensation should be made for any loss of flood storage due to the construction of a levee or floodwall. Both serve as a barrier to the flow of traffic and access must be provided through or over the levee or floodwall. In addition, views can be obstructed due to the height of the structures. Finally, if the barrier contains doors and/or gates, as part of the maintenance program periodic drills should be performed to ensure that the barrier system is fully functional prior to a flood.

7.3 Channel Modifications

There are 3 common types of structural projects that use modifications to channels to control flood waters. The first of these structural projects includes channel improvements, whereby a channel is made wider, deeper, smoother, and/or straighter. Some channels can be concrete lined. This is called slope paving. Slope paving reduces the friction factor between the water and the channel, ultimately allowing the water to move faster. Increased flow rates resulting from the modifications can increase the erosion of channel banks.

The second category of channel modifications is Bridge and Culvert improvements. This includes the replacement, enlargement, or removal of existing bridge decks and culverts at road and railroad crossings of streams. There are 3 scenarios under which this would be beneficial. The first being that the original opening was too small to carry the flood waters and it needed to be made larger. In the second scenario, the existing structure is no longer adequate due to increased flows resulting from new developments upstream. Lastly, openings can be blocked by debris. These modification methods can have an effect on lowering the flood heights in the vicinity of the bridges, but the downside is that the flooding problem can be shifted downstream.

The third and final type of structural project employed for channel modifications is diversion projects. In a diversion project a new channel diverts, i.e. sends, floodwaters to a new or different location. The result is less flooding on the original waterway where the water was diverted from.

7.4 Dredging

Dredging involves the removal of sediment from a channel bottom in order to deepen it. While it may appear that dredging to deepen a stream or channel will allow for an increased capacity for flood waters, there are shortcomings to this approach.

Dredging on most rivers, channels and streams removes one to two feet of sediment from the bottom at a time. The additional capacity that the extra 1-2 feet provides is usually not sufficient to handle the increased flows during flood events. As waters continue to flow in the newly dredged waterways, sediment is redeposited, gradually

losing the additional drainage capacity that was earlier achieved. Dredging also disturbs the natural habitat that has formed over years of non-disturbance.

Best Management Practices (BMPs) can be put into place while dredging is occurring. BMPs minimize the impacts that dredging has on water quality. Silt Curtains, Gunderbooms and Operation Controls are all examples of BMPs that can be employed.

A permit from the United States Army Corps of Engineers is required by Federal law prior to commencement of any dredging operations. The permitting process can be lengthy and requires advanced planning and environmental protection safeguards.

Overall, dredging is best suited for and usually undertaken on large rivers in order to maintain navigational channels.

7.5 Drainage System Maintenance

Drainage System Maintenance is the routine repairs and upgrades to the open and closed storm sewer systems and natural drainage way system in an effort to keep the overall system running efficiently. Proper maintenance can also help to improve water quality. The cost of a maintenance program is typically included as part of the annual public works budget for a municipality as it is in Birmingham.

Maintenance activities fall into two categories based on what part of the overall drainage system is being worked on; the closed storm sewer system or the open drainage system and natural drainage system. Maintenance work on open channels and detention basins should not affect the shape of either the channel or the detention basin. Trash, debris and overgrowth that are obstructing the channel and reducing the hydraulic performance are typically removed. Access is also critical to proper maintenance of streams and channels. One noted problem within the City of Birmingham is that numerous open drainage channels do not have access easements / servitudes for maintenance purposes.

Since portions of the City's storm water drainage system falls on both public and private lands, the division of responsibility for the care of the system is also divided. The drainage system is inspected on a regular basis throughout the year and maintenance is performed as needed. The Department of Public Works is responsible for the removal of silt, large obstructions, trash and other debris from publicly owned waterways and storm sewer systems. Records are kept of both the inspection process and maintenance efforts performed throughout the year. The City of Birmingham also enforces a dumping regulation that prohibits the dumping of materials into the drainage system. Finally, property owners are responsible for maintaining drainage swales as well as detention and other drainage related improvements located on their private property.

7.6 Conclusions

1. Historically, structural projects have been used in the development of the City of Birmingham to drain urbanized areas and control or reduce the frequency and extent of flooding.
2. Natural streams have been altered through channel modification procedures, and underground storm sewer systems have been implemented. However, these improvements sometimes become inadequate due to increased development over time or maintenance needs.
3. Structural projects typically are funding intensive.
4. Structural projects can sometimes be very effective methods for flood reduction, however sometimes they can have detrimental downstream or environmental effects.
5. There are access issues that impact that City's ability to maintain drainage infrastructure.
6. Significant resources (personnel and equipment) are required to effectively maintain the City's drainage related infrastructure.

7.7 Recommendations

1. The City does have an ongoing Capital Improvement Program (CIP) including approximately \$12 million of drainage related projects. Most are moderate to small scale projects related to improving the storm sewer system or implementing closed storm sewer systems where open channels exist. While a near term Capital Improvement Program is well defined, a mid to long term Capital Improvement Program of significant structural flood reduction projects has not been identified. In order to effectively identify significant structural improvements which will provide substantial flood reduction benefits, calibrated hydrologic and hydraulic (H&H) models of existing and future conditions for the affected drainage basins must be developed. While FEMA H&H models exist for most major creeks within Birmingham, model improvements relevant to calibration and to topographic data will be required to have effective models for evaluation of flood reduction alternatives. Once calibrated models are developed, alternative strategies and solutions can be evaluated considering existing and future conditions, as well as downstream impacts. Environmental and ecological impacts should also be evaluated. Major flood prone areas, as identified in the "Flooding Hotspot" GIS database should be evaluated using the models to identify and prioritize cost effective flood reduction alternatives. These projects can then be evaluated for funding options, and once a

reasonable funding source is identified, programmed into the Capital Improvement Program.

Currently, the only drainage basin in which a feasibility study is being conducted to evaluate structural flood reduction alternatives is Village Creek. The study is not complete.

2. Structural flood reduction alternatives to be evaluated may include preliminary regional detention / retention storage opportunities. These type projects can be multi-purpose, providing flood reduction and flood storage capabilities, recreational opportunities, water quality enhancement and a water source during drought conditions.
3. Major open drainage channels servicing the City should be inventoried in the City GIS database. Those considered significant and important to the overall drainage system should be evaluated as to whether or not they have dedicated public maintenance access. Those with no public servitude or access should be identified, and the City should then institute a long term plan to acquire servitude for maintenance purposes.
4. Maintenance of the City's drainage system is important to maximize the efficiency of the existing drainage system (including debris & trash removal, vegetation control, excavation of open channels and the maintenance of the storm sewer system). City resources, personnel and equipment, allocated to this effort should be evaluated to determine the capability to effectively maintain the system at an efficient level. This is discussed in more detail in **Section 11**.
5. Education of the public on the ways to report flooding problems and drainage system maintenance needs to the City should be undertaken. There are several methods including the new 311 system to register complaints and/or problems with the City. The City does have a process to track and respond to such citizen issues with time constraints, however, numerous citizens were not aware of this process based on Stakeholder meeting comments. A brochure defining the methods, process, protocols and response times should be developed for distribution through the City's Public Information Program.

8.0 NATURAL RESOURCE PROTECTION

The goal and/or purpose of natural resource protection is the preservation and/or restoration of natural areas. Through the preservation and restoration of natural areas, beneficial functions of floodplains and watersheds can be recognized. Natural and beneficial functions of the floodplain include:

- The storage of floodwaters
- Absorption of flood energy
- The reduction of flood scour
- Infiltration that absorbs overland flood flow
- Groundwater recharge
- Preservation of habitat for flora and fauna
- The removal or filtering of excess nutrients, pollutants, and sediments from water
- Opportunity for recreational and aesthetic pursuits

There are 5 main areas of Natural Resource Protection that this Chapter discusses including:

1. Wetlands Protection
2. Erosion and Sediment Control
3. River Restoration
4. Best Management Practices (BMPs)
5. Dumping Regulations

8.1 Wetlands Protection

Wetlands store and release large amounts of (flood) waters. They are often found in floodplains and other depressed areas of the watershed. Since wetlands can accommodate and store flood waters, they also have the ability to aid in the reduction of downstream water velocity. Wetlands can also function as a natural filter, improving the local water quality while providing a habitat for numerous species of fish, plants and other wildlife.

Both the United States Army Corps of Engineers (USACE) as well as the Environmental Protection Agency (EPA) have regulatory control over wetlands. This regulatory power is borne out of the US Clean Water Act, Section 404, passed by Congress in 1972. The objective of the Clean Water Act is to “restore and maintain the chemical, physical, and biological integrity of the Nation’s waters.” When Congress passed the Clean Water Act in 1972, the Act defined “waters of the United States” as navigable waters. However, Congress’ intent was for the broadest possible meaning of “waters of the United States”, and for the definition to expand beyond traditional navigable waters. In 1977, the USACE revised and expanded its regulations for wetlands to be consistent

with the 1972 Congressional intent. The final regulations issued explicitly included “isolated wetlands and lakes, intermittent streams, prairie potholes, and other waters that are not part of a tributary system to interstate waters or to navigable waters of the United States, the degradation or destruction of which could affect interstate commerce”. Section 404 requires that when applying for a permit the applicant must show that they have 1) taken steps to avoid wetland impacts where practicable; 2) minimized the potential impacts to wetlands; and 3) provided compensation for any remaining, yet unavoidable impacts through activities to restore or create wetlands. In addition, the U.S. Fish and Wildlife Service, the National Marine Fisheries Service and various State resource agencies have an important advisory role in the program. A permit will be issued to a project whose application meets the desired goal of the agencies, to protect wetlands by limiting or preventing development that would adversely affect them.

If a permit is issued, compensatory mitigation is generally required to offset the adverse impacts of the proposed development to wetlands and other aquatic resources. There are various types of mitigation activities including wetland establishment, restoration, enhancement, and protection / maintenance or preservation. Potential drawbacks exist for various mitigation activities. For instance, if the mitigation action calls for the creation of wetlands at a new location, there will be a large time lag between when the original wetlands were impacted and when the newly created wetlands reach a quality status that is comparable to the original. Secondly, if the mitigation actions are proposed for a location outside of the existing watershed or drainage basin different from where the potential impacts are to occur, the flood protection benefits would not be the same as the original wetlands.

The State of Alabama also has regulatory control over wetlands. In addition to Federal and State regulations, the City of Birmingham has several regulations that indirectly pertain to wetlands that developers must comply with. Some of these regulations include:

- *Soil Erosion and Sediment Control Ordinance;*
- *Subdivision Regulations; and*
- *Engineering Design Guidelines for Subdivision and Commercial Developments*

8.2 Erosion and Sedimentation Control

The construction phase of a project typically leaves the area exposed to erosion and sediment control issues. The clearing stage of a construction project involves the removal of vegetation and trees present on the property. Removing these natural erosion stabilizing materials can have an adverse affect on local waterways. Normal surface runoff can erode the newly exposed soil at the construction site. The eroded soil is then carried with the surface runoff into the local streams and lakes.

CITY OF BIRMINGHAM

FLOOD MITIGATION / STORMWATER MANAGEMENT PLAN

Vegetation serves as a natural filter of surface runoff; filtering excess nutrients, pollutants and sediment. With the vegetation removed from the site, these materials are carried along with the runoff into the local waterways. Excess nutrients can alter the aquatic habitat for many species of animals and plants, resulting in adverse impacts. Pollutants carried into local waters also affect the riparian and aquatic habitats.

State and Federal agencies have regulatory authority over water quality through the Clean Water Act which authorizes the National Pollutant Discharge Elimination System (NPDES). The NPDES permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. The Stormwater Management Authority (SWMA) is the lead agency in charge of the NPDES permit program for the City of Birmingham and the surrounding communities.

Sedimentation is of concern for water bodies near construction sites. Excess sediment carried by surface water runoff can deposit in the bottoms of streams and channels, gradually filling them in and reducing the effective drainage area. Streams that become clogged require more maintenance and potential dredging to remove the sediment build up.

Due to the potential impacts associated with erosion and sediment control, communities have implemented Soil Erosion and Sediment Control ordinances. These ordinances introduce practices aimed at minimizing the negative effects described above. The City of Birmingham has a *Soil Erosion and Sediment Control Ordinance* currently in place “whereas, it is the purpose of this ordinance to protect and maintain the environment of the City and the short-term and long-term public health, safety and general welfare of the citizens of the City by controlling discharges and surface runoff of eroded soil, sediment and other pollutants, thereby, maintaining and improving the quality of the community waters into which the storm water outfalls flow, including, without limitation, the lakes, streams, ponds, wetlands, sinkholes and groundwater of the City, preserving and protecting the City’s investment in the safety and use of its roads, rights of way, storm sewer system and other public property, and preventing the creation of hazards and/or nuisances.” The City of Birmingham’s ordinance applies only to land disturbing activities, excluding agriculture; silviculture; minor land disturbing activities like home gardens; minor land disturbing activities such as individual connections for utility services; minor maintenance and repair; construction or repair of railroad tracks; and digging of water wells of environmental monitoring wells.

Topsoil erosion can be reduced through the slowing of surface water runoff draining to channels or ditches. The slowing of the runoff velocity allows for increased time along the ground surface and subsequently increases the opportunity for infiltration into the soil. Numerous methods exist for slowing surface water runoff, including sediment fences, hay or straw bales, terraces, constructed wetlands, and impoundments, i.e. sediment basins. Typically, erosion and sedimentation control regulations call for the inclusion of these methods into construction plans. In most cases the soil erosion and sediment control regulations are directed toward construction sites and activities.

The City of Birmingham's regulations require that a permit application identify Best Management Practices (BMPs) that "protect and preserve existing natural drainage channels; assure that waters draining from the development area are free of point and non-point source pollutants, including eroded soil and sediment, and do not cause water problems on adjacent properties to any greater extent than occurs in the absence of the development; and assures that waters are drained from the development in such a manner that will not cause erosion to any greater extent than would occur in the absence of development."

Birmingham's City Engineer provides administrative oversight and the enforcement of provisions laid out in the *Soil Erosion and Sediment Control Ordinance*. The City Engineer can request assistance from the Storm Water Management Agency, Inc. in the enforcement of this ordinance, including regulation, inspection, monitoring and testing for pollutant loading. SWMA shall be requested to act as the City Engineer's authorized agent for the enforcement of this ordinance as it applies to the City of Birmingham's municipal storm sewer system.

Incorporating stormwater management concepts addressing both water quality and quantity through BMP strategies during project development phases including planning and design can yield significant benefits. The following considerations should be taken into account during the project development and planning stage.

- Thorough understanding of the proposed development
- Subdividing the site into natural drainage areas
- Preservation of floodways and wetlands
- Determination of the location of environmentally sensitive areas and their minimization in those areas
- Planning the development to fit the site
- Confinement of construction activities to the least critical areas
- Clustering buildings in the most suitable areas for development
- Utilization of natural drainage system
- Minimizing disturbed areas
- Minimizing impervious areas
- Instituting natural buffers along drainage channels and waterways
- Determining the limits of land disturbance and phasing development
- Selection of the proper erosion and sediment control practices

Utilizing these and similar concepts in the master planning and site planning phase of development can yield substantial long term flood control and water quality benefits.

8.3 River Restoration

River restoration goes by many names including “riparian restoration”, “stream restoration”, “stream conservation” and “ecological restoration”. The latter term refers directly to the restoration of indigenous plants and animals to an area. An important aspect to the restoration of rivers and streams is the use of suitable, erosion resistant, indigenous plants along the banks.

At the heart of stream / river restoration is the concept of dynamic equilibrium. Dynamic equilibrium is the natural ranges of flow, sediment movement, temperature and other variables that stream systems normally function in. Restoration can include activities and methods that are designed to bring about changes in the stream corridor such that it will ultimately recover its dynamic equilibrium. Activities and methods can be passive or active in nature. Passive restoration is the concept of allowing streams to heal themselves.

The Federal Interagency Stream Restoration Working Group, in Stream Corridor Restoration – Principles, Processes, and Practices, list the functions associated with stream corridors that are directly related to dynamic equilibrium. The goal of restoration is to reestablish these functions and thereby recover dynamic equilibrium. Functions associated with stream corridors include:

- Habitat – the spatial aspect of the environment which allows species to live, reproduce, feed and move.
- Barrier – the stoppage of materials, energy, and organisms
- Conduit – the ability of the system to transport materials, energy, and organisms.
- Filter – the selective penetration of materials, energy, and organisms.
- Source – a setting where the output of materials, energy, and organisms exceeds the input.
- Sink – a setting where the input of water, energy, organisms and materials exceeds the output.

According to the NC Department of Environmental and Natural Resources Guidelines for Riparian Buffer Restoration, more than one factor will play a role in the success of a stream conservation or riparian restoration project. Factors to consider include the physical characteristics of the site, land costs, land ownership, and logistical constraints.

Placement of the right selection of vegetation can reduce long term maintenance costs when compared to concrete lined or sodded channel banks. The Natural Resource Conservation Service (NRCS) estimates that over a 10-year period the combined costs of installation and maintenance of natural landscape may be as low as 1/5 the cost of conventional landscape maintenance (i.e. mowing turf, etc).

Currently, there is an ongoing study of the benefits of the stream restoration process to Village Creek and Valley Creek in the City of Birmingham. This study is being conducted by the United States Army Corps of Engineers in cooperation with the City of Birmingham. As stated in **Section 5.2**, over 950 properties have been acquired in the Village Creek area. As flood prone structures were removed from the Special Flood Hazard Area or floodplain, many areas of Village Creek have now been returned to its natural state as a retention basin for flood waters. Data from this study suggests that there has also been a significant reduction in flood losses in the Village Creek floodplain.

8.4 Best Management Practices

Best Management Practices (BMPs) are defined by the City of Birmingham as “activities, prohibitions of practices, maintenance procedures and management practices designed to prevent or reduce the discharge or surface runoff of sediment or other pollution.” The types of pollutants that BMPs address are generally non-point source pollutants. Non-point source pollutants come from non-specific locations. Examples include fertilizers, pesticides, animal wastes, oils and salts from street surfaces and industrial areas and sediment from agricultural, construction and forestry activities. Generally these pollutants are carried into streams, ditches and storm sewer systems by means of surface flow.

A more basic definition is that BMPs are the planning steps and physical actions that you can do to protect the environment while you develop your property. When implemented correctly, BMPs can minimize adverse impacts of development on water resource functions and help control stormwater runoff quality and quantity (flooding). Although a primary purpose of BMPs is the protection of wetlands, BMPs also allow for continued (sustainable) development. In fact, they are designed to help the homeowner, developer and planner:

- Preserve the environment;
- Protect the area from flood damage;
- Protect the area from erosion; and
- Improve site aesthetics

In an effort to facilitate the clean up of the polluted rivers and lakes across the country, programs and laws requiring the use of BMPs have been established. The United States Environmental Protection Agency (EPA) oversees the National Pollutant Discharge Elimination System (NPDES). The permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. As part of the permit application and approval process, the program mandates the use of Best Management Practices for new developments and redevelopment. The Stormwater Management Authority administers this program for the City of Birmingham.

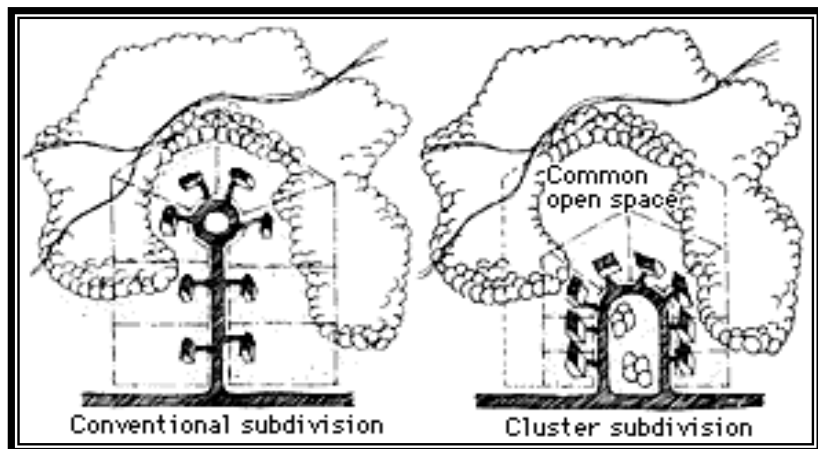
There are numerous types of BMPs. The following is a discussion of some of the various types of BMPs that are available for use.

Setbacks and Buffers

A setback is the area between intensive development and a protected area. Only limited activities are recommended for approval within a setback. A typical recommendation for a minimum setback is 75 feet along lakes, streams and wetlands. Inside a setback there can be a transitional area, closest to the water body or wetland. This transitional area is known as the buffer strip. The purpose of buffers are to minimize erosion, stabilize the stream bank or lakeshore, filter surface and subsurface runoff pollutants from adjacent development, screen manmade structures, preserve aesthetic values and provide access for maintenance. As mentioned in the previous section, River Restoration, buffers should be maintained or planted in native riparian vegetation. While wider buffers are encouraged, the recommended minimum buffer width, where feasible, is 25 feet.

Cluster Developments

With this practice, only those areas most suited to development are subject to grading and modifications to accommodate development. Typically lot sizes are reduced, while keeping the original number of lots the same. Sensitive areas are set aside, not modified and generally used as common areas. Additional benefits of this BMP include improved aesthetics, increased open space and reduced infrastructure in the development.



Conservation Easements

Conservation Easements limit the use of a piece of property, prohibiting certain types of development through incorporation of legal provisions into the property deed. These legal provisions stay with the property deed for a limited amount of time or in perpetuity, depending on how the easement was drafted. While allowing for continued private ownership of the land, conservation easements restrict land uses to current uses or to non-damaging activities, thereby excluding activities such as commercial development or residential subdivisions. Conservation easements are also known by the resource it is drafted to protect, i.e. agricultural, historic or open space easement.

An outside party, usually local governments, non-profit organizations or land trusts, are the parties that “hold” conservation easements. Responsibilities are given to the

easement holder such that they are required to monitor and enforce the terms and adherence to the conservation easement by current and future property owners.

Compensation can be made to landowners through reduced property taxes on the land involved in the easement. Tax implications vary by state, but there are usually federal and state tax advantages to the donor.

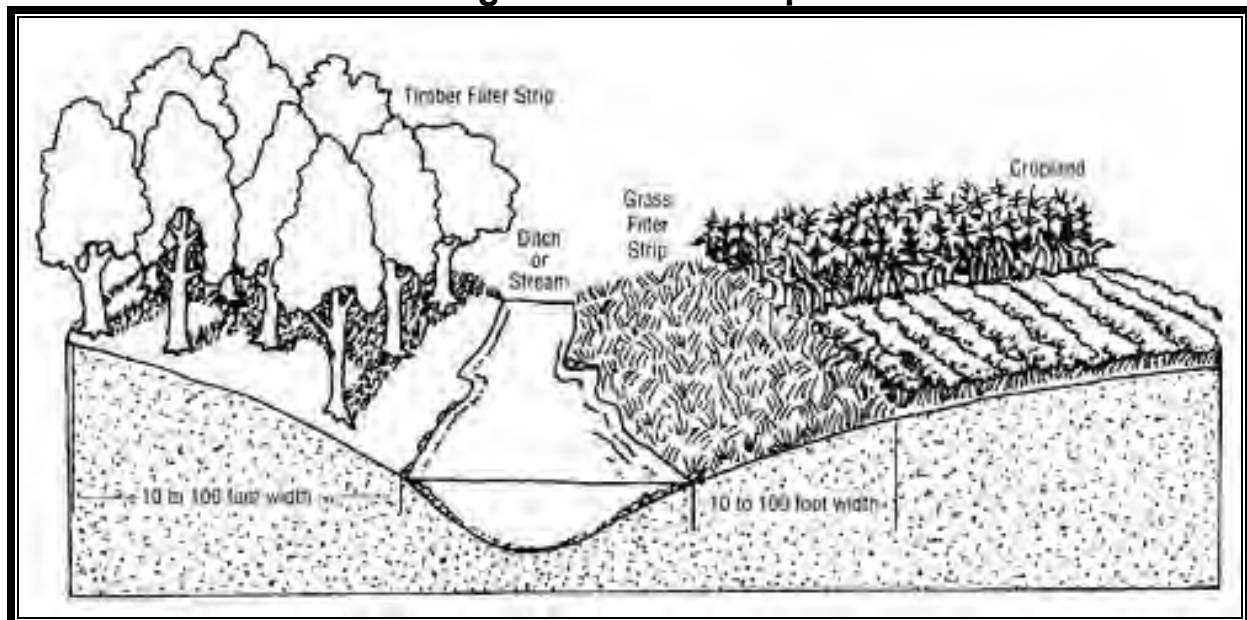
Construction Phasing

The main goal associated with the Best Management Practice of Construction Phasing is to minimize the time that the land is disturbed, thereby minimizing the potential for erosion and habitat disturbance. Construction phasing is critical for large developments that are being planned over a lengthy time period. The key concept associated with this BMP is to only disturb those portions of the site where development is imminent, then finalize and stabilize those areas as quickly as possible.

Vegetated Filter Strips

Vegetated Filter Strips are used to provide water quantity and quality protection (See **Figure 8.1**). The vegetation used in filter strips reduce the water's velocity, allowing it to infiltrate the ground; filter sediments from agricultural runoff prior to discharge into streams and drainage ways; and remove pollutants from water.

Figure 8.1
Vegetated Filter Strips



Source: *Fact Sheet Vegetative Filter Strips*, Ohio State University

Generally, filter strips are well suited for use in residential developments (including runoff from roofs), parking lots, and office developments. Filter strips can be used to reduce runoff from parking lots and other impervious areas. Performance is best when

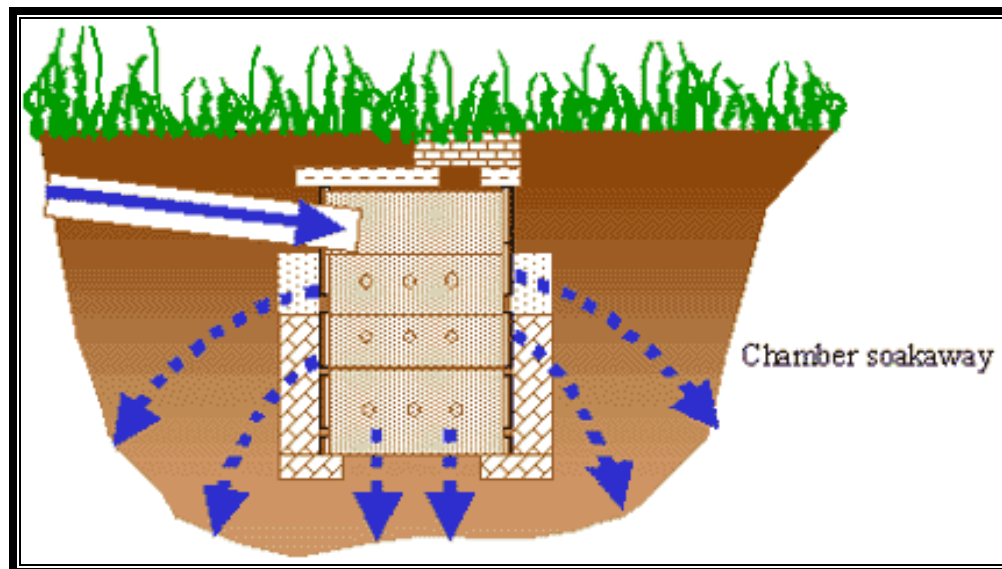
this BMP is used on gradual slopes less than 5% and when draining relatively small areas.

The selection process of vegetation for use in the filter strips should not be overlooked. Plants with strong root systems and dense top growth generally provide an all around strong selection choice. The strong root systems add stability to the system and aid in ground water infiltration. Plants with dense top growth provide a large surface area for runoff to travel through.

Infiltration Devices

Stormwater runoff from paved, grass and vegetative areas can be managed through the use of these devices. Surface runoff can be directed over land or through pipes directly to the infiltration device, where it is temporarily stored and slowly released. Examples include: infiltration basins, trenches, and dry wells. An example is shown in **Figure 8.2**. Infiltration trenches and basins can have a high rate of failure due to the clogging of the devices by sediment. For that reason, sediment traps may be used in combination with infiltration trenches or basins; located upstream of the device.

Figure 8.2
Infiltration Devices



Source: *International Source Book on Environmentally Sound Technologies for Wastewater and Stormwater Management*, United Nations Environment Programme, Division of Technology, Industry, and Economics.

Some general design issues should be considered when planning the use of an infiltration device. Soil conditions can have a large impact on the success of the system. Obviously, this BMP is not suited for non-permeable soils. In addition, areas with high water tables would not be suitable for an infiltration device due to the inability of limited ability for ground water infiltration.

Benefits of this type of device include reduced peak flows, reduced storm drainage costs, reduced down stream flooding, improved groundwater recharge and improved stormwater quality.

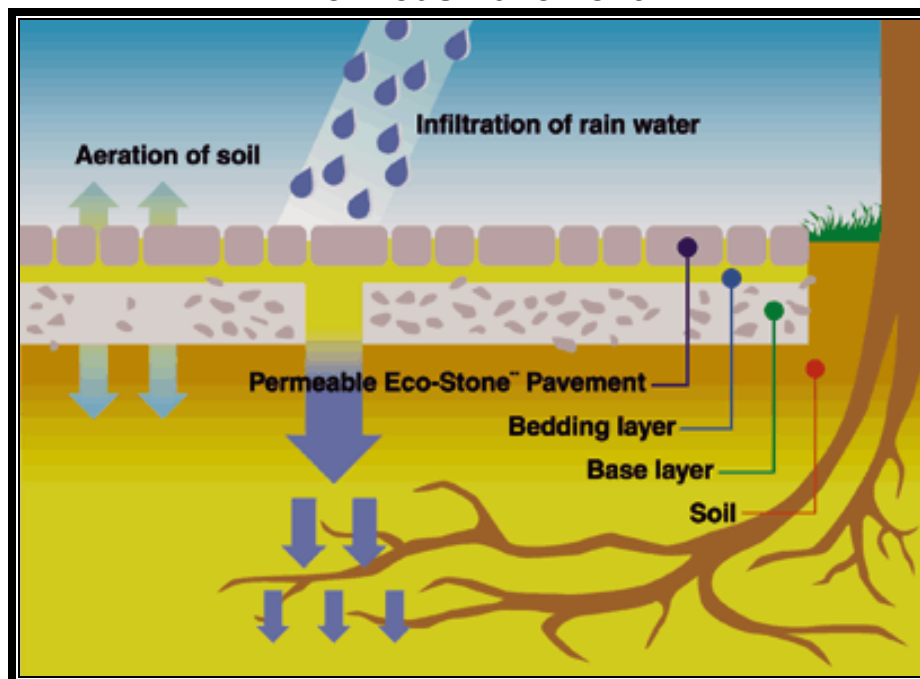
Pervious Pavement

Pervious pavement allows water to travel through the pavement material and infiltrate into the soil all the while allowing pedestrian and vehicular traffic to pass over it. Use of this material also aids in the reduction of stormwater runoff. Examples of such pavement types include gravel, crushed stone, open paving blocks, pervious paving blocks, and pervious concrete.



Pervious pavers and pavements in recent years have been the recipients of much research. The recent issues of the magazine entitled Stormwater included articles on both porous concrete and pervious pavers. **Figure 8.3**, from “Green Roads: Research into Permeable Pavers”, by William Jones, is a cross section diagram showing the infiltration of stormwater through permeable pavers and the subgrade.

Figure 8.3
Pervious Pavement



Source: “Green Roads: Research into Permeable Pavers”, Stormwater

Green Roofs

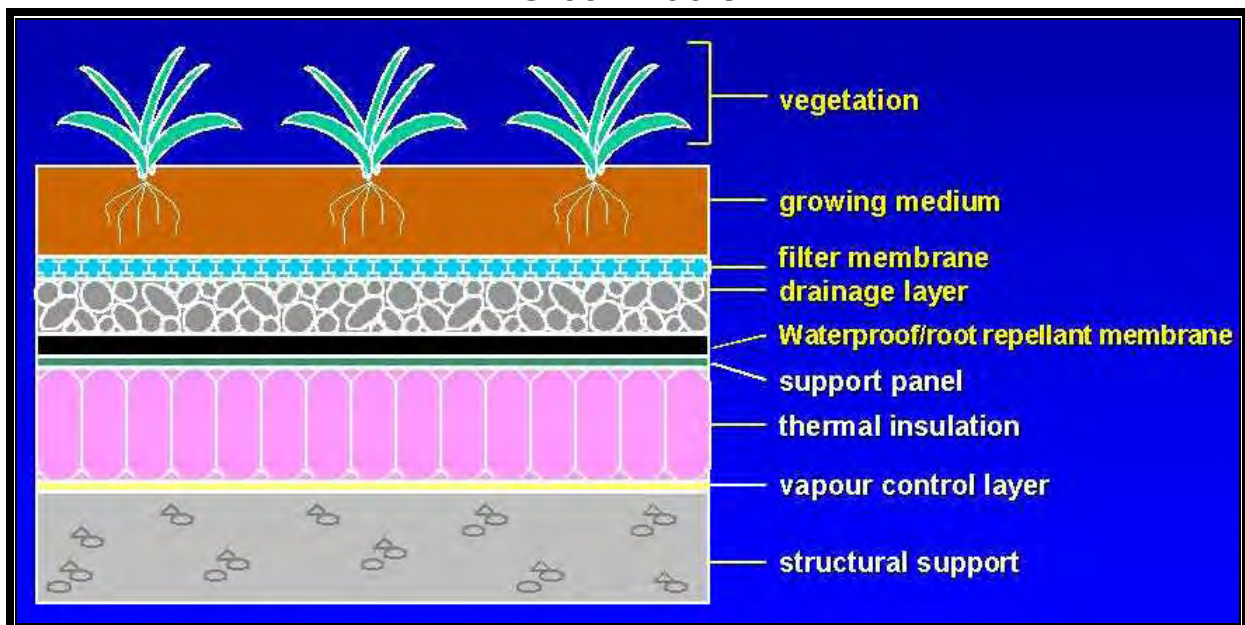
A Green Roof involves the creation of green space on top of a man-made structure; usually a building. The creation of this green space runs the gamut from thatching roofs with sod or integrating gardens into the top structure of tall buildings in urban environments. What sets the latter apart from just a garden on top of a building is that the vegetation is actually an extension of the roof system (See **Figure 8.4**)



Green Roofs reduce the amount of stormwater runoff, and aid in slowing down runoff from rooftops through the use of these vegetative materials as the top layer of the roof. This BMP is effective at reducing the amount of stormwater generated on a project site. It is also very effective at lowering overall energy costs.

Source: hortweb.cas.psu.edu/research/greenroofcenter/history.html

Figure 8.4
Green Roofs



Source: National Research Council, Institute for Research in Construction

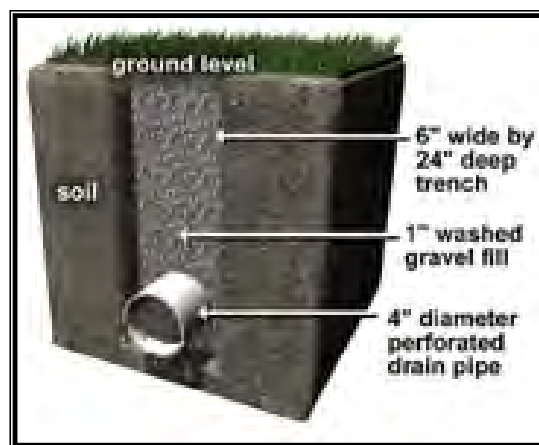
Wet / Wetland Detention Basins

With this BMP, storm water is directed into constructed ponds with a permanent pool of water. A detention basin is used for the short term holding of stormwater runoff. The basins are designed such that when the storm water runoff is released, the flow rates are comparable to predevelopment flow rates. The primary mechanism for pollutant removal is settlement. Wetland detention basins require routine maintenance for the periodic removal of accumulated sediment.

Level Spreaders / French Drains

Level spreaders / French drain systems are designed to spread out concentrated surface flows over a large area, facilitating the infiltration of the stormwater into the ground. A key concept with this BMP is the uniform dispersion of stormwater across an area. Runoff to level spreaders and French drains should be relatively free of sediment. If the runoff does contain a rather large amount of sediment, it should be treated with a sediment trap prior to reaching the level spreader and/or French drain.

Figure 8.5
French Drain



Source: French Drain can Divert Storm Water, Cincinnati Enquirer

Native Vegetation

Due to the deeper root system associated with native vegetation near and along water ways, infiltration of stormwater is allowed. The deeper root system is also one of the main reasons that native vegetation is used for stream restoration projects. The vegetation serves as a stabilizing tool for the area in question, reducing the effects of erosion as well as supporting other erosion control practices. By reducing the effects of erosion, maintenance and repair costs over the long term are decreased.

Treatment Train

The Treatment Train approach is the use of multiple BMPs in a series. A series of BMPs will provide greater protection to the aquatic resource than an individual BMP. As seen in earlier individual BMP discussions, there are shortcomings to individual methods, but treatment train systems can be designed, with those limitations in mind. For example, native vegetation can be planted along the path of a French Drain in an effort to reduce the amount of sediment that enters the drain. Also, natural vegetation can be used in vegetative filter strips to receive the maximum benefit of both.

8.5 Dumping Regulations

While the Clean Water Act, NPDES, and Water Quality Ordinances address liquid pollutants, they do not address solid objects. Dumping Regulations on the other hand focus entirely on solid materials such as appliances, shopping carts, automobiles, and yard waste that make their way into the local waterways. Unlike liquid pollutants, the solid materials may not directly pollute the waterways, but they do obstruct the flows, even during periods of low flow, and can contribute to flooding.

The problem associated with dumping is that many people do not realize the consequences of their actions. Dumping even what many people consider “natural” materials, such as grass clippings, tree branches and other landscape waste, can obstruct channels and kill the natural vegetation lining them.

The City of Birmingham does enforce a regulation that prohibits dumping in the drainage system. Section 11-3-23 of the Birmingham City Code prohibits “criminal littering” in any public or private waters or property.

8.6 Conclusions

1. The City’s flood mitigation efforts, as put forth through their flood mitigation program, can build on public interest in protection of wetlands as well as natural floodplain functions, while utilizing available natural resource protection programs as a means of supporting flood protection efforts.
2. In the past, wetlands areas were often filled and destroyed to accommodate development. Wetlands provide significant flood storage benefits, water quality benefits and habitat for flora and fauna. Wetlands are now tightly regulated through Section 404 of the Clean Water Act.
3. State and Federal agencies have regulatory control through the NPDES permit program which regulates point source discharges into waters of the United States. The SWMA handles the NPDES permitting process for the City of Birmingham.
4. The City of Birmingham has implemented a *Soil Erosion and Sediment Control Ordinance* to address non-point source discharges, erosion, sedimentation and negative water quality impacts associated with construction and land disturbing activities.
5. The newer practices of River Restoration and Best Management Practices (BMPs) show great potential and promise for affecting positive change in the way pollution and stormwater issues are treated by private landowners and developers. However, there is a lag between the development of these methods and the education of the public for appropriate use of the measures.

8.7 Recommendations

1. Work with the Black Warrior / Cahaba Rivers Land Trust and other participating entities to continue acquiring property and easements adjacent to the major creeks within the City of Birmingham, specifically Valley Creek, Five Mile Creek, Village Creek, and Shades Creek for natural resource protection, and conservation of floodplains and wetlands. These initiatives are directly related to the Greenways program. All Greenway plan development within the City of Birmingham should be reviewed and coordinated with the City Floodplain Administrator to maximize flood mitigation and stormwater management benefits.
2. Natural resource protection and associated stormwater management and BMP concepts should be instituted in the master planning, land planning, site planning, and platting stages of project development. Concepts such as buffer zones, open space preservation, cluster developments, minimization of impervious surfaces, preservation of floodways and wetlands / sensitive environmental areas are types of measures which should be considered in these early stages of project development. Instituting these type concepts at this phase will supply significant long term benefits for flood mitigation and water quality. These concepts should be integrated into the Subdivision Regulations and through Zoning Regulations.
3. A Stormwater Management / BMP handbook identifying best management practices for the various stages of project development could be developed. The handbook would address BMPs for:
 - a. Master Planning, Land Planning, and Site Planning Phases;
 - b. Design Phase;
 - c. Construction Phase; and
 - d. Long Term Operations / Maintenance.

Guidance documents such as *Subdivision Regulations, the Soil Erosion and Sediment Control Ordinance and Design Guidelines* could reference the Stormwater Management / BMP Handbook requiring design and construction professionals to consider such strategies.

4. Feasibility studies utilizing calibrated H&H (Hydrologic & Hydraulic) models to evaluate structural flood reduction projects should also include evaluation of ecological restoration benefits, as is the case with the USACE study for Village and Valley Creeks.

9.0 PUBLIC INFORMATION

Effective public outreach programs, providing information to the public at-large, usually involve both public and private agencies, groups and individuals. Public information activities afford property owners, businesses, renters, and local officials the opportunity to obtain information on local flood hazards and a variety of means available to protect both people and property. These informational activities can also serve as a motivational tool, spurring individuals to take flood protection steps on their own.

The City of Birmingham currently administers a Public Information Program providing:

- Copies of elevation certificates, upon request,
- Flood zone information from the latest FIRMs,
- Technical assistance to interested property owners,
- The community's requirement for flood zone delineation on all subdivision plat proposals as well as other proposed site plans,
- Documents relating to floodplain management (available at the public library),
- Outreach programs including annual mailings of a brochure to all properties within the community's Special Flood Hazard Area (SFHA),
- For the preservation of approximately 1285 acres in the special flood hazard area as open space,
- For the enforcement of regulations that require freeboard for new and substantial improvement, cumulative substantial improvement, and natural and beneficial functions,
- Maintenance and use of digitized maps in floodplain management,
- Enforcement of Soil Erosion and Sediment Control Ordinances, and
- The regular inspection and routine maintenance of the drainage system.

Under the Community Rating System (CRS) special credit is given to communities that develop a "public information program strategy". To receive credit for the Public Information Program Strategy, a document must be prepared and submitted covering six main topics. The six topics that a Public Information Program Strategy must cover are:

1. The local flood hazard.
2. Flood Safety and Property Protection measures for the identified hazard.
3. Current flood related information activities, including an inventory of ongoing and/or implemented projects.
4. The Community's public information program goals.
5. The proposed projects to be done each year to meet the program goals. At least one project must be implemented each year.
6. The monitoring and evaluation process for the public information program strategy.

Since this Flood Mitigation / Stormwater Management Plan addresses the six areas of interest throughout the plan, it could qualify as the City of Birmingham's Public Information Program Strategy for CRS credit.

9.1 Map Information

Flood maps can be educational tools. The provision of flood map information to a community is largely beneficial. It gives property owners the opportunity to educate themselves on the potential flood hazards that their property is susceptible to, and to take necessary preventative measures. Realtors and prospective homeowners can educate themselves as to whether a potential property is in a flood zone and/or requires flood insurance prior to entering into a sale.

A great deal of information can be obtained from flood maps pertaining to both historical and potential flood hazards. However, the information can be difficult to locate and those unfamiliar with the maps may encounter difficulty reading them. Communities, such as the City of Birmingham, that provide information from FEMA's Flood Insurance Rate Maps (FIRMs), provide a service to their citizens.

FIRMs are the official flood maps used by the City of Birmingham. Many of the FIRMs for the City were originally developed in the 1970's. There have been recent updates to the 100-Year Floodplain (BF E). However, substantial improvement could be realized with improved models and more accurate topographic data. FEMA is currently engaged in the national Flood Map Modernization Initiative. The State of Alabama, Department of Economic and Community Affairs, Office of Water Resources is working in coordination with FEMA to update the limits of the 100-year Floodplain / Base Flood Elevation within Jefferson County and the City of Birmingham as part of the Flood Map Modernization Program.

As stated in the Draft Flood Map Modernization Program (FMMP) Business Plan, "the goal of the FMMP is to update the flood maps and create a more accurate digital product that will improve floodplain management across the country." To support the Federal goal, Alabama created the Alabama Flood Map Modernization Program (AFMMP). Two of the program's objectives directly affect residents throughout the State, including Birmingham. The two objectives of concern are to 1.) "Establish and maintain a premier data collection and delivery system" and to 2.) "Expand and better inform the user community". In the coming weeks, months and years the OWR, through the AFMMP, will be working towards "populating the system with the most reliable data from existing and/or generated new flood risk data where necessary that meets FEMA and other standards; provide the data, technology platform and analytical tools that enable users to be better informed to analyze the data, and to decide and act appropriately resulting in reduced vulnerability to natural, accidental or man-made hazards;...make information available to users and stakeholders in a public domain environment where appropriate;... and implement innovative solutions for the presentation of data that are meaningful to its intended users."

Once the map modernization efforts are complete, the City will be able to provide its citizens more accurate information relative to their property and its location within the SFHA. Additional information such as zoning, locations of flooding outside of mapped areas and other known hazards can also be provided by communities to supplement the information available in the FIRMs and as available from the map modernization effort.

Such supplemental information can currently be obtained from the City of Birmingham's Department of Planning, Engineering and Permits. In addition to providing information to citizens about the location of their property relevant to the floodplain, the Department of Planning, Engineering, and Permits also provides information relevant to the depth and frequency of flooding. During citizen inquiries, City staff takes advantage of the opportunity to remind citizens that being outside a flood zone does not prevent them from potential flooding. In turn, the citizen inquiry process is used by staff members to offer information regarding flood insurance, property protection measures and mitigation measures available to property owners.

9.2 Library and Websites

The local library and the internet are bountiful repositories of information for residents searching for information regarding flooding, flood protection, and the protection of natural resources. Public libraries historically have been the main research tool when looking into a topic. However, with the advent of the internet in recent years, people are turning to websites more and more as their main tool in information gathering.

The City of Birmingham provides documents pertaining to floodplain management in the special Floodplain Library at the Birmingham Public Library. Documents are available for public viewing at the reference section of the library. The information can not be checked out of the library, but can be viewed and copied during business hours.

The official website for the City of Birmingham is www.informationbirmingham.com. Presently, under the Department of Planning, Engineering and Permits, on this site, information regarding design guidelines, permit applications, SBCCI Technical Code and Flood Protection can be obtained. The flood protection information provided is a pamphlet published by the City informing property owners of flood hazards in the city, flood insurance, safety tips and suggestions for possible actions that they can take to protect themselves and their property.

9.3 Outreach Projects

Outreach projects are a means of notifying the community and/or floodprone property owners about flood hazards and potential mitigation actions. They are designed to encourage people to seek out additional information and take steps to protect themselves and their property.

Communities developing outreach programs are taking a proactive approach through the development of programs that reach out to citizens and supply them with information, even when it isn't requested. Projects can be aimed at the entire community or targeted to specific audiences like insurance agents, realtors, and contractors, who can then implement their own outreach efforts. Topics that are often covered in outreach efforts include:

- Local Flood Hazard
- Flood Safety
- Flood Insurance
- Property Protection Measures
- Natural & Beneficial Functions of the Floodplain
- Map of local flood hazards
- The Flood Warning System
- Floodplain Development Permit Requirements
- Substantial Improvement / Substantial Damage (NFIP) Requirements
- Drainage System Maintenance

Various methods exist to disseminate information to the public. The most basic of which includes mailing and other means of mass distribution of printed materials. Additional measures include:

- Radio & TV news coverage and shows
- Newspaper articles or special sections
- Displays in public buildings
- Presentations to local neighborhood, civic or business organizations
- Informational open houses
- Website
- Integration with local school curriculums

In 2003, the City of Birmingham completed numerous outreach efforts. These efforts consisted of the annual mailing of an outreach brochure to all the properties in the community's Special Flood Hazard Area, the Birmingham City Council Flood Assessment / Town Hall Meeting; Rising- West Princeton Neighborhood Meeting; and the Project Impact Community Awareness Day.

9.4 Technical Assistance

Local building inspection department staff serve on the front lines of the outreach programs, providing help and guidance to the many property owners who are contemplating and/or beginning the retrofitting process. Local staff does not design flood protection measures for individuals, but provides advice and expertise, free of charge. Often the staff can recommend or identify qualified contractors or licensed professionals to citizens in need of assistance in the retrofitting process.

Technical assistance can extend beyond City Hall. One-on-one assistance can be given to property owners through flood audit programs. This type of program is where a qualified expert visits a property site and helps the property owner identify flood-prone areas, as well as offer suggestions on ways to mitigate the potential flooding that is specific to that property. Another program that constitutes community outreach is information / technical open houses, where topics like flood proofing are the focus. A topic-specific open house can have multiple seminars addressing various issues. For example, with flood proofing, seminars and/or information can be provided on the overall process of retrofitting flood-prone structures, the selection of a qualified contractor, financial assistance, and preparations for the next flood event.

The City of Birmingham currently advertises technical assistance efforts that it provides. First visitors to the Department of Planning, Engineering and Permits can find out if their property is located in a floodplain, in addition to obtaining supplementary information relative to the depth and frequency of flooding. Secondly, the Permitting Services Office provides advice and assistance on retrofitting techniques. Lastly, when requested, the City Engineer's Office responds to flooding, drainage and sewer backup problems on a property.

9.5 Real Estate Disclosure

When purchasing a property, potential investors may not be fully aware of the risks of flooding to the property. Mortgage applicants or other loan applicants seeking loans from federally regulated lending institutions must be advised that their property is in a floodplain as shown on the FIRM. However, this requirement only states that the borrower must be informed 10 days prior to the closing of the loan.

Real Estate Disclosure is a public awareness program in which real estate agents notify those interested in purchasing properties located in the SFHA about the flood hazard and the flood insurance purchase need.

In the real estate industry, Alabama is considered a "buyer beware" state. There currently is a state law that requires the disclosure of health and/or safety hazards. Unfortunately, at the time of this report flooding is not considered to fall in either of those categories.

The City of Birmingham's *Zoning Ordinance Provision for Floodplain Zones* states that all subdivision plat proposals and other proposed site plans for new development in a flood-prone area, including manufactured home parks or subdivisions, shall have floodplain zones delineated and base flood elevation data provided by a registered land surveyor or professional engineer. This allows a prospective buyer to obtain the plat and find out pertinent floodplain information relevant to the property.

9.6 Educational Programs

Environmental education programs can be undertaken by schools, camps, youth organizations, conservation departments, and park and recreation departments. These programs are aimed at teaching children about flooding, the causes of it, factors that affect flooding problems, and the importance of protecting the natural and beneficial functions of watersheds and floodplains. Educational activities can range from simple things like informational signs near rivers and streams to the more involved process of integrating information into the educational curriculum.

Educational programs are not limited to children. Seminars and workshops can be developed for groups of all ages. Programs exist that provide support and curriculum materials for educational programs and schools. Some websites where materials can be found include:

- FEMA's "FEMA for Kids"
- USGS "Water Science for Schools"
- State of Alabama Geological Survey "Geoscience and Educational Websites"

The Birmingham Public Schools' curriculum development is guided by Framework for Instructional Design and Evaluation. It is a district policy that calls for a 5 year design and evaluation cycle for all curricular areas. This cycle gives the City the opportunity to have a routine plan to update the earth science courses and the information presented to the children, as new information and data becomes available, relevant to flooding and other hazards.

9.7 Conclusions

1. Numerous ways exist for public information programs to be used to inform the public of the hazards (specifically flood) that face them and the many ways that they can protect themselves.
2. The majority of the programs can be implemented by City of Birmingham Staff if the personnel resources are available.
3. Other programs, like the Real Estate Disclosure and Educational Programs, require coordination of efforts between the City and program partners.
4. The City currently has a relatively extensive Public Information Program; however, there are opportunities for improvement.
 - a. The City has an excellent Map Information Program.
 - b. The City engages in annual Public Outreach projects.

- c. The City also provides Flood Protection Assistance.

9.8 Recommendations

1. The City should continue to implement its Public Information Activities Program.
 - a. This includes providing map and flood hazard information to inquirers.
 - b. Continue to supply the City of Birmingham Public Library with appropriate flood protection references, government (i.e. FEMA) publications, maps, etc. while also placing this information on the Planning, Engineering and Permits website.
 - c. Continue annual mailing of outreach brochures, and participation in town hall meetings and community meetings.
2. The following are recommendations for enhancement of the Public Information Activities Program that the City of Birmingham can implement to more effectively disseminate information on flood hazard, mitigation and available City Services.
 - a. A separate enhanced flood protection website should be created and linked to the City's official website. Links should be provided to SWMA's website. GIS maps of floodplains should be linked to the site. Real time information from the ALERT System should be linked and displayed on this page.
 - b. Increase the number of community workshops for flood prone neighborhoods, making property owners aware of specific flood hazards and flood proofing techniques. Education on the ALERT system should also be provided. Information on methods to report flooding problems, maintenance needs and the City tracking system should also be included. Gear some workshops more toward local design professionals regarding planning, engineering and construction for issues such as BMPs, guidance for floodplains and watershed management, and stormwater management.
 - c. Public access television could be used to show informational videos on flooding hazards and mitigation issues.
 - d. Staff should investigate means of disclosing flood hazards and meet with the Birmingham Realtors Association to discuss possible approaches.
 - e. Staff should investigate preparing a model flood preparedness plan for businesses and critical facilities to aid them in developing their own plan.
 - f. The City of Birmingham should designate a month as Flood Awareness Month. This would provide a designated time each year, prior to storm season, when the

CITY OF BIRMINGHAM

FLOOD MITIGATION / STORMWATER MANAGEMENT PLAN

PEP staff, as well as other City departments and agencies could bring attention to and distribute information on flood preparedness and flood protection information.

- g. Staff could continue to work in coordination with the Citizen's Participation Program to promote the dissemination of flood related information.
- h. Coordinate outreach efforts with local utility service providers' information programs to aid in the dissemination of flood preparedness information throughout the community.
- i. Develop an informational program to inform and teach students in the local schools about flooding and flood safety measures. Coordinate with private and public educational establishments to bring this information to them and to integrate into science curriculum. This should be linked to the Flood Awareness Month.

10.0 FLOOD MITIGATION / STORMWATER MANAGEMENT ACTION PLAN

The Flood Mitigation / Stormwater Management Action Plan defines the strategies and actions related to floodplain management, flood mitigation and stormwater management that the City of Birmingham will pursue to achieve the goals and objectives defined in this document.

The FEMA defined floodplain and stormwater management planning process was utilized, instituting a collaborative planning process encompassing the previously defined Technical Advisory Board, Stakeholder Committee, as well as members of the general public. The Action Plan also integrates results and strategies of other related planning efforts including the Jefferson County, Alabama Natural Hazards Mitigation Plan, the Alabama State Hazard Mitigation Plan, the Strategic Business Plan for Map Modernization in Alabama, and the on-going City of Birmingham Comprehensive Plan Update, as well as other related local planning efforts.

Section 10, Flood Mitigation / Stormwater Management Action Plan has been organized by related categories and topics as outlined below:

Section 10.1 Preventative Measures organized by applicable ordinances and development guideline documents.

Section 10.2 Property Protection Measures including a discussion of the repetitive loss properties strategy.

Section 10.3 Emergency Services

Section 10.4 Structural Measures

Section 10.5 Natural Resource Protection

Section 10.6 Public Information Measures including a public information program strategy.

Section 10.7 Stormwater Management Action Plan

Section 10.8 CRS Program Strategies

Following the proposed strategies and actions by category, **Section 10.9** includes a discussion of potential funding sources for the implementation of identified actions and strategies. This is followed by **Section 10.10** Implementation Schedule for Identified Actions and Strategies. The final section, **10.11**, discusses a plan update strategy.

10.1 Prevention

10.1.1 Ordinance Action Items

1. Zoning Ordinance / Zoning Ordinance Provisions for Floodplain Zones

- a. Relevant to the Zoning Ordinance, incorporate provisions regarding enhanced open space requirements for residential, commercial, and mixed use development uses. Emphasis should be placed on developers to designate SFHA, jurisdictional wetlands, and other sensitive environments as open space for conservation and/or recreation use. Requirements to maintain vegetated buffers along natural streams and major drainage ways should also be incorporated. This could be instituted as a zoning ordinance provision for open space.
- b. For planned unit developments, especially those development tracts with substantial designated SFHA, cluster development concepts should be emphasized, whereby increasing allowable densities in areas most suitable for development and preserving the SFHA and other environmentally sensitive areas.
- c. The City is currently reviewing the Model Floodplain Ordinance proposed by Jefferson County. If the City chooses to adopt this model ordinance, it would supersede the existing “*Zoning Ordinance Provisions for Floodplain Zones*”.

However, if the City decides not to adopt the Jefferson County model ordinance, they should seriously consider modifying the existing “*Zoning Ordinance Provisions for Floodplain Zones*” or develop a new model floodplain ordinance consistent with City goals and objectives. Key general provisions / modifications that should be considered for inclusion relevant to floodplain management include:

- i. Increase the flood protection elevation (FPE) for new construction from 1’-0” to 1’-6” above the base flood elevation.
- ii. Severely restrict development in the floodway by not allowing the placement of fill in the floodway and limiting development to conservation / open space / passive recreation uses and flood control / utility needs.
- iii. For developments within designated Special Flood Hazard Areas outside of the floodway, restrict development by requiring no net loss of flood storage capacity, in turn severely limiting placement of fill in the SFHA. In turn, any placement of fill in the floodplain fringe would have to be offset by the establishment of an equal or greater amount of flood storage capacity through fill displacement. Also minimum lot sizes of 1 to 2 acres should be incorporated throughout the SFHA to limit density of development within the

- floodplain. Provisions for providing a maximum percent of impervious cover should also be implemented by type use. An example would be for residential lots, the house footprint, driveway parking, and other improvements should not exceed 4200 sf of impervious cover, or a maximum percent of impervious cover could be specified by zoning classification.
- iv. Define land use / development standards for existing and future FEMA, USACE, or otherwise federally acquired properties within the SFHA.
 - d. An important component to developing an effective Floodplain Management Program is to have a clear and accurate delineation of the special flood hazard areas including the base flood elevation, and floodway limits. The City in coordination with the State of Alabama, Department of Economic and Community Affairs, Office of Water Resources (a designated Cooperating Technical Partner), and FEMA is currently proceeding with a Floodplain Map Modernization Program (FMMP). An interim update using best available data is to be completed for major creeks in Jefferson County in 2005. Once the interim update is complete, the City and State should proceed with a more detailed Flood Map Modernization effort for major drainage basins within the City of Birmingham through improved, calibrated hydrologic and hydraulic (H&H) model development and the use of improved topographic data. Developed models should account for existing and future conditions within the watershed.
 - i. Unstudied streams for which no delineation of SFHA has been developed should be identified and included in the City's Map Modernization Program. This will allow for delineation of the 100-Year floodplain limits as well as delineation of the floodway, in turn limiting development in these areas consistent with the Floodplain Ordinance.
2. *Soil Erosion and Sediment Control Ordinance*
- The current *Soil Erosion and Sediment Control Ordinance* is comprehensive for construction phase activities, requiring a Soil Erosion and Sediment Control Permit which must be accompanied by a "control plan", BMP plan and specifications for all permits, and a drainage plan for flood prone or designated Special Flood Hazard Areas. The ordinance is geared toward land disturbing activities during the construction phase. While implementing best management practices and erosion control techniques during the construction phase is critical and beneficial, consideration should be given to incorporating stormwater and associated best management practice strategies to the planning, design and long term operation phases of a project.
- a. A Stormwater Management / BMP Handbook identifying best management practices for the various stages of project development should be developed. The handbook would address BMPs for:
 - i. Master Planning, Land Planning, and Site Planning Phases;

- ii. Design Phase;
- iii. Construction Phase; and
- iv. Long Term Operations / Maintenance.
- v. Guidance documents such as Subdivision Regulations, the *Soil Erosion and Sediment Control Ordinance* and Design Guidelines could reference the BMP Manual requiring design and construction professionals to consider such strategies. In the review and permitting process it would be incumbent upon the developer to document that a reasonable effort has been made to consider and incorporate appropriate BMPs.

3. Subdivision Regulations and Engineering Design Guidelines for Subdivisions and Commercial Development

- a. Consideration should be given to including a more detailed section in the Subdivision Regulations regarding treatment of SFHA and environmentally sensitive areas including SFHAs, wetlands, etc. Natural vegetated buffers should be required adjacent to natural creeks and rivers. Methods, such as *cluster type development*, allowing for open space preservation of jurisdictional wetlands and SFHA should be emphasized and rewarded.

Reference should be made to the Stormwater Management / BMP Handbook for guidance on master planning, land planning and site planning techniques relevant to flood mitigation planning and stormwater management which will provide long term flood mitigation and water quality benefits.

A review mechanism should also be instituted within the Department of Planning, Engineering and Permits to make sure every reasonable effort has been made to incorporate BMP planning phase strategies as outlined in the handbook for the proposed development.

- b. The Design Guidelines for drainage and storm sewer systems are generally consistent with most metropolitan areas throughout the southeast, specifying a minimum design return period for a 10-Year storm event, with a 25-Year event return period for box culverts and pipes larger than 60". In light of this, and in order to reduce urban flooding due to storm sewer system capacity limitations, the City where feasible, should consider requiring all development outside of the SFHA to be elevated a minimum of 1'-0" to 1'-6" above the crown of the adjacent roadway. This would help to reduce urban flooding associated with inadequate storm sewer system capacity.
- c. Other Stormwater Management considerations for inclusion include:
 - i. Require landscaped center sections for cul-de-sacs while still effectively accommodating emergency vehicles.

- ii. Allow and promote utilization of pervious surfaces for sidewalks, walkways, and driveways.
- iii. Reduce minimum street width to 24' for local streets.
- iv. Encourage use of open drainage swales in lieu of closed storm sewer systems especially in the SFHA.
- v. Require that final plats have all required flood data indicated by the *Zoning Ordinance Provisions for Floodplain Zones*.

4. Building Codes

The current building code adopted by the City (Standard Building Code) in conjunction with the “*Zoning Ordinance Provisions for Floodplain Zones*” meets or exceeds the NFIP requirements. However, the City should consider adoption of the “*2000 International Codes*” due to the more aggressive requirements relevant to natural hazard mitigation.

Additionally, the City should consider requiring a Certificate of Occupancy or a Certificate of Completion, whichever is applicable, be issued for all floodplain building and utility developments to insure compliance.

5. Parking Ordinance

Parking lots can encumber large areas with impervious surfaces and have negative effects such as increased runoff rates and lower water quality. The City has made strides to address this issue, however in the next update of the ordinance the following issues should be considered for incorporation,

- a. Encourage pervious surfaces in all situations, both inside and outside designated SFHA and reducing the amount of impervious surfaces.
- b. Require that overflow parking be pervious surfaces.
- c. Promote vertical parking where reasonable and feasible, encouraging, “Green Roofs” for such solutions.
- d. Reference the Stormwater Management / BMP Handbook (if developed) section regarding parking lot planning and design and require associated BMPs be considered and instituted where reasonable and feasible.
- e. Specify landscaping requirements (percent to be landscaped) for parking lots.
- f. Review parking ratios requirements for all uses and reduce requirements, where allowable, specifying both minimum and maximum parking requirements.
- g. Consider both surface and subsurface parking lot runoff storage opportunities.

6. Landscaping Requirements

The current City Landscaping Requirements do not address flood mitigation or stormwater management issues. However, strategically placed landscaping, and utilizing appropriate plant materials can provide excellent stormwater management functions. Concepts such as natural buffer zones and filter strips adjacent to rivers, streams, and parking lots can be effective. Wet pond concepts, taking advantage of the natural filtering process of wetland vegetation, is another example.

The City should update the Landscaping Requirements to address flood mitigation and stormwater management issues such as incorporating design of filter strips and the utilization of natural vegetation along streams and buffers. Many of these strategies are closely related to the ones which would be defined in the Stormwater Management / BMP Handbook. Due to this, reference should be made to the handbook and appropriate reviews of site plans and landscape plans to ensure reasonable efforts have been made to institute these strategies.

10.1.2 Map Modernization Program

As noted in **Section 10.1.1**, Item 1d, the State of Alabama is a Technical Mapping Partner with FEMA. By becoming a technical mapping partner, the State can delineate floodplains within its borders on behalf of FEMA. Jefferson County EMA and the State of Alabama have been in discussions regarding the status of the mapped floodplains within Jefferson County. The two entities have agreed that the existing, mapped floodplains are out of date and in need of revisions. To this end, the State, as the technical mapping partner, has commissioned an interim re-delineation and digital mapping of the floodplains located in Jefferson County utilizing available data. Newly available topographic data that is of more substantial detail than previously available will be utilized in the interim re-delineation process which will be completed by 2005.

While the interim update will be beneficial, long term improvement to the H&H models should be implemented to more accurately delineate the floodplain limits. As part of the Map Modernization Program, H &H models FEMA created for the major watersheds within the City of Birmingham (Village Creek, Shades Creek, Valley Creek, Five Mile Creek, and the Cahaba River) would be updated. All five of these watersheds were updated in 1999. At the time of this report, the status of each waterway's model is as follows (ranking from best to worst):

1. Village Creek
2. Upper Shades Creek
3. Valley Creek
4. Five Mile Creek
5. Cahaba River and tributaries including Stinking Creek, Abes Creek, Little Shades Creek, Pinchgut Creek

The Map Modernization Program should consider prioritizing the model updates and associated floodplain mapping in the following order for major streams within the City of Birmingham:

1. Village Creek
2. Upper Shades Creek
3. Valley Creek
4. Five Mile Creek
5. Cahaba River & Tributaries

Costs associated with these studies / model updates vary. A full update to the FEMA model for a specific watershed, where there is accurate calibration with historic rain events, would cost in the range of \$250,000 - \$500,000. These full updates would be near to mid-term projects associated with the Map Modernization Program.

10.2 Property Protection

10.2.1 Property Protection Action Items

1. Property owners should be more aware of the available protection measures that can help to reduce flood losses. In order to promote and support this awareness of available protection measures, the City should enhance the following programs.
 - a. Public Information Program including:
 - i. Conduct Community workshops and flood audits for individual properties targeted at property protection measures.
 - ii. Make public aware of potential of outside funding sources and support through the funding process.
2. For buyout and relocation programs, the City should institute a program level planning process designed to minimize the loss of population and tax base and maximize the benefit of the acquired property to the general public. Basic steps may include:
 - a. Identify locations / structures for acquisition and relocation.
 - b. Identify comparable housing alternatives within the City.
 - c. Identify incentive programs to relocate within the City and develop a relocation plan.
 - d. Develop alternative land use plans for acquired property such as conservation, recreation, parklands, etc.; consistent with FEMA guidelines. The land

use / development guidelines for acquired properties should be set forth in the *Zoning Ordinance Provision for Flood Zones*.

3. As funding through FEMA mitigation grant programs becomes available to the City, the City should:
 - a. Continue property acquisitions in all current and past FEMA and USACE acquisitions project areas to maintain neighborhood character and continuity as well as to accomplish open space planning objectives for each area.
 - b. Provide financial assistance to acquire flood prone buildings and properties; emphasis should be on pre-FIRM residential buildings, repetitive loss properties, floodway properties, and critical facilities.
 - c. Provide financial assistance to elevate buildings to protect against flood damage; emphasis should be on certain buildings, where acquisition or relocation is not feasible, or that were constructed before the enactment of floodplain regulations (pre-FIRM buildings).
 - d. Develop a local flood mitigation assistance program focused on providing flood mitigation services and programs for flood prone properties affected by non-presidential declared disasters and non-emergency related disaster declarations. This program should offer services such as technical assistance, public information, disaster relief assistance in the form of grants for utility and structure protection, and small-scale drainage control projects, etc.

10.2.2 Repetitive Loss Strategy

Research of historical and recent storm events, NFIP Claim Data, and other available information relevant to the City of Birmingham, has identified the main problem as the significant flooding of homes, businesses, automobiles, yards and roadways resulting in considerable property damage and disruption of services. This research has also revealed that the City and FEMA maintain extensive data relevant to repetitive loss structures. **Figure 2.3** identifies NFIP Repetitive Loss Structures within the City of Birmingham. Repetitive loss properties, as defined by FEMA, are properties, i.e. building, that are currently insured for which two or more NFIP losses (occurring more than 10 days apart) of at least \$1000 each have been paid within any 10-year period since 1978. City of Birmingham NFIP compliance records indicate that there are currently 50 Repetitive Loss Properties.

Repetitive loss properties place a financial burden on the National Flood Insurance Program, as well as the community, year after year. The costs outlined in **Tables 2.2** and **2.3** were obtained for repetitive losses in the City of Birmingham and summarized by year.

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For smaller flood events in the City of Birmingham, roughly in the total insurance claim range of \$1,000 to \$400,000 dollars, repetitive loss properties constitute a significant portion of all claims. Repetitive loss property claims represent as much as 88% of all claims associated with smaller events / storms. On larger flood events, repetitive loss claims comprise roughly 25% of the total claims.

If the number of repetitive loss properties can be reduced, the impacts of the smaller floods can be reduced by upwards of 90%. Also by reducing or eliminating the number of repetitive loss properties incurring damage, the losses associated with the larger floods can be cut by up to a quarter. Due to these facts, the City has designated addressing repetitive loss properties for flood protection as a high priority.

To effectively achieve these potential reductions in damages and subsequent NFIP claims, the City should outline a strategy for how it intends to handle repetitive loss properties. It is recommended that the City incorporate the following strategies to address repetitive loss properties.

1. Highest priority should be given to repetitive loss properties (RLP) located within the floodway. For these RLPs, acquisition and relocation would be the first consideration. If these methods are not feasible other methods of property protection such as elevation and wet floodproofing should be evaluated. Within this category, preference should also be given to RLPs with the highest number of claims and highest value in claims.
2. Second priority RLP to address would be floodplain properties (not located within the floodway). Again, preference would be given to properties with the highest number of claims and the highest value in claims. In an attempt to minimize impacts to existing communities and reduce potential population loss, property protection measures such as elevation, wet floodproofing, and dry floodproofing would be considered first. Acquisitions and relocations would be considered if other, lower impact property protection measures are deemed not feasible.
3. Third priority RLP properties would be those not located within the floodway or limits of the 100-Year floodplain. Preference again, would be given to properties with the highest number of claims and the highest value in claims. In an effort to maintain neighborhood character and continuity, acquisition and relocation of properties will not be considered unless extraordinary circumstances exist. All other property protection measures, as defined by FEMA, will be evaluated for such properties.
4. The City should continue to provide financial assistance to institute property protection measures for repetitive loss properties consistent with the prioritization process outlined above. A primary funding tool to consider would be the Flood Mitigation Assistance (FMA) program. Other FEMA funded grants should also be considered.

5. The City should continue to institute small pipe drainage control projects throughout the City. Benefits of the small drainage control projects can be realized by properties located in or outside of the floodplain.
6. To incorporate this strategy, the City should evaluate and prioritize the identified repetitive loss properties within the City consistent with the strategy outlined above, determine applicable flood protection measures for each, estimate implementation costs, then bundle properties into prioritized groups and identify the most suitable funding options.

10.3 Emergency Services

10.3.1 ALERT System

As was noted earlier, the calibration of the Village Creek Model for flood forecasting was completed in 2002. When discussing the model used for Village Creek, some clarifications need to be made. First, FEMA completed a Flood Insurance Study (FIS) in 1999 for major watersheds in the City of Birmingham, including modeling of Village Creek. It should be noted that the FEMA modeling efforts used the peak flow method to develop the hydrology associated with the modeled area. Following the FIS performed by FEMA, Jefferson County EMA needed to calibrate the model for use in predictive modeling efforts associated with the ALERT System. Jefferson County's calibration efforts built upon the 1999 FIS model, adding new cross sections where needed, in addition to changing the hydrology modeling method from the peak flow method to the rainfall-runoff method. The latter hydrology method allows for the use of the floodplains for floodwater storage. Finally, as part of the "Birmingham Watershed Study", the USACE developed an H&H model for the Village Creek watershed. Similar to the Jefferson County EMA model, this model built upon the 1999 FIS model, adding new cross sections and updating the hydrology. After encountering initial issues with the calibration of the model, the USACE used the EMA developed hydrology (rainfall-runoff method) instead of the FEMA (peak flow method) hydrology, because it provided a more accurate simulation condition. This difference in hydrology methods can lead to a significant difference in the peak design discharge (flow) for a stream being modeled. The peak flow method could result in significantly larger peak discharge figures than models using the rainfall-runoff method. The USACE model being used in the latest study of Village Creek is considered to be the most up to date of all the models.

10.3.2 Emergency Services Action Items

1. Full integration and automation of the ALERT System to develop predictive models on all major rivers and streams in the Birmingham area should be undertaken. Predictive models should be developed for each of the 5 major streams, based on the 1999 FEMA Model, with some modifications made so that the model can be integrated into the Jefferson County EMA ALERT System. These modifications should include the use of the EMA hydrology model based on the rainfall-runoff

method as opposed to the FEMA peak flow method and the use of new and more detailed topographic data. The estimated cost to implement a predictive model and integrate it with the ALERT System for a major stream in Jefferson County, utilizing the existing FEMA model as a base, is \$100,000.

2. Add more stream gages and weather stations, where necessary, at strategic locations to enhance the effectiveness of the ALERT System. Consideration of adding video cameras to selected gage sites should be given for verification purposes.
3. Predictive and real time flood information / data should be linked to the Geographic Information System (GIS) in order to create real-time maps of flooded areas in high hazard locations.
4. Evaluate and develop improved methods and define process and protocols for real time information dissemination to the public consistent with development of the ALERT System.
5. Identify and prioritize critical facilities located in flood hazard areas with highest risks. Initiate process and aid in the development of flood hazard emergency plans for prioritized critical facilities. To assist in this effort, develop a model flood hazard emergency plan for critical facilities.
6. Establish the proper client-user relationships to allow pertinent staff and certain critical facilities the ability to access and/or monitor ALERT system information via the internet.

10.4 Structural

10.4.1 Structural Action Items

1. Support Jefferson County EMA in preparing a request to FEMA that all future H&H modeling efforts within the county use the rainfall-runoff model as opposed to the peak flow model.
2. The City does have an ongoing Capital Improvement Program (CIP) including over \$12 million of drainage related projects. Most are moderate to small scale projects related to improving the storm sewer system or implementing closed storm sewer systems where open channels exist. While a near term Capital Improvement Program is well defined, a mid to long term Capital Improvement Program of significant structural flood reduction projects has not been identified. In order to effectively identify significant structural improvements which will provide substantial flood reduction benefits, calibrated hydrologic and hydraulic (H&H) models of existing and future conditions for the affected drainage basins must be developed. While FEMA H&H models exist for most major streams within Birmingham, model

improvements relevant to calibration, method, and topographic data will be required to have effective models for evaluation of flood reduction alternatives. Once updated, calibrated models are developed, alternative strategies and solutions can be evaluated considering existing and future conditions, as well as downstream impacts. Environmental and ecological impacts should also be evaluated. Major flood prone areas, as identified in the "Flooding Hotspot" GIS database should be evaluated using the models to identify and prioritize cost effective flood reduction alternatives. These projects can then be evaluated for funding options, and once a reasonable funding source is identified, programmed into the Capital Improvement Program.

- a. Currently, the only drainage basin in which a feasibility study is being conducted to evaluate structural flood reduction alternatives is Village Creek. While the study is not complete, an updated, calibrated model has been completed and flood reduction alternatives are being developed. The City should actively pursue funding through the USACE for feasibility studies for Valley Creek, Five Mile Creek, other sections of Shades Creek, and the Cahaba River and other significant tributaries.
3. Structural flood reduction alternatives evaluated as a part of the recommended feasibility studies should include preliminary regional detention / retention storage opportunities. These type projects can be multi-purpose, providing flood reduction and flood storage capabilities, recreational opportunities, water quality enhancement, and can help mitigate drought conditions.
4. Major open drainage channels should be inventoried in the City GIS database. Those considered significant and important to the overall drainage system should be evaluated as to whether or not they have dedicated public maintenance access. Those with no public servitude or access should be identified, and the City should then institute a long-term plan to acquire servitude for maintenance purposes.
5. Maintenance of the City's drainage system is important to maximize the efficiency of the existing drainage system (including debris & trash removal, vegetation control, excavation of open channels and the maintenance of the storm sewer system). City resources, personnel and equipment, allocated to this effort should be evaluated to determine the capability to effectively maintain the system at an efficient level. This is discussed in more detail in **Section 11**.
6. Education of the public on the ways to report flooding problems and drainage system maintenance needs to the City should be undertaken. There are several methods including the new 311 system to register complaints and/or problems with the City. The City does have a process to track and respond to such citizen issues with time constraints. However, numerous citizens were not aware of this process based on Stakeholder meeting comments. A brochure defining the methods, process,

protocols and response times should be developed for distribution through the Public Information Program discussed later in this document.

7. As part of the Map Modernization Process the City should include previously unstudied / limited studied stream segments. To date, there are approximately 18 miles of unstudied and limited studied stream segments in the City of Birmingham. These stream segments are mostly unstudied portions of detailed studied streams or unstudied / limited studied unnamed tributaries. They are generally located in the northeastern part of the City. Although not all of these stream segments currently flood, this could change as basin development continues. This project would enable the City to better identify the flood risks to existing properties located along these stream segments as well as minimize the flood impact to future development by establishing detail-studied, up-to-date floodplains.

10.5 Natural Resource Protection

10.5.1 Natural Resource Protection Action Items

1. Work with the Black Warrior / Cahaba Rivers Land Trust and other participating entities to continue acquiring property and easements adjacent to the major streams within the City of Birmingham, specifically Valley Creek, Five Mile Creek, Village Creek, Shades Creek, and the Cahaba River for natural resource protection, and for floodplain and wetlands conservation. These initiatives are directly related to ongoing and planned Greenway programs. All Greenway plan development within the City of Birmingham should be reviewed and coordinated with the City Floodplain Administrator to maximize flood mitigation and stormwater management benefits.
2. The City should expand the Greenways Planning Program by developing a formal Floodway to Greenway Conversion Program. The program objective would be to convert floodway properties to greenway properties through fee-simple acquisitions and/or conservation easements. This program would allow the City to relocate the most adversely impacted floodplain residents as well as to use its floodways as streamside buffers, flood storage areas, recreational areas, and as community parks and other community-based, open space amenities. The program should also provide relocation incentives for keeping displaced property owners within the City of Birmingham as well as provide flood protection mechanisms for those floodway properties that are not acquired. The Black Warrior / Cahaba Rivers Land Trust would be a cooperating partner with the City in such a program. To initiate this process, the City should commission a Master Plan Study for the Floodway to Greenway Program incorporating on-going Greenway projects.
3. Natural resource protection and associated stormwater management and BMP concepts should be instituted in the master planning, land planning, site planning, and platting stages of project development. Concepts such as buffer zones, open space preservation, cluster developments, minimization of impervious surfaces,

preservation of floodways and wetlands / sensitive environmental areas are types of measures which should be considered in these early stages of project development. Instituting these type concepts at this phase will supply significant long term benefits for flood mitigation and water quality. These concepts should be integrated into the Subdivision Regulations and through Zoning Regulations.

4. Feasibility studies utilizing calibrated H&H (Hydrologic & Hydraulic) models to evaluate structural flood reduction projects should also include evaluation of stream / ecological restoration benefits. Watersheds that need to be studied include: Valley Creek Watershed, sections of Shades Creek Watershed, Five Mile Creek Watershed, and the Cahaba River Watershed, where it includes Stinking Creek, Abes Creek, Little Shades Creek, and Pinchgut Creek.

10.6 Public Information

10.6.1 Public Information Plan

All recommendations pertaining to the enhancement of the Public Information Activities Program currently employed by the City of Birmingham as a Community Rating System program participants should be made relevant to an overall proposed Public Information Program Strategy. Through this Program Strategy that will be outlined in the following paragraphs, the City can implement the proposed recommendations to more effectively disseminate information on flood hazard, mitigation and available City Services.

The proposed Public Information Program Strategy is based on six main points. Three of the six: 1) the local flood hazard; 2) the flood safety and property protection measures appropriate for that hazard; and 3) the goals for the community's public information program are laid out in **Sections 1** through **9** of this report.

The fourth issue the strategy is based on is the on-going Public Information Activities Program. This includes providing map and flood hazard information to inquirers. Supplying the City of Birmingham Public Library with appropriate flood protection references, government (i.e. FEMA) publications, maps, etc. while also placing this information on the Planning, Engineering and Permits website. The City performs an annual mailing of outreach brochures, and participation in town hall and community meetings. These activities cover a wide variety of topics including, but not limited to, the City's flood hazards and flood prone areas; what the City is doing about flooding and stormwater problems; flood warning and safety procedures; drainage maintenance rules and procedures; property protection measures; NFIP and flood insurance; regulatory requirements and procedures; and water quality issues and beneficial floodplain functions. As part of this strategy, the City will continue these efforts.

Relevant to the fifth issue, future activities, the general strategy is to maintain the current annual public information program and to enhance the program through targeted outreach efforts and more effective dissemination of data. Strategies include targeted

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workshops exclusive to flood protection and mitigation for flood prone residences, businesses, and design and construction professionals responsible for the planning, design and construction of the built environment. In addition to the annual ongoing Public Information activities, the City should implement the following Public Information Initiatives. These initiatives should be implemented on a yearly or continual basis in order to reach the goals of the Flood Mitigation / Stormwater Management Plan. Targeted initiatives include:

1. An enhanced flood protection website should be created and linked to the City's official website. Links should be provided to the SWMA and FEMA website. GIS maps of floodplains should be linked to the site. Real time information from the ALERT System should eventually be linked and displayed on this page.
2. Conduct two community workshops in flood prone neighborhoods, exclusively related to flood mitigation issues including specific flood hazards, flood proofing techniques, education on the ALERT system, information on methods to report flooding problems, maintenance needs, and the City tracking system. The City should also conduct 1 workshop annually geared toward local design professionals regarding planning, engineering and construction for issues such as BMPs, guidance for floodplains and watershed management, and stormwater management.
3. Prepare and distribute a flood informational brochure on the floodplain review and permitting process.
4. A brochure defining the methods, process, protocols and response times, associated with citizens reporting flooding or drainage system maintenance problems, should be developed for distribution through the Public Information Program.
5. Prepare informational brochure on acquisition, relocation, and/or elevation process for repetitive loss properties and repetitively-damaged properties. Include this information on the enhanced website developed for flood mitigation / stormwater management.
6. Utilize public access television to show informational videos on flooding hazards and mitigation issues.
7. Investigate means of disclosing flood hazards and meet with the Birmingham Realtors Association to discuss possible approaches.
8. Investigate preparing a model flood preparedness plan for businesses and critical facilities to aid them in developing their own plan. Work with the Mayor's Office of Economic Development to prepare and conduct workshops with business owners and critical facility personnel located in the floodplain to discuss flood preparedness plan development.

9. Staff should perform flood audits for individual properties making the owner aware of the property specific flood hazard and of specific flood proofing techniques for minimizing the hazard.
10. The City of Birmingham should designate a month as Flood Awareness Month. This would provide a designated time each year, prior to storm season, when the PEP staff, as well as other City departments and agencies could bring attention to and distribute information on flood preparedness and flood protection information.
11. Staff should continue to work in coordination with the Citizen's Participation Program to promote the dissemination of flood related information.
12. Coordinate outreach efforts with local utility service providers' information programs to aid in the dissemination of flood preparedness information throughout the community.
13. Develop an informational program to inform and teach students in the local schools about flooding and flood safety measures. Coordinate with private and public educational establishments to bring this information to them and to integrate into science curriculum. This should be linked to the Flood Awareness Month.

10.7 Stormwater Management

An effective Stormwater Management program needs to address not only current and future regulatory and policy requirements, but also flooding problems, stormwater quantity as well as quality, maintenance and operations of the stormwater system, natural resource protection, and public education.

Regulatory and policy requirements related to Stormwater Management include, but are not limited to, Federal Stormwater Permitting Regulations such as the Clean Water Act, and more specifically the Phase II National Pollution Discharge Elimination System (NPDES) stormwater permitting program; floodplain management, including the National Flood Insurance Program, of which the City of Birmingham is an active participant; and City Ordinances, such as the *Soil Erosion and Sediment Control Ordinance* and *Zoning Ordinance Provisions for Floodplain Zones*.

The City of Birmingham's Floodplain / Stormwater Management Program is presently administered by the Department of Planning, Engineering and Permits through its Planning and Urban Design Services Division and Engineering Division. The department is primarily responsible for all program measures except drainage system maintenance and emergency response. The Engineering Division is responsible for administering the stormwater management program component including designing and managing all small pipe and capital improvement drainage projects; administering the *Soil Erosion and Sediment Control Ordinance*; and managing watershed studies and

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providing surveying support for all flood mitigation and stormwater management projects.

The *Soil Erosion and Sediment Control Ordinance*, a key stormwater management tool for the City, was adopted by the City to address issues related to the Clean Water Act as well as certain provisions of the NPDES permit process. While NPDES permits are primarily the responsibility of the Stormwater Management Authority, the City requires a Soil Erosion and Sediment Control Permit to regulate substantial land disturbing activities. The permit requires submittal of a “control plan” including a Best Management Practices plan, and specific erosion control as well as a drainage plan for sites located wholly or partially within the 100-Year floodplain or other hazard areas. The ordinance provides a good method at the City level for enforcing utilization of Soil Erosion and Sediment Control techniques during construction related land disturbing activities.

Birmingham’s *Subdivision Regulations* require that adequate stormwater drainage systems be provided for each subdivision. *Engineering Design Guidelines for Subdivisions and Commercial Developments* go on to require that a 10-Year design storm be used, at the minimum, for the design of all storm sewer collection systems. If Box Culverts or pipes larger than 60 inches in diameter are required, the design storm should be modified to 25-Years, at a minimum. The policy of the City of Birmingham relative to stormwater detention / retention is that the post-development runoff rate shall equal the pre-development rate; however, no specific methods for achieving this goal are identified.

Other City, County and independent agencies assist in the performance of stormwater management duties including, but not limited to, the Department of Public Works, Jefferson County Emergency Management Agency (EMA), and the Stormwater Management Authority (SWMA). The Department of Public Works is presently responsible for performing drainage system inspection, maintenance and small-scope drainage improvement work for the City’s Floodplain / Stormwater Management Program. This department performs routine, complaint-based, and emergency maintenance work for all city-owned components of the natural and man-made stormwater system including retention / detention basins. Their maintenance / inspections activities include: stormwater system obstruction removal, channel nuisance vegetative and non-native sediment clearance; bridge and roadway crossing debris and drift clearance; in-stream maintenance dredging; and rainfall / creek level gage debris removal.

Jefferson County EMA’s current, primary stormwater management program role is to coordinate the emergency support staff and resources needed for providing a coordinated emergency response prior, during and following a major flooding event.

The Stormwater Management Authority, formed in 1997, is comprised of approximately 23 municipalities and is responsible for ensuring that its members satisfy the stormwater

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permitting requirements as set forth by the National Pollutant Discharge Elimination System (NPDES) program and the Alabama Department of Environmental Management. On behalf of its members, of which the City of Birmingham is one, the Authority performs several stormwater management tasks that make-up the stormwater management program. However, most of the stormwater management tasks the Authority provides for its members are stormwater quality control related. They include storm sewer pollutant investigations, in-stream water quality monitoring, industrial and other end-of-the-pipe discharge monitoring and inspections, land disturbing permitting, and GIS mapping and database development.

As can be seen through the descriptions of the responsibilities of the various departments and agencies that have a stake in the stormwater management component of the City of Birmingham's Floodplain / Stormwater Management Program, the City of Birmingham to date has taken substantial steps to implement effective stormwater management tools, where possible, in an effort to comply with all Federal, State, and local legislation, as well as to respond to the local public services, health and safety issues. Even with the efforts implemented by the City and participating agencies to date, the City's program can be improved. Areas to address include Flooding, Stormwater Quality and Quantity, Stream Habitat, Maintenance & Operations, and Water Quality Response and Public Education.

Flooding – As identified in **Section 2**, and as documented in **Figures 2.2 and 2.3**, various areas throughout the City of Birmingham currently experience the effects of flooding. Many of these areas are located in the Village Creek, Valley Creek, Five Mile Creek and Upper Shades Creek Watersheds. While some areas of flooding can be eliminated through mitigation techniques such as acquisition, not all locations of flooding can be effectively remedied. Effective stormwater management can help address this problem.

Stormwater Quantity and Quality – The Stormwater Management Authority (SWMA) and the City of Birmingham currently require new developments in the City to mitigate the impacts of stormwater quantity (i.e. stormwater runoff) and quality per the Clean Water Act, City design guidelines and the *Soil Erosion and Sediment Control Ordinance*, and the *Floodplain Ordinance*. It should be noted that many developments in the City of Birmingham came into existence prior to the establishment of the Clean Water Act and subsequently, the NPDES process. At that time, there were minimal stormwater runoff and quality controls placed on developments. Because of this, stormwater runoff and water quality issues still affect the City in the locations of the older developments. New development and redevelopment is also imminent and must be addressed.

Stream Habitat – Due to development in and along the floodplains, many local streams and rivers natural vegetative and riparian habitats have been degraded. Existing and ongoing Greenway projects as well as proposed stream restoration project for Village

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Creek are attempts to reverse those negative effects. At this time, the need still exists for continued similar projects along the City of Birmingham's streams and rivers.

Maintenance & Operation – Stormwater runoff in the City of Birmingham comes from two main sources: runoff from City streets and other properties, and runoff from private property that makes its way into the City's stormwater system. Routine maintenance on both subsurface and open drainage stormwater systems is essential to the proper operation of the overall system. Several issues relevant to maintenance exist including: lack of adequate access to easements for City-owned and operated storm sewer system elements, a need for accurate survey of stormwater facilities throughout the City, and maintenance of drainage facilities on privately owned land.

Water Quality Response & Public Education – The City of Birmingham currently has a system in place to respond to citizen complaints, questions and comments regarding the stormwater system. Better educating the citizens of Birmingham about this process could improve citizen participation. Many of the water quality and stream issues begin with the behavior of individuals. While most residents, businesses, and other citizens, are aware of and supportive of the ongoing efforts to control pollution and preserve the natural environment of the streams and rivers, some people are not aware of the ordinances and regulations that prohibit dumping into or the removal of vegetation or alteration of streams in the stormwater system. The enforcement of regulations on maintenance of stormwater systems and pollution control, an aggressive public information strategy, and a response plan relevant to pollutant spill incidents should be actively pursued.

While there are numerous stormwater management related ordinances, guidance documents and ongoing activities associated with the stormwater management program component of the City of Birmingham's Floodplain / Stormwater Management Program, there appears to be a need for a more comprehensive and unified approach to stormwater management within the City of Birmingham. The primary emphasis has been on water quality related issues and control of stormwater runoff associated with land disturbing activities / construction, with minimal focus on water quantity.

The following stormwater management strategies and actions are defined to develop a more comprehensive approach to address both, water quality and quantity issues as well as incorporating stormwater management principals in all phases of the land development process. Many of the noted strategies and actions are relevant to other components of the Action Plan and have been incorporated into those sections as well as this section.

1. Development of a Stormwater Control or Drainage Control Ordinance
The City should consider developing, in cooperation with SWMA, a stormwater management or drainage control ordinance that includes the provisions of the erosion control ordinance as one of its stormwater management components. This type of ordinance would provide for management of stormwater both during and

after construction, providing long term benefits relevant to preventing the worsening of existing upstream and downstream flooding conditions. The following provisions should be considered in the ordinance:

- a. The ordinance should provide performance-based criteria that provides direction in the selection, design, and implementation of stormwater Best Management Practices;
 - b. A Stormwater Management Handbook should be referenced that sets forth the specific hydrologic and BMP design criteria;
 - c. The ordinance should include alternatives to on-site stormwater management measures (i.e. purchase / donation of privately-owned lands to provide permanent streamside buffers; creation of stormwater management facility on previously developed properties that lack proper stormwater management; or monetary contribution to watershed studies or towards a regional detention / retention facility); and
 - d. Applicability of ordinance for each watershed should be based on each watershed's preventive and corrective flood mitigation and stormwater runoff management need.
2. In the interim, the City should develop interim stormwater management policies for addressing its existing flooding and stormwater runoff management problems. These policies should address:
- a. Watercourse protection;
 - b. Preventative versus corrective measures;
 - c. Streamside protection;
 - d. Site development runoff policies for new development and redevelopment;
 - e. Stormwater storage facilities location and design requirements;
 - f. Off-line versus on-line detention / retention systems;
 - g. Surface versus subsurface detention / retention systems;
 - h. Regional versus on-site detention / retention systems;
 - i. Peak runoff volume control versus runoff volume control;
 - j. Multi outlet control versus single outlet control;

- k. Master drainage planning;
- l. City versus private drainage system maintenance responsibilities;
- m. Structural versus nonstructural flood mitigation;
- n. Intergovernmental coordination / cooperation; and
- o. Open space management.

3. Development of a Stormwater Management BMP Handbook

The current *Soil Erosion and Sediment Control Ordinance* is comprehensive, requiring a Soil Erosion and Sediment Control Permit which must be accompanied by a "control plan", BMP plan and specific actions for all permits, and a drainage plan for flood prone or designated Special Flood Hazard Areas. The ordinance is geared toward land disturbing activities during the construction phase. While implementing best management practices and erosion control techniques during the construction phase is critical and beneficial, consideration should be given to incorporating stormwater and associated best management practice strategies to the planning, design and long term operation phases of the project.

- a. The City should develop a Stormwater Management / BMP Handbook identifying stormwater and best management practices for the various stages of project development. The handbook would address BMPs for:
 - i. Master Planning, Land Planning, and Site Planning Phases;
 - ii. Design Phase;
 - iii. Construction Phase; and
 - iv. Long Term Operations / Maintenance.

Guidance documents such as Subdivision Regulations, the *Soil Erosion and Sediment Control Ordinance* and Design Guidelines could reference the BMP Manual requiring design and construction professionals to consider such strategies. In the review and permitting process it would be incumbent upon the developer to document that a reasonable effort has been made to consider and incorporate appropriate BMPs based on performance criteria noted in the ordinance.

Natural resource protection and associated stormwater management and BMP concepts should be instituted in the master planning, land planning, site planning, and platting stages of project development. Concepts such as buffer zones, open space preservation, cluster developments, minimization of impervious surfaces, and preservation of floodways and wetlands / sensitive environmental areas are types of measures which should be considered in these early stages of project development. Instituting these type concepts at this phase will supply significant long term benefits

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for flood mitigation and water quality. These concepts should be integrated into the Subdivision Regulations and through Zoning Regulations.

4. Work in cooperation with SWMA to develop a protocol for regional coordination among municipalities regarding Flood Reduction Studies and Projects. Implementing flood control projects can benefit one community while having significant downstream impacts. Establishing the process for communication among municipalities will allow municipalities to coordinate flood control related projects for win-win type scenarios.
5. Implement the proposed Stormwater Infrastructure-Floodplain Structure Hazard Mitigation Survey. This proposed project would involve surveying and geo-referencing the City's stormwater drainage system and 500-year floodplain properties. The key project tasks include: Survey and Mapping, GIS Database Development, Informational Database Development, and Applications Database Development. This project could be funded by a FEMA grant awarded to the City and/or the Stormwater Management Authority, Inc. This project would provide far-reaching tangible benefits to the City's Floodplain / Stormwater Management Program including:
 - a. Improved drainage system maintenance and capacity;
 - b. Improved GIS drainage system coverage;
 - c. Improved emergency response efforts;
 - d. Improved damage assessment accuracy;
 - e. Improved master drainage planning and stormwater ordinance development;
 - f. Improved future stormwater runoff quantity and quality modeling efforts;
 - g. Improved off-site drainage impact assessment from proposed developments;
 - h. Improved flood protection technical assistance for floodplain residential and business property owners; and
 - i. Improved floodplain review and permitting efficiency.
6. All major open drainage channels should be inventoried in the City GIS database. Those considered significant and important to the overall drainage system should be evaluated as to whether or not they have dedicated public maintenance access. Those with no public servitude or access should be identified, and the City should then institute a long term plan to acquire servitude for maintenance purposes.

7. Comprehensive Plan

- a. The City of Birmingham is currently in the process of updating the City's Comprehensive Plan. Close coordination between the two parallel planning processes should continue and strategies from the Flood Mitigation / Stormwater Management Plans should be considered and incorporated where possible including: open space preservation concepts especially in the SFHA, down zoning (reduced density) in the SFHA, instituting greenway projects and associated conservation easements / natural buffers adjacent to natural and man made drainage ways.

8. Zoning Ordinance / Zoning Ordinance Provisions for Floodplain Zones

- a. Relevant to the Zoning Ordinance, provisions regarding enhanced open space requirements for residential, commercial, and mixed use development uses should be considered. Emphasis should be placed on developers to designate SFHA, jurisdictional wetlands, and other sensitive environments as open space for conservation and/or recreation use. Requirements to maintain vegetated buffers along natural streams and major drainage ways should also be considered.
- b. For planned unit developments, especially those development tracts with substantial SFHA designated areas, cluster development concepts should be emphasized, whereby increasing allowable densities in areas most suitable for development and preserving SFHA and other environmentally sensitive areas.

9. Subdivision Regulations and Engineering Design Guidelines for Subdivisions and Commercial Development

Consideration should be given to including a more detailed section in the *Subdivision Regulations* regarding treatment of Special Flood Hazard Areas and environmentally sensitive areas including SFHAs, wetlands, etc. Natural vegetated buffers should be required adjacent to natural creeks and rivers. Methods, such as *cluster type development*, allowing for open space preservation of jurisdictional wetlands and SFHA should be emphasized and rewarded.

Reference should be made to the Stormwater Management / BMP Handbook for guidance on master planning, land planning and site planning techniques relevant to flood mitigation planning and stormwater management which will provide long term flood mitigation and water quality benefits.

10. Parking Ordinance

The City does have a parking ordinance in place. Parking lots can encumber large areas with impervious surfaces and have negative effects such as increased runoff rates and lower water quality. The City has made strides to address such issues,

however in the next update of the ordinance the following specific issues should be considered:

- a. Encouraging pervious surfaces in all situations, both inside and outside designated SFHA and reducing the amount of impervious surfaces.
- b. Specifying both minimum and maximum parking requirements.
- c. Requiring that overflow parking be pervious surfaces.
- d. Promote vertical parking where reasonable and feasible, encouraging, "Green Roofs" for such solutions.
- e. Reference the Stormwater Management / BMP Handbook (if developed) section regarding parking lot planning and design and require associated BMPs be considered and instituted where reasonable and feasible.
- f. Specify landscaping requirements (per cent to be landscaped) for parking lots.

11. *Landscaping Requirements*

The current City Landscaping Requirements do not address flood mitigation or stormwater management issues. However, strategically placed landscaping, and utilizing appropriate plant materials can provide excellent stormwater management functions. Concepts such as natural buffer zones and filter strips adjacent to rivers, streams, and parking lots can be effective. Wet pond concepts taking advantage of the natural filtering process of wetland vegetation is another example.

Consideration should be given to updating the Landscaping Requirements to address flood mitigation and stormwater management issues. Many of these strategies are closely related to the ones which would be defined in the Stormwater Management / BMP Handbook. Due to this, reference should be made to the handbook and appropriate reviews of site plans and landscape plans to ensure reasonable efforts have been made to institute these strategies.

12. Structural flood reduction alternatives evaluated as part of the recommended feasibility studies may include preliminary regional detention / retention storage opportunities. These type projects can be multi-purpose, providing flood reduction and flood storage capabilities, recreational opportunities, water quality enhancement and a water source during drought conditions.
13. Work with the Black Warrior / Cahaba Rivers Land Trust and other participating entities to continue acquiring property and easements adjacent to the major creeks within the City of Birmingham, specifically Valley Creek, Five Mile Creek, Village Creek, and Shades Creek for natural resource protection and for floodplain and wetland conservation. These initiatives are directly related to ongoing and planned

the Greenway programs. All Greenway plan development within the City of Birmingham should be reviewed and coordinated with the City Floodplain Administrator to maximize flood mitigation and stormwater management benefits.

14. Feasibility studies utilizing calibrated H&H (Hydrologic & Hydraulic) models to evaluate structural flood reduction projects should also include evaluation of ecological restoration benefits.
15. Increase the number of community workshops for flood prone neighborhoods, making property owners aware of specific flood hazards and flood proofing techniques. Education on the ALERT system should also be provided. Information on methods to report flooding problems, maintenance needs and the City tracking system should also be included. Gear some workshops more toward local design professionals regarding planning, engineering and construction for issues such as BMPs, guidance for floodplains and watershed management, and stormwater management.

10.8 CRS Program Review and Proposed Actions

The Community Rating System (CRS) is part of the National Flood Insurance Program (NFIP). The objective of the program is “to reward communities that are doing more than meeting the minimum NFIP requirements to help their citizens prevent or reduce flood losses.” As defined in the NFIP, the minimum requirements are to adopt and enforce a floodplain management ordinance for the SFHA that specifies minimum requirements for reducing flood losses. Some examples of these requirements would be requiring elevation certificates, and requiring that the finished floor elevation be at the base flood elevation.

As discussed in **Section 1.4**, communities receive credit points for the programs and initiatives that they enact to meet the goals of the CRS program. Higher point accumulations lead to a great reduction in flood insurance premiums.

As of the last CRS submittal, the City of Birmingham had accumulated a total of 1672 points for the programs and initiatives that they have put forth. This point total results in a CRS Class Rating of 7 for the City. Because of the CRS Class Rating 7, flood insurance policy holders receive a 15% discount on their flood insurance premiums. The City of Birmingham was the first community in the State of Alabama to receive such a CRS class designation. A general description of current CRS efforts undertaken by the City of Birmingham is as follows:

1. Distributes public information to floodplain residents annually and performs various public outreach projects each year.
2. Maintains elevation and flood proofing certificates for all approved; new and/or substantially-improved developments in the floodplain. (Zoning Ordinance)

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3. Provides floodplain protection assistance for site specific data requests.
4. Provides map determinations and flood zone information to all inquirers.
5. Maintains a special flood protection library for publications and materials concerning flood protection at the Birmingham Library.
6. Assures open space preservation of approximately 1,200 acres of park land / open space located in the floodplain.
7. Acquires and relocates floodplain properties through various acquisition and relocation projects.
8. Enforces A-1 low density zoning of 1 acre minimum lot area for portions of the floodplain, as is called for in the Zoning Ordinance.
9. Provides / performs for computerized flood data maintenance via GIS.
10. Provides for some stormwater management capabilities via the *Soil Erosion and Sediment Control Ordinance*.
11. Conducts a comprehensive program for drainage system maintenance.

To further improve the CRS Rating, the City can undertake additional initiatives, resulting in accumulation of additional CRS credit. **Table 10.1** outlines the CRS credit requirements for improving the CRS rating to Class 6 and Class 5 along with the points needed for the City to reach each Class, based on the City's current CRS standing.

Table 10.1
CRS Requirements

Point Range	CRS Class	Points Needed to Reach Class
1,500 – 1,999	7	0
2,000 – 2,499	6	328
2,500 – 2,999	5	828

Numerous projects / initiatives can be undertaken to receive additional CRS credit. However, not all of the initiatives would work well for the City of Birmingham. The following is a list of some possible future efforts for CRS recognition that can be considered. Although this list is not all encompassing, it does give a general indication of what is available and may be appropriate for the City.

1. Complete and approve the Flood Mitigation / Stormwater Management Plan.

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2. Create a flood protection website, including linking GIS to the web page along with other information, such as SWMA; the Department of Planning, Engineering and Permits; and FEMA's web pages.
3. Coordinate with the ADECA and the Office of Water Resources (OWR) on the Map Modernization Program (MMP) for flood data maintenance.
4. Coordinate with the Jefferson County, Alabama Natural Hazards Mitigation Plan and the State of Alabama Hazard Mitigation Plan, especially in the identification and mitigation of critical facilities.
5. Link retrofitting and flood proofing information to a central website.
6. Expand the flood threat recognition system that is currently in place, i.e. the ALERT System, and link it to a central website, provide effective dissemination of real-time data.
7. Become a recognized National Weather Service Storm Ready Community.

Table 10.2 expands on the possible actions to be taken by the City for CRS credit, listing Potential Actions, along with an estimate of possible CRS Credit that may be awarded for such an initiative. Based on these Potential Actions, near and long term strategies can be developed such that the City of Birmingham moves toward a CRS Class Rating of 6 and ultimately, a CRS Class Rating of 5.

Table 10.2
CRS Class Rating

POTENTIAL ACTION	ESTIMATED POSSIBLE CRS CREDIT
Create Floodplain Management Plan	200
Create a Stormwater Management Master Plan for watersheds, Develop a Stormwater Management / BMP Handbook.	95
Coordinate with the Map Modernization Program ongoing in the State – Become a Cooperating Technical Partner through SWMA	50
Outreach efforts in line with Program Strategy from Flood Mitigation / Stormwater Management Plan, such as Community workshops to promote the available flood protection measures	60
Regulate Freeboard for new buildings in B,C,D & X Zones (Zoning &, Stormwater Management Ordinances)	50
Fund additional flood studies that result in new flood elevation data, etc. (If FEMA assists with funding)	50
Require Stormwater Management Regulations	
<ul style="list-style-type: none"> Based on at least all development being regulated except for parcels of 0.5 acres or less or increases in impervious area of <10,000 square feet 	5

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POTENTIAL ACTION	ESTIMATED POSSIBLE CRS CREDIT
<ul style="list-style-type: none"> Use, or continue to use, a Design Storm of at least a 10 YR Storm, preferably greater (25-100 YR) (Stormwater Management Ordinance, Subdivision Regulations & Design Guidelines) 	30
Implement Stream Restoration Efforts	10
Require Enhanced Land Development Criteria, including Low Density Zoning (Zoning Ordinance, Subdivision Regulations)	50
Meet with Birmingham Realtors Association to put together information that can be provided to prospective buyers & require disclosure of flood hazard	10
Implement a model floodplain ordinance (Jefferson County or similar) (Floodplain Ordinance, Subdivision Regulations, Zoning Ordinance)	
<ul style="list-style-type: none"> Require more restrictive floodway standard 	50
<ul style="list-style-type: none"> Implement Enclosure Limits (such as Non Conversion Agreements) 	50
<ul style="list-style-type: none"> Prohibit all fill in the floodway, and/or require that any fill within the 100-Year floodplain be offset with equal fill displacement in the floodplain 	70
<ul style="list-style-type: none"> Require a more restrictive freeboard requirement (1.5' to 3') 	100
<ul style="list-style-type: none"> Require protection of critical facilities 	75
Create a Website with information on Flood Mitigation / Stormwater Management	30
<ul style="list-style-type: none"> Add flood protection references, flood insurance information, etc. 	
<ul style="list-style-type: none"> Provide links to the City's official website, FEMA and SWMA's site 	
Fully institute a Flood Warning System, including the integration & automation of the ALERT System on all major streams	60
<ul style="list-style-type: none"> Add additional stream gages and weather stations @ strategic locations as well as video cameras to select gage sites 	
Establish adopted plan on warning notification including established notifications means such as sirens, door- to-door notification, Emergency ALERT System, as well as implement the following new initiatives:	45
<ul style="list-style-type: none"> Link ALERT System notification and predictive and real time information to website 	
<ul style="list-style-type: none"> Provide real time mapping capabilities of flooded areas in high hazard locations on proposed website 	
Become recognized as a NWS Storm Ready Community	25
Prepare a model flood preparedness plan for critical facilities and coordinate warning efforts	30
Develop a detailed Post-Disaster Recovery Plan	50
Acquisition for Flood Mitigation	50
Dam Safety Program	75
Dam Safety Response Plan	100
Acquisition associated with 3 new Federal Grants	75

The near term goal for the City of Birmingham, as it relates to the CRS Program, is to move from a CRS Class 7 to a CRS Class 6. To do this, the City must implement programs that will facilitate the receipt of at least an additional 328 credit points. In the long term, the City should implement programs that will facilitate a CRS Class adjustment from a Class 6 to a Class 5. This latter adjustment requires obtaining at least an additional 500 CRS points (in addition to the 328 points obtained from the

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adjustment from the Class 7 to the Class 6). **Tables 10.3** and **10.4** identify near and long-term actions, respectively, that should be considered to obtain the stated goals.

Table 10.3
Near-Term Priorities

Action	Estimated Possible CRS Credit
Floodplain Management Plan	200
Create Website	30
Outreach Efforts Program Strategy – Ex. Community mailings, workshops on protection measures, flood warning and safety	60
Institute a Flood Warning System that includes the integration and automation of the ALERT System on Village Creek and other streams	60
Establish a Notification Plan that includes established methods as well as dissemination of information from the ALERT system via a website.	45
Acquisition for Flood Mitigation	50
TOTAL	445

Table 10.4
Long-Term Priorities

Action	Estimated Possible CRS Credit
Become a NWS Storm Ready Community	35
Coordinate with the Map Modernization Program	50
Create a model Stormwater Management Master Plan for Village Creek	95
Implement model floodplain ordinance	350
Develop a Post-Disaster Recovery Plan	50
Dam Safety Program	75
Dam Safety Response Plan	100
Acquisition associated with 3 new Federal Grants	75
TOTAL	830

10.9 Potential Funding Sources for Plan Implementation

Because the Flood Mitigation / Stormwater Management Plan addresses a broad spectrum of mitigation issues, there is a need for a variety of funding sources. Funding often times comes from an assortment of sources, including the Federal, State and local governments in addition to private funding opportunities.

10.9.1 Federal Funding

Identified Federal funding sources include funding programs available through the Federal Emergency Management Agency (FEMA), the United States Army Corps of Engineers (USACE), the Department of Housing and Urban Development (HUD), the Department of Agriculture (DOA), Natural Resources and Conservation (NRCS), and the National Oceanographic and Atmospheric Administration (NOAA). The following is a list of applicable Federal assistance programs, which should be considered.

Federal Emergency Management Agency (FEMA)

1. *Hazard Mitigation Grant Program (HMGP)*

Program authorized under Section 404 of the Robert T. Stafford Act, providing grants to State and local governments involved in long-term hazard mitigation planning and measures following a presidentially declared disaster. The Federal share of any project shall not exceed 75% of the total eligible program costs.

- a. 5% HMGP Initiative [existing source of funding] – Initiated by FEMA in 1996. This program / policy established that up to 5% of the total HMGP funds for open and future disaster declarations are made available for the state to use on hazard mitigation measures that are difficult to evaluate against traditional program cost-effectiveness criteria. Currently, all available 5% HMGP funds for the State of Alabama are being utilized to fund a statewide warning and communication project, resulting in enhanced warning, communication and response capabilities statewide.
- b. 7.5% Public Assistance Funding [existing source of funding] – Section 404 of the Robert T. Stafford Act was amended by the Hazard Mitigation and Relocation Assistance Act of 1993. Later, in 2003, as a result of the Consolidation Appropriations Resolution, the amount of available funding for mitigation projects became 7.5% of the public and individual assistance programs.
- c. 7% Planning Grants [existing source of funding] – For all Presidential declared disasters with open application periods on or after November 13, 1999, the Disaster Mitigation Act of 2000 (DMA 2000) authorizes Grantees to use up to 7% of HMGP funds available to develop State, local or Tribal government mitigation plans.

2. *Pre-Disaster Mitigation Grants (PDM)* [existing source of funding]

Pre-Disaster Mitigation Grants focus primarily on planning and mitigation activities implemented prior to a disaster occurring. All PDM applicants, if they have been identified through the National Flood Insurance Program (NFIP) as having a Special Flood Hazard Area (SFHA), must be participating in the NFIP, to be eligible for funding. Grants are available for two types of actions; mitigation planning and mitigation projects.

3. *Disaster Resistant University Grants* [existing source of funding]

The Federal Register states “FEMA will provide PDM funds to assist universities, through State and local governments, to implement a sustained pre-disaster natural hazard mitigation program to reduce overall risk to facilities, research assets, students and faculty.”

4. *Flood Mitigation Assistance Program (FMA)* [existing source of funding]

The National Flood Mitigation Fund provides grants to local and State jurisdictions on a 75/25 cost share basis, for planning and implementation of mitigation projects. Examples of mitigation projects include acquisition, elevation, relocation, flood-proofing, and technical assistance. The enabling legislation specifically excludes large scale structural flood control projects from receiving this type of funding. It is the goal of the FMA to reduce or eliminate claims under the National Flood Insurance Program.

United States Army Corps of Engineers (USACE)

The USACE provides several Federal assistance programs applicable to hazard mitigation including:

1. *General Investigation Studies* [existing source of funding]

These studies require local cost sharing of 50%. As of the time this document went to publication, qualified projects can receive up to 75% Federal funding.

2. *Continuing Authorities* [potential source of funding]

This program allows the USACE to take action on water resource projects under a specific dollar amount. For these projects, a feasibility study would be performed. Local cost shares for these studies vary from 0 to 50%.

Projects deemed cost-effective in which a Federal interest is established could qualify for up to 75% Federal funding. Specific Continuing Authorities programs applicable to hazard mitigation include:

- a. Section 205 – General small flood drainage / control projects [potential source of funding].
 - i. Study costs include:
 - First \$100,000 – 100% Federal Share
 - Any amount over \$100,000 – 50/50 Federal / Non-Federal Share
 - ii. Project costs include:
 - 35-50% of total project costs paid by Non-Federal – 5% in cash
 - \$7,000,000 maximum Federal costs
 - Non-Federal entity operates and maintains the project
- b. Section 206 – Aquatic Ecosystem restoration and protection projects, including design, planning and construction [potential source of funding].

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- i. Study costs include:
 - 65/35 Federal / Non-Federal Share
 - ii. Project costs include:
 - 35% of total project costs paid by Non-Federal
 - \$5,000,000 maximum Federal costs
 - Non-Federal entity operates and maintains the project
- c. Section 208 – Water way clearing and snagging projects [potential source of funding].
- i. Study costs include:
 - First \$40,000 – 100% Federal Share
 - Any amount over \$40,000 – 65/35 Federal / Non-Federal Share
 - ii. Project costs include:
 - 35-50% of total project costs paid by Non-Federal – 5% in cash
 - \$500,000 maximum Federal costs
 - Non-Federal entity operates and maintains the project
- d. Section 14 – Emergency stream bank and shoreline protection [potential source of funding].
- i. Study costs include:
 - First \$40,000 – 100% Federal Share
 - Any amount over \$40,000 – 65/35 Federal / Non-Federal Share
 - ii. Project costs include:
 - 35% of total project costs paid by Non-Federal – 5% in cash
 - 65% of total project costs paid by Federal
 - \$1,000,000 maximum Federal costs
 - Non-Federal entity operates and maintains the project
- e. Section 1135 – Environment restoration projects where a Corp project contributed to the deprivation of the environment [potential source of funding].
- i. Study costs include:
 - 75/25 Federal / Non-Federal Share
 - ii. Project costs include:
 - 25% of total project costs paid by Non-Federal
 - \$5,000,000 maximum Federal costs
 - Non-Federal entity operates and maintains the project
- f. Floodplain Management Services – Education and planning services for flood hazards and floodplain management [potential source of funding].
- i. Study costs include:

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- 100% Cost Recovery from non-water resource agencies and private sector
- 0% cost to State, regional, local governments and Non-Federal public agencies
- ii. Project costs include:
 - Studies, generally cost \$10,000 - \$25,000
- g. Planning Assistance to State – Comprehensive Plan development relating to the development, utilization and conservation of water and related land resources [potential source of funding].
 - i. Study costs include:
 - 50/50 Federal / Non-Federal Share
 - ii. Project costs include:
 - Federal Share generally \$25,000 - \$75,000
 - \$500,000 maximum annual Federal allotment per state / tribe
- 3. *Congressional Authorization (Major Civil Works Projects)* [existing source of funding]

Feasibility studies for major civil works projects undertaken by the USACE that indicate Federal interests (benefit / cost ratio greater than 1:1) may be funded through Congressional Authorization of the proposed program. This is currently being utilized for Village Creek Watershed study.

United States Department of Housing and Urban Development (HUD)

Current sources of funding:

1. *Community Development Block Grants (CDBG)* [existing source of funding]

This program allows for the distribution of grant money for the development of viable communities, principally for low and moderate income communities and neighborhoods. Community development can be accomplished through housing, suitable living environments and the expansion of economic opportunities. Activities that are eligible for funding under State administered CDBG include, but are not limited to acquisition of property for public purposes; construction of public facilities; and planning activities.

2. *Section 312 Loan Program* [potential source of funding]

This program provides funds for the rehabilitation of residential and non-residential properties, including flood repair and flood proofing.

3. *Rental Rehabilitation Program* [potential source of funding]

Through this program, funds are made available for rehabilitation of rental properties including flood proofing and repair of flood damage.

United States Department of Agriculture (DOA) – Natural Resource Conservation Service (NRCS)

1. *Emergency Watershed Protection* [potential source of funding]

In watersheds damaged by severe natural events, this program provides assistance to reduce hazards to life and property. If funds are available, NRCS can provide 100% of the cost of emergency situations and 80% of the cost of non-emergency situations.

United States Economic Development Administration (EDA)

1. *Public Work Grants* [potential source of funding]

These grants are given to public and private non-profit organizations as well as to Indian Tribes for the building or expansion of public facilities that are essential to industrial and commercial growth.

2. *Technical Assistance Grants* [potential source of funding]

Funding is made available through these grants to communities and firms for economic feasibility studies of resource development in the establishment of jobs. The funding also provides on-site support for innovative economic development techniques.

3. *Planning Grants* [potential source of funding]

Funding available through planning grants to pay for the expertise needed to plan, coordinate and implement comprehensive economic development programs.

4. *University Center Program Grants* [potential source of funding]

These grants are awarded to colleges and universities to utilize available resources to provide technical assistance to clients and address the economic development problems and opportunities of their service area.

5. *Revolving Loan Fund Grants* [potential source of funding]

This funding is aimed at helping depressed areas overcome specific capital market gaps and to encourage greater private sector participation in economic development

activities. In concert with private lenders, RLF grantees make fixed asset and/or working capital loans to area businesses.

6. *Economic Adjustment Program Grants* [potential source of funding]

Assist State and local governments in solving recent and anticipated severe adjustment problems, resulting in abrupt and serious job losses and to help areas implement strategies to reverse and halt long-term economic deterioration, i.e. natural disasters and military installation closures.

10.9.2 State and Local Funding

The State of Alabama currently funds two State agencies that are involved in hazard mitigation activities.

1. *Alabama Emergency Management Agency (AEMA)*

AEMA receives State funds for efforts related to the administration and operations of the Federal disaster funding programs at a State level, in addition to disaster response. These funds are not available at the local level.

2. *Alabama Department of Conservation and Natural Resources (DCNR), Office of Water Resources*

The Office of Water Resources (OWR) currently administers the NFIP program and related CRS program for the State of Alabama. OWR receives funding from the State for the NFIP. Currently, the Federal / local share split is 75% Federal / 25% State. The State of Alabama provides the 25% match through cash or in-kind contributions. These funds are not available at the local level.

From a local funding perspective, there are two primary initiatives. The City of Birmingham currently has a near-term capital improvement program, based on bond issue proceeds. Approximately \$12 million of the bond issue proceeds have been committed to drainage-related improvements including primarily mid to small scale upgrades to the urban storm sewer system. Jefferson County plans to provide \$2 million annually for flood mitigation related projects, which is to be distributed among Jefferson County and the numerous participating municipalities within the County.

The City of Birmingham provides local matching funds for FEMA, USACE and other Federal grant programs awarded to the City.

The City of Birmingham also provides funding for maintenance and operation of the entire urban stormwater drainage system within the City through the Department of Public Works. The City also participates in providing their pro-rata share of funding for the SWMA operations.

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10.10 Action Item and Implementation Schedule

**Table 10.5
Immediate-Term Action Item and Implementation Schedule (2005)**

Description of Action	Related Strategy / Action	Lead Implementation Agency	Implementation Time Frame	Potential Funding Sources	Estimated Budget / Cost to Implement
Begin implementation of Repetitive Loss Strategy by identifying RLPs relevant to location in floodway, floodplain, and outside floodplain. Evaluate relevant property protection measures and prioritize RLP for action.	Property Protection 10.2.2	PEP	2005	FMA, PDM HMGP	Staff Time
Begin implementation of three awarded Flood Mitigation Grants for acquisition (includes one HMGP and two PDM grants)	Property Protection 10.2.1	PEP	2005 - 2007	HMGP, PDM	Staff Time plus \$8 Million
Develop a planning process associated with Acquisition and Relocation Projects	Property Protection 10.2.1 Item 2	PEP/Community Development	2005 - 2007	N/A	Staff Time plus \$40,000 Consultant Assistance
Prepare and submit HMGP or PDM Planning Grant for Stormwater Infrastructure – Floodplain Structure Hazard Mitigation Survey Phase I.	Structural 10.4.1	PEP	2005	HMGP, PDM	Staff Time
Continue coordination with USACE on the Village Creek/ Upper Shades Creek Feasibility Studies and identify flood reduction alternatives for incorporation into the Capital Improvements Program for flood control.	Structural 10.4.1	PEP	2005	USACE City of Birmingham	Staff Time, Local Match Requirements to be determined

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Table 10.5
Immediate-Term Action Item and Implementation Schedule (2005)

Description of Action	Related Strategy / Action	Lead Implementation Agency	Implementation Time Frame	Potential Funding Sources	Estimated Budget / Cost to Implement
Develop a detailed qualitative review of proposed benefits and impacts associated with the proposed Jefferson County Model Floodplain Ordinance and the planned modifications to the existing City of Birmingham Floodplain Ordinance.	Preventative 10.1.1	PEP	2005	City of Birmingham	Staff Time plus \$25,000 for Consultant Assistance
Coordinate with JCEMA, SWMA and Alabama Office of Water Resources to complete Interim Floodplain Map Modernization update using best available data.	Prevention 10.1.1, Item 1d	JCEMA with OWR, PEP	2005	FEMA, Map Modernization Program, OWR	Staff Time
Implement the Public Information Program Strategy. Immediate Term Actions will include: A) Preparation of materials and presentation for community workshop to address: <ul style="list-style-type: none"> Property Protection and Flood Proofing Techniques Funding Opportunities Education on the Flood Warning System, "ALERT" Methods, process and response time to report flooding and maintenance needs. B) Prepare and Distribute Flood Information Brochure on the Floodplain Review and Permitting Process C) Develop a brochure defining the methods, process, protocols and response times associated with citizens reporting flooding or drainage system maintenance problems. D) Continue coordination efforts with the Citizen Participation Program to promote the dissemination of flood related information.	Public Information 10.6.1 10.6.1, Item 2	PEP with JCEMA	2005	HMGP, PDM, City of Birmingham	Staff Time, \$10,000 Reproduction and Advertising \$15,000 Consultant Assistance

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**Table 10.5
Immediate-Term Action Item and Implementation Schedule (2005)**

Description of Action	Related Strategy / Action	Lead Implementation Agency	Implementation Time Frame	Potential Funding Sources	Estimated Budget / Cost to Implement
<p>Improve the CRS rating from 7 to 6 by initiating the near-term priorities identified in the CRS Program Review.</p> <p>Task includes develop and submit relevant information to CRS Program. Key areas to coordinate to receive needed credit include:</p> <ul style="list-style-type: none"> • Flood Warning System/ Notification Plan • Completed Acquisition Projects • Flood Mitigation/ Stormwater Management Plan 	<p>CRS Program Review 10.8, Table 10.3</p>	<p>PEP</p>	<p>2005</p>	<p>N/A</p>	<p>Staff Time</p>
Establishment of a Flood Mitigation Committee	Plan Maintenance 10.11	PEP	2005	City of Birmingham	Staff Time

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**Table 10.6
Near-Term Action Item and Implementation Schedule (2005-2007)**

Description of Action	Related Strategy / Action	Lead Implementation Agency	Implementation Time Frame	Potential Funding Sources	Estimated Budget / Cost to Implement
Incorporate enhanced open-space requirements including vegetated buffers into Zoning Ordinance.	Prevention 10.1.1, Items 1a & 1b	PEP	2006-2007	N/A	Staff Time
Prepare flood mitigation project grant applications for identified high-priority properties in the floodway for acquisition.	Property Protection 10.2.2	PEP	2005	FMA, PDM HM/GP	Staff Time
Decide on adoption of model Floodplain Ordinance from Jefferson County.	Prevention 10.1.1, Item 1c	PEP	2005-2006	N/A	Staff Time
If Jefferson County model Floodplain Ordinance is not adopted, modify the existing Floodplain Ordinance or develop a new Floodplain Ordinance consistent with strategies outlined in 10.1.1 Item c.	Prevention 10.1.1, Item 1c	PEP	2005 - 2006	N/A	Staff Time
Initiate enhanced Floodplain Map Modernization Program through H&H model updates by primary watershed / stream. <ul style="list-style-type: none"> • Village Creek • Upper Shades Creek 	Prevention 10.1.1, Item 1d 10.1.2 10.1.2	PEP PEP PEP	2006-2007	FEMA, Map Modernization Program, OWR, USACE	\$600,000
Develop Stormwater Management / BMP Handbook.	Prevention 10.1.1, Item 2a Stormwater Management 10.7, Item 3	PEP	2005 - 2006	HMPG, FMA, PDM	\$250,000

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**Table 10.6
Near-Term Action Item and Implementation Schedule (2005-2007)**

Description of Action	Related Strategy / Action	Lead Implementation Agency	Implementation Time Frame	Potential Funding Sources	Estimated Budget / Cost to Implement
Develop Interim Stormwater Management Policies consistent with provision outlined in 10.1.1, Item 2c.	Prevention 10.1.1, Item 2c Stormwater Management 10.7, Item 2 Property Protection 10.2.1	PEP	2006	City of Birmingham HMGP, PDM	Staff Time plus \$25,000 for Consultant Assistance Staff Time
Continue implementation of 3 awarded Flood Mitigation Grants for acquisition	Property Protection 10.2.1	PEP	2006-2007	HMGP, PDM	Staff Time
Modify <i>Subdivision Regulations and Engineering Design Guidelines for Subdivisions and Commercial Development</i> consistent with provisions outlined in 10.1.1, Item 3a and 3c.	Prevention 10.1.1, Items 3a & 3c Natural Resource Protection 10.5.1, Item 3	PEP	2006 - 2007	N/A	Staff Time plus \$25,000 for Consultant Assistance
Consider incorporating the provision requiring that all development outside of the SFHA be elevated a minimum of 1'-0" to 1'-6" above the crown of the adjacent roadway, where feasible.	Prevention 10.1.1, Item 3b	PEP	2006 - 2007	N/A	Staff Time
Consider adoption of the 2000 International Building Codes.	Prevention 10.1.1, Item 4	PEP	2007	N/A	Staff Time
Require a Certificate of Occupancy or a Certificate of Completion, whichever is applicable, be issued for all floodplain building and utility development.	Prevention 10.1.1, Item 4	PEP	2006 - 2007	N/A	Staff Time

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**Table 10.6
Near-Term Action Item and Implementation Schedule (2005-2007)**

Description of Action	Related Strategy / Action	Lead Implementation Agency	Implementation Time Frame	Potential Funding Sources	Estimated Budget / Cost to Implement
Re-evaluate existing <i>Parking Ordinance</i> and consider incorporation of provisions included in 10.1.1, Item 5.	Prevention 10.1.1, Item 5	PEP	2006 - 2008	N/A	Staff Time plus Consultant Services \$25,000
Modify and improve existing <i>Landscape Requirements</i> to include provisions for Flood Mitigation and Stormwater Management consistent with 10.1.1, Item 6.	Prevention 10.1.1, Item 6	PEP	2007 - 2008	N/A	Staff Time plus Consultant Services \$25,000
Prepare grant applications and submit for second and third priority RLP properties and identify mitigation measures.	Property Protection 10.2.2	PEP	2006 – 2008	HMGF, FMA, PDM	Staff Time
Prepare and submit HMGF or PDM Planning Grant for Stormwater Infrastructure Floodplain Structure Hazard Mitigation Survey Phase II.	Structural 10.4.1	PEP	2006	HMGF, PDM	Staff Time
Continue to Develop a planning process associated with Acquisition and Relocation Projects to minimize community disruption and loss of population, identify comparable housing within the City, provide incentives to relocate in the City and address the reuse of acquired property.	Property Protection 10.2.1, Item 2	PEP / Community Development	2006 - 2007	N/A	N/A
Continue property acquisitions in all current and past FEMA and USACE acquisition project areas to maintain neighborhood character and continuity as well as to accomplish open space planning objectives for each area.	Property Protection 10.2.1, Item 3a	PEP	Continue through Near-Term	FEMA Mitigation Grants (PDM, HMGF, FMA)	Staff Time \$1 Million Annually

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**Table 10.6
Near-Term Action Item and Implementation Schedule (2005-2007)**

Description of Action	Related Strategy / Action	Lead Implementation Agency	Implementation Time Frame	Potential Funding Sources	Estimated Budget / Cost to Implement
Provide financial assistance to acquire flood prone buildings and properties; emphasis should be on pre-FIRM residential buildings, repetitive loss properties, floodway properties, and critical facilities.	Property Protection 10.2.1, Item 3b	PEP	Continue over 10-year horizon	FEMA Mitigation Grants (PDM, HMGP, FMA)	Staff Time \$1 Million Annually
Provide financial assistance to elevate buildings to protect against flood damage; emphasis should be on certain buildings, where acquisition or relocation is not feasible, or that were constructed before the enactment of floodplain regulations (pre-FIRM buildings).	Property Protection 10.2.1, Item 3c	PEP	Continue over 10-year horizon	FEMA Mitigation Grants (PDM, HMGP, FMA)	Staff Time \$500,000 Annually
Develop a local flood mitigation assistance program focused on providing flood mitigation services and programs for flood prone properties affected by non-presidential declared disasters and non-emergency related disaster declarations. This program should offer services such as technical assistance, public information, disaster relief assistance in the form of grants for utility and structure protection, and small-scale drainage control projects, etc.	Property Protection 10.2.1, Item 3d	PEP	2006 - 2007	FEMA Mitigation Grants. City of Birmingham	Staff Time \$500,00 Annually
Improve Flood Warning System by developing predictive model for instrumented streams. <ul style="list-style-type: none"> Village Creek (complete) Upper Shades Creek Five Mile Creek 	Emergency Services 10.3.2, Item 1	JCEMA	Complete 2006 2007	5% HMGP	\$100,000 \$125,000

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**Table 10.6
Near-Term Action Item and Implementation Schedule (2005-2007)**

Description of Action	Related Strategy / Action	Lead Implementation Agency	Implementation Time Frame	Potential Funding Sources	Estimated Budget / Cost to Implement
Add additional stream gages and weather stations to enhance ALERT system.	Emergency Services 10.3.2, Item 2	JCEMA	2006 - 2007	5% HMPG	\$50,000
Develop detailed real-time information dissemination program relevant to the ALERT system. Evaluate Reverse 911 Program.	Emergency Services 10.3.2, Item 4	JCEMA	2005 - 2006	5% HMPG	Staff Time
Identify and prioritize critical facilities located in flood hazard area with highest risk.	Emergency Services 10.3.2, Item 5	PEP	2005 - 2006	HMGF, PDM	\$100,000
Begin development of a mid to long-term Capital Improvement Program for structural flood reduction improvements by developing: <ul style="list-style-type: none"> Calibrated H&H models suitable for evaluation of flood reduction alternatives and initiate basin wide flood reduction assessments on Valley Creek and Five Mile Creek. These feasibility level studies should incorporate stream / ecological restoration alternatives. 	Structural 10.4.1, Items 2 & 3 Natural Resource Protection 10.5.1, Item 4	PEP and Jefferson County	Initiate requests for funding in 2005 - 2006, Process will continue over 5-year horizon	FEMA, USACE	\$1.5 Million per basin
Implement Phase I of the proposed Stormwater Infrastructure – Floodplain Structure Hazard Mitigation Survey. Include an inventory of primary and secondary drainage channels and determine need of public access easements for maintenance.	Structural 10.4.1, Items 4	PEP	2006 - 2007	FEMA, HMGF, USACE	\$1.25 Million
Develop protocol for regional coordination among municipalities regarding conducting flood reduction studies and projects.	Stormwater Management 10.7, Item 4	SWMA	2005 - 2006	N/A	Staff Time

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**Table 10.6
Near-Term Action Item and Implementation Schedule (2005-2007)**

Description of Action	Related Strategy / Action	Lead Implementation Agency	Implementation Time Frame	Potential Funding Sources	Estimated Budget / Cost to Implement
Implement the Public Information Program Strategy as defined in 10.6.1. Specific actions include:	Public Information 10.6.1	PEP	2005		Consultant Assistance \$25,000
<ul style="list-style-type: none"> Develop flood protection / mitigation website Conduct community workshops in flood prone neighborhoods Prepare and distribute brochures on the floodplain review and permitting process, flood mitigation process for repetitive loss properties, and methods, process, protocols and response time associated with citizens complaints and reports of flooding or maintenance needs Meet with Birmingham Realtors Association to investigate means of disclosing flood hazards Prepare model Flood Preparedness Plan for businesses and conduct workshops. Designate a Flood Awareness Month where Flood Preparedness and Protection are highlighted. Coordinate outreach efforts with local utility service providers' information programs. Develop an informational program to inform and teach students in local schools about flooding and flood safety measures. 	10.6.1, Item 1 10.6.1, Item 2 10.6.1, Items 3, 4, & 5	PEP PEP PEP	2005 2005 2005 - 2006	City of Birmingham	Staff Time Staff Time Staff Time plus Reproduction
	10.6.1, Item 7	PEP	2005		Staff Time
	10.6.1, Item 8	PEP / Economic Development	2005 – 2006		Staff Time
	10.6.1, Item 10	PEP / Mayor's Office	2005 - 2006		Staff Time
	10.6.1, Item 12	PEP	2006 - 2007		Staff Time
	10.6.1, Item 13	PEP	2006 - 2007		Staff Time

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**Table 10.6
Near-Term Action Item and Implementation Schedule (2005-2007)**

Description of Action	Related Strategy / Action	Lead Implementation Agency	Implementation Time Frame	Potential Funding Sources	Estimated Budget / Cost to Implement
Expand the Greenways Planning Program by developing a Floodway to Greenway Conversion Program. Initiate this process by updating the Master Plan for Greenways.	Natural Resource Protection 10.5.1, Items 1 & 2	PEP	2005 2006	FEMA, HMGP or USACE	\$150,000
Improve the CRS rating from 6 to 5 by instituting the long-term priorities identified in the CRS Program Review.	CRS Program Review 10.8, Table 10.4	PEP	2006 - 2008	N/A	Staff Time

**Table 10.7
Mid to Long-Term Action Item and Implementation Schedule (2008 – 2014)**

Description of Action	Related Strategy / Action	Lead Implementation Agency	Implementation Time Frame	Potential Funding Sources	Estimated Budget / Cost to Implement
Initiate enhanced Floodplain Map Modernization Program through H&H model updates by primary watershed / stream.	Prevention 10.1.1, Item 1d				
<ul style="list-style-type: none"> Five Mile Creek Volley Creek Cahaba River and Tributaries 	10.1.2	PEP PEP PEP	2007-2008 2008 2009-2010	FEMA, Map Modernization Program, OWR, USACE	\$300,000 \$300,000 \$500,000
Complete reevaluation of existing Parking Ordinance and consider incorporation of provisions included in 10.1.1, Item 5	Prevention 10.1.1, Item 5	PEP	2008	N/A	Staff Time

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**Table 10.7
Mid to Long-Term Action Item and Implementation Schedule (2008 – 2014)**

Description of Action	Related Strategy / Action	Lead Implementation Agency	Implementation Time Frame	Potential Funding Sources	Estimated Budget / Cost to Implement
Identify unstudied streams for which no delineation of SFHA has been defined and limited studied streams and incorporate into Map Modernization Program and incorporate into Map Modernization Program.	Prevention 10.1.1, Item 1d Structural 10.4.1, Item 7	PEP	2006 - 2010	FEMA, Map Modernization Program, OWR, USACE	\$500,000
Develop Stormwater Management Ordinance including provisions noted in 10.1.1, Item 2b.	Prevention 10.1.1, Item 2b Stormwater Management 10.7, Item 1	SWMA in coordination with PEP	2006 - 2009	N/A	Staff Time
Continue property acquisitions in all current and past FEMA and USACE acquisition project areas to maintain neighborhood character and continuity as well as to accomplish open space planning objectives for each area. (CONTINUED FROM NEAR-TERM)	Property Protection 10.2.1, Item 3a	PEP	Continue through Mid to Long Term	FEMA Mitigation Grants (PDM, HMGP, FMA)	Staff Time
Provide financial assistance to acquire flood prone buildings and properties; emphasis should be on pre-FIRM residential buildings, repetitive loss properties, floodway properties, and critical facilities. (CONTINUED FROM NEAR-TERM)	Property Protection 10.2.1, Item 3b	PEP	Continue over 10-year horizon	FEMA Mitigation Grants (PDM, HMGP, FMA)	Staff Time
Provide financial assistance to elevate buildings to protect against flood damage; emphasis should be on certain buildings, where acquisition or relocation is not feasible, or that were constructed before the enactment of floodplain regulations (pre-FIRM buildings). (CONTINUED FROM NEAR-TERM)	Property Protection 10.2.1, Item 3c	PEP	Continue over 10-year horizon	FEMA Mitigation Grants (PDM, HMGP, FMA)	Staff Time

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**Table 10.7
Mid to Long-Term Action Item and Implementation Schedule (2008 – 2014)**

Description of Action	Related Strategy / Action	Lead Implementation Agency	Implementation Time Frame	Potential Funding Sources	Estimated Budget / Cost to Implement
Improve Flood Warning System by developing predictive model for instrumented streams. <ul style="list-style-type: none"> • Valley Creek • Cahaba River and Tributaries 	Emergency Services 10.3.2, Item 1	JCEMA	2008 - 2010 2008 - 2010	5% HMPG	\$125,000 \$125,000
Link real-time flood information data to City and SWMA GIS System.	Emergency Services 10.3.2, Item 3	JCEMA	2008 -2010	5% HMPG	\$25,000
Begin development of a mid- to long-term Capital Improvement Program for structural flood reduction improvements by developing: <ul style="list-style-type: none"> • Calibrated H&H models suitable for evaluation of flood reduction alternatives and initiate feasibility studies on Cahaba River and tributaries and other unstudied streams. These feasibility studies should incorporate stream / ecological restoration alternatives. (CONTINUED FROM NEAR-TERM)	Structural 10.4.1, Items 2 & 3 Natural Resource Protection 10.5.1, Item 4	PEP and Jefferson County	Initiate requests for funding in 2005, Process will continue over 10-year horizon	FEMA, USACE	To Be Determined
Implement program to acquire public access / maintenance easements for critical open drainage channels that currently do not have public access.	Structural 10.4.1, Item 4	Public Works	2008 - 2015	City of Birmingham, Black Warrior / Cahaba Rivers Land Trust, FEMA Grant Programs	To Be Determined

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**Table 10.7
Mid to Long-Term Action Item and Implementation Schedule (2008 – 2014)**

Description of Action	Related Strategy / Action	Lead Implementation Agency	Implementation Time Frame	Potential Funding Sources	Estimated Budget / Cost to Implement
Improve the CRS rating from 6 to 5 by instituting the long-term priorities identified in the CRS Program Review. (CONTINUED FROM NEAR-TERM)	CRS Program Review 10.8, Table 10.4	PEP	2006 – 2008	N/A	To Be Determined
Complete grant applications and submit for second and third priority RLP properties and identify mitigate measures	Property Protection 10.2.2	PEP	2008	HMGF, FMA, PDM	Staff Time
Complete modifications and improvements to existing Landscape Requirements to include provisions for Flood Mitigation and Stormwater Management consistent with 10.1, Item 6	Prevention 10.1.1, Item 6	PEP	2008	N/A	Staff Time

10.11 Plan Evaluation and Maintenance

A Flood Mitigation / Stormwater Management Plan is a living document and should not become stagnant. In order to remain effective, such a plan requires routine maintenance and updating. As part of its CRS participation, the City is required to perform plan evaluation maintenance updating activities.

To this end, a Flood Mitigation Committee should be established, where the goal of the committee would be to evaluate the effectiveness of the plan and its proposed actions, as well as to ensure that the plan stays current. The committee would be advisory only, with no formal powers, reporting to the Mayor. Membership would include the City's Floodplain Administrator; Director of Planning, Engineering and Permits; Director of Public Works representatives from land trusts such as the Black Warrior / Cahaba Rivers Land Trust; Jefferson County EMA Director; and others at the discretion of the Mayor or who may be interested.

In the initial months following the formal adoption of the Flood Mitigation / Stormwater Management Plan, the Flood Mitigation Committee would meet semi-regularly (i.e. monthly) in order to review and evaluate initial projects proposed in the document and determine if they are effectively being implemented. After that, the committee will meet on an annual basis to review the plan and any flooding that may have occurred in the previous year. It should be noted that by Federal Law, the Jefferson County, Alabama Natural Hazards Mitigation Plan is to be updated at least every 5 years. Material from that updated plan will need to be incorporated into this Flood Mitigation / Stormwater Management Plan, where applicable. A report of the review and evaluation will be created and submitted to the Mayor, including the following items:

- Action items accomplished in the previous calendar year;
- Evaluation of the implementation of those items;
- Action items that were not implemented and why; and
- Areas of the plan that may require formal revisions / updates.

The Department of Planning, Engineering and Permits is charged with supervising the implementation of the plan's action items, in accordance with priorities given.

10.12 Plan Adoption Resolution

The following draft resolution is recommended for adopting this Flood Mitigation / Stormwater Management Plan and establishing the Mitigation Committee.

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Resolution No. _____

Whereas the City of Birmingham has been faced with riverine and flash flooding and drainage problems over the years that have flooded buildings, closed businesses, disrupted traffic, and presented a general public health and safety hazard; and

Whereas the City's Flood Mitigation Planning Team has prepared a recommended *Flood Mitigation / Stormwater Management Plan* that reviews the City's options to reduce damage from flooding and stormwater problems; and

Whereas the recommended *Flood Mitigation / Stormwater Management Plan* has been presented for review to the City's residents, neighborhood groups, and state and regional agencies, and has been supported by those reviewers;

Now, therefore, be it resolved that:

1. The *Flood Mitigation / Stormwater Management Plan* is hereby adopted as an official plan of the City of Birmingham.
2. The Mitigation Committee is hereby established as a permanent advisory body.
 - a. The Committee members and its Chair shall be appointed by the Mayor, subject to the approval of the City Council.
 - b. Resident Committee members shall serve two year terms with one-half of the members' terms expiring each year.
 - c. The schedule of Committee meetings shall be posted in appropriate place. All meetings of the Committee shall be open to the public.
3. The Committee shall meet as often as necessary to prepare or review mitigation activities and progress toward implementing the *Flood Mitigation / Stormwater Management Plan*. It shall meet at least once each year to review the status of on-going projects.
4. By September 1 each year, the Committee shall prepare an annual evaluation report to the Mayor and the City Council on *the Flood Mitigation / Stormwater Management Plan*. The report will cover the following points:
 - A review of the original plan.
 - A review of any floods that occurred during the previous calendar year.
 - A review of the action items in the original plan, including how much was accomplished during the previous year.

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- A discussion of why any action items were not completed or why implementation is behind schedule.
 - Recommendations for new projects or revised action items. Such recommendations shall be subject to approval by this Council as amendments to the adopted plan.
5. The Committee should not restrict itself to only flood hazard mitigation. As time and interests become available, it should also investigate mitigation measures appropriate for tornadoes, landslides, sinkholes, and other hazards facing the City of Birmingham and Jefferson County.
6. The Floodplain Administrator is charged with supervising the implementation of the plan's recommendations within the funding limitations provided by the City Council or other sources. The Administrator shall give priority attention to those action items recommended by the Flood Mitigation / Stormwater Management Plan with the earliest deadlines.

ADOPTED this the _____ day of _____, 2004

President of the City Council of
The City of Birmingham, Alabama

ADOPTED this the _____ day of _____, 2004

Mayor of the City of Birmingham
Alabama

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11.0 ORGANIZATION, PROGRAM ROLES, AND ADMINISTRATION OF FLOODPLAIN / STORMWATER MANAGEMENT PROGRAM

11.1 Existing Organization, Program Roles and Responsibilities

The Floodplain / Stormwater Management effort for the City of Birmingham involves numerous Federal, State, County and City agencies. From the Federal perspective, FEMA, along with the National Oceanographic and Atmospheric Administration (NOAA), National Weather Service (NWS), and the United States Army Corps of Engineers (USACE) are primary coordinating agencies and funding partners. FEMA administers the NFIP program and related CRS program, as well as the Emergency Management Assistance Program. NOAA and the National Weather Service provide severe weather monitoring and warning services. The USACE, as part of its watershed management mission, provides programs for watershed management including flood control, wetlands protection and stream restoration, as well as numerous related Federal funding programs.

At the State level, primary participating and cooperating agencies include the Alabama Emergency Management Agency (AEMA) and the Alabama Department of Conservation and Natural Resources (DCNR), Office of Water Resources (OWR). AEMA administers the FEMA Federal disaster funding programs at the State level, in addition to disaster response. The OWR currently administers the NFIP program and related CRS program for the State of Alabama.

At the local level, the following county and city agencies participate or provide related services for the City of Birmingham's Floodplain / Stormwater Management Program.

Table 11.1
County and City Agencies Participating in the City of Birmingham's Floodplain / Stormwater Management Program

Municipality	Agency Name	Program Role
City of Birmingham	Department of Planning, Engineering & Permits	Administer NFIP, CRS and provide floodplain and watershed planning services, and public outreach role.
City of Birmingham	Department of Public Works	Provides maintenance and inspection for urban drainage system.

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Municipality	Agency Name	Program Role
City of Birmingham	Community Development and Division of Economic Development	Provides relocation advisory assistance, and some funding for assistance to floodplain properties.
City of Birmingham	Division of Economic Development	Facilitates interaction between staff and business community regarding floodplain problems, and assists business owners in relocation out of floodplain.
City of Birmingham	Department of Management Information Services	Provides both hardware and software support for the flood warning system.
Multi-Jurisdictional Agency in Jefferson County	Stormwater Management Authority	Responsible for stormwater permitting (NPDES) and provides GIS mapping assistance.
Jefferson County	Jefferson County Emergency Management Agency	Provides coordinated emergency response.

11.1.1 Departmental / Agency Existing Program Roles

The Floodplain / Stormwater Management Program for the City of Birmingham is operated and administered primarily through the Planning, Engineering and Permits Department with primary support from the Public Works Department and the Stormwater Management Authority and secondary support from the Department of Community Development, Department of Information Management Services, and Jefferson County Emergency Management Agency. The Stormwater Management Authority coordinates and administers the NPDES Permit process within its jurisdiction and has provided program support to the City of Birmingham through GIS mapping support for the Village Creek and Upper Shades Creek Watershed studies. The Department of Public Works is responsible for drainage system maintenance and repairs. The following is a description of the current program, lead and support roles for each department and agency as provided by the City of Birmingham.

1. Department of Planning, Engineering and Permits

The Department of Planning, Engineering and Permits (PEP) administers the Floodplain / Stormwater management programs through its Planning and Urban Design Services Division and its Engineering Division. The department is primarily responsible for all program measures except drainage system maintenance and emergency response. The Planning and Urban Design Services floodplain / stormwater management staff is responsible for administering the floodplain management program component including floodplain ordinance administration, floodplain and watershed planning project development and management, floodplain mitigation projects development and management, flood emergency response program, and public awareness program and managing watershed projects/ studies. The Engineering Division engineering staff is responsible for administering stormwater management program components

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including designing and managing small-pipe and capital improvement drainage projects, administering the *Soil Erosion and Sediment Control Ordinance*, and providing surveying support for all flood mitigation and stormwater management projects.

2. Department of Public Works

Performing drainage system inspection, maintenance and small-scope drainage improvement projects relevant to the City's Floodplain / Stormwater Management Program is the responsibility of the Department of Public Works (DPW). This department performs routine, complaint-based, and emergency maintenance work for all city-owned components of the natural and man-made drainage system including retention / detention basins. Their maintenance / inspection activities include: drainage system obstruction removal; channel nuisance vegetative and non-native sediment clearance; bridge and roadway crossing debris and drift clearance; in-stream maintenance dredging; and rainfall / creek level gage debris removal.

3. Department of Community Development

The Community Development Department provides support to the City's Floodplain / Stormwater Management Program by providing relocation advisory assistance and limited relocation funding for properties acquired under the FEMA grant programs. The department has also provided emergency assistance to flood property owners in the form of temporary relocation and debris clean-up assistance. Periodically, the department provides rehabilitation grants and loans for improving existing residential floodplain properties. The Community Development Department has supported the stormwater management program component by funding various small-pipe drainage improvement and capital improvements projects including street and storm sewer system improvements.

4. Division of Economic Development

The Division of Economic Development supports the City's Floodplain / Stormwater Management Program by facilitating meetings between floodplain and stormwater management staff with prospective developers and with existing business owners with flood related problems. The Division has also started assisting business owners located inside the limits of the 100-year floodplain in relocating out of the special flood hazard areas. However, it does not have a formal business relocation or flood protection assistance program in place to aid businesses with existing and re-occurring flooding problems.

5. Department of Information Management Services

The Department of Information Management Services (DIMS) provides both hardware and software support for the Jefferson County Emergency Management

Agency flood warning system ALERT. The Communications Division is responsible for maintaining the remote communications component of the rainfall / creek level gages located throughout the City. The Operations Division assists in providing computer hardware troubleshooting and maintenance for the flood warning system.

6. Stormwater Management Authority

The Stormwater Management Authority (SWMA) formed in 1997 is comprised of approximately 23 municipalities and is responsible for ensuring that its members satisfy the stormwater permitting requirements as set forth by the *National Pollutant Discharge Elimination System* program and the Alabama Department of Environmental Management. On behalf of its members, the Authority performs several stormwater management tasks that make up its stormwater management program. *However, most of the stormwater management tasks the Authority provides for its members are stormwater quality control related.* They include storm sewer pollutant investigations, in-stream water quality monitoring, industrial and other end-of-the-pipe discharge monitoring and inspections, land disturbance permitting, GIS mapping and database development.

The SWMA's water quantity control services have been limited to providing GIS mapping support for the Village / Valley Creek Watershed Study, and the Upper Shades Creek Watershed Study. However, SWMA has yet to develop a stormwater control ordinance that addresses water quality and/or water quantity control. The Authority is in the initial stages of developing a stormwater control ordinance that would address industrial / business discharges. However, it is likely that this ordinance will focus on providing non-structural water quantity controls in lieu of providing both structural and non-structural water quality and quantity controls.

7. Jefferson County Emergency Management Agency

The Jefferson County Emergency Management Agency's (EMA) primary Floodplain / Stormwater Management Program role is to coordinate the emergency support staff and resources needed for providing a coordinated emergency response before, during and after a major flooding event. This response includes providing public work services, public health services, human resource services, etc.

To assist EMA in providing prompt, sufficient and well-coordinated emergency response services, it operates a comprehensive flood warning system. This flood warning system, termed "ALERT," covers all of the major creeks flowing through Jefferson County and is comprised of a gage network that monitors rainfall amount and creek levels and other weather-related information; primary and secondary base stations; several repeater stations; and real-time rainfall and flow monitoring and flood forecasting software. Warning dissemination is coordinated with the National Weather Services (NWS) and with the Jefferson County Emergency Operation Center team which includes City of Birmingham representatives. The Jefferson

County EMA also coordinates and submits requests for public and individual disaster relief assistance to State and Federal agencies as well as coordinates disaster-related damage assessments.

To improve the effectiveness of the program in the future, each department and each agency must play a greater role in advancing the City Floodplain / Stormwater Management Program. The Department of Planning, Engineering and Permits must enhance its floodplain planning, watershed planning and public outreach role. The Public Works Department must enhance its storm sewer system maintenance and inspection role. The Community Development and Division of Economic Development must play a greater role in funding and providing staff support to the flood mitigation projects, as well as in public outreach to floodplain residences and businesses. The Stormwater Management Authority must play a significant or lead role in the development of a model stormwater ordinance that addresses both structural and non-structural stormwater quantity control / flood mitigation. The Jefferson County Emergency Management Agency must assist in the public outreach and flood and watershed planning efforts.

11.2 Future Operations and Administration of Floodplain / Stormwater Management Program

Significant advancement and improvements in the Floodplain and Stormwater Management Program have been accomplished over the last 10 years under the current organizational structure and program roles and responsibilities. To their credit, the City of Birmingham Floodplain and Stormwater Management staff in association with supporting city agencies and staff have created one of the premier Floodplain and Stormwater Management Programs within the State of Alabama. While the City has made significant strides in implementing flood mitigation and stormwater management initiatives, there are still significant existing flooding problems, water quality and quantity stormwater management issues to address and concerns related to the impact future developments will have on the flooding situation within the City of Birmingham.

To effectively enhance the program, some commitment of additional resources in both personnel and equipment may be necessary to advance the program to the next level. However, there would be substantial potential benefits associated with any additional resources committed to this effort. Reasons to seriously consider allocating additional resources to address mitigation and stormwater management issues within the City of Birmingham include:

1. As per the State of Alabama and Jefferson County Natural Hazards Mitigation Plans, flooding is the number one risk relevant to natural hazards at both the State and county level.
2. Birmingham has experienced several severe flooding events recently with a Presidential Disaster Declaration as recently as September of 2004.

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3. Enhancements to the current CRS program can result in lower flood insurance rates for the citizens of the City of Birmingham.
4. There are significant Federal funding opportunities for flood mitigation and stormwater management initiatives. Enhancements to the programs should result in an improved position to compete for this funding and ultimately increase funding levels within the community to address flood related problems.
5. FEMA is aggressively pursuing the Map Modernization Program in coordination with the Alabama Office of Resources, identifying Jefferson County and the City of Birmingham as high priorities. Close coordination and local assistance with this program should allow the City to expedite this important national initiative for the residents of the City of Birmingham.
6. Enhancements to the program should result in reduced future flood damage impacts, improved water quality, enhanced recreational opportunities and an overall general improvement to the quality of life for residents of the City of Birmingham.

Based on the study goals, recommended strategies for consideration, review of existing agency program roles, and City / Stakeholder input, **Table 11.2** defines recommended program role enhancements by department / agency.

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**Table 11.2
Recommended Program Role Enhancements by Department / Agency**

Department / Agency	Current Role	Lead or Supporting Role	Enhanced Role
Department of Planning, Engineering & Permits (PEP) This department plays the lead role in administration of the City's Floodplain / Stormwater Management Program. The Planning and Urban Design Services Division administers the Floodplain Management Program and the Engineering Division administers the stormwater management program.	Administer NFIP Program and existing Floodplain Ordinance.	Lead	<ul style="list-style-type: none"> Work to strengthen existing floodplain ordinance or develop new ordinance / consideration of Jefferson County model floodplain ordinance to address strategies identified in flood mitigation action plan (Section 10).
	Administer CRS Program.	Lead	<ul style="list-style-type: none"> Consistent with the flood mitigation action plan, pursue implementation of CRS program initiatives to acquire additional CRS credit and improve CRS rating to 6 in near-term and 5 in mid-term to lower flood insurance premiums.
	Review proposed development plans and permits for floodplain related development including review of soil and erosion control permits, civil construction permits, subdivision plats in floodplain, all utility related permits and building permits in floodplain.	Lead	<ul style="list-style-type: none"> Develop plan review and inspection check list. Prepare for distribution documentation of permit review process and permit requirements information sheet. Develop design guidance (Stormwater Management / BMP Handbook) for various flood protection / stormwater management techniques. Prepare flood information and training materials for flood review and inspections staff. Work with GIS staff to provide user-friendly flood review activities, conditions and reports in permit plans. Work with inspection services in establishing activity sign-off rules and other case related business rules. Establish flood review procedures for subdivision, zoning board of adjustments and zoning advisory committee cases. Also establish flood review procedures for capital improvement projects, community development housing rehabilitation loan or grant projects for proposed or existing floodplain properties.
	Assist in disaster and post disaster recovery efforts in coordination with JCEMA.	Support	<ul style="list-style-type: none"> Play primary role in preparing flood related damage assessment within City of Birmingham, to assist Jefferson County EMA in preparation of Federal disaster assistance requests.

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**Table 11.2
Recommended Program Role Enhancements by Department / Agency**

Department / Agency	Current Role	Lead or Supporting Role	Enhanced Role
<u>Department of Planning, Engineering & Permits (PEP) continued</u>	Administer and provide greenways and watershed planning activities.	Lead	<ul style="list-style-type: none"> Lead a comprehensive floodway to greenway conversion program. Local lead on map modernization floodplain mapping program. Local lead on future watershed planning studies including flood reduction and stream restoration efforts. Lead in developing capital improvement program for flood reduction and stormwater management efforts.
	Prepare and administer public awareness program for flood mitigation and stormwater management.	Co-Lead	<ul style="list-style-type: none"> Work with division of Economic Development in developing a flood protection education program for flood prone businesses and critical facilities.
	Provide support and input into comprehensive planning, land use, zoning, and land development codes.	Support	<ul style="list-style-type: none"> Support integrating floodplain and stormwater management strategies as outlined in the action plan (Section 10) into existing development guidance documents and development codes.
	Administer stormwater management program for City.	Lead	<ul style="list-style-type: none"> Refine or develop stormwater management policies consistent with action plan strategies addressing water course protection, regional detention vs. on-site detention, multi- vs. single outlet control, site development run-off requirement, open channel vs. closed channel conveyance, open channel and closed channel maintenance policies, as well as maintenance policies for detention and retention facilities. Lead coordinating agency consistent with recommended action plan for master drainage plan / watershed management studies and plans. Lead agency for review and evaluation of developing a stormwater control ordinance, either specific to the City or in conjunction with the SWMA that would incorporate the existing ordinance provisions, stormwater retention / detention provision and BMPs. This ordinance would work in concert with the Stormwater Management / BMP Handbook.

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**Table 11.2
Recommended Program Role Enhancements by Department / Agency**

Department / Agency	Current Role	Lead or Supporting Role	Enhanced Role
<p>Department of Public Works The Department of Public Works is the lead City agency for maintaining the open and closed drainage system, including the major creeks.</p>	<p>Performs maintenance of open and closed stormwater drainage system.</p>	<p>Support</p>	<ul style="list-style-type: none"> Participate in a supporting role in the planning and development of stormwater management policies related to streamside and channel management and maintenance policies including open vs. closed drainage systems and detention / retention storage. Due to lack of personnel resources, consider enhancing the nuisance vegetation removal with technology-based techniques such as herbicidal treatments and advanced / more efficient equipment.
<p>Department of Community Development Primary program role includes providing funding for drainage and street improvements projects through CDBG grants. The department also provides relocation, clean-up and home repair assistance to qualifying floodplain residents. They have also assisted in providing floodplain information to residents.</p>	<p>Provide housing rehabilitation loans and grants.</p>	<p>Lead</p>	<ul style="list-style-type: none"> Improve housing rehabilitation loan and grant process by requiring that all necessary permits be obtained as a condition of funding, and by including a floodplain determination during the application review stage and informing the DPEP floodplain staff of floodplain properties identified for rehabilitation assistance so that the floodplain requirements can be determined prior to rehabilitation assistance approval. Incorporate floodplain review in code enforcement process so that the flood protection requirements for floodplain properties with code violations can be properly determined. Better coordinate disaster relief funding process with DPEP by ensuring that properties receiving funding are repaired in accordance with all applicable city building, zoning, floodplain development codes and by placing conditions on funding assistance such as the mandatory purchase of flood insurance where applicable.

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**Table 11.2
Recommended Program Role Enhancements by Department / Agency**

Department / Agency	Current Role	Lead or Supporting Role	Enhanced Role
Department of Community Development <i>continued</i>	Provides relocation, clean-up and repair assistance.	Lead / Support	<ul style="list-style-type: none"> Play a lead role in providing relocation payment and advisory assistance in support of non-structural flood mitigation projects such as floodplain structure acquisition / demolition and structure acquisition / relocation projects. Play a lead role in relocation of floodplain property owners or of displaced tenants by offering financial and other incentives for those floodplain properties owners whose properties are acquired to relocate in the city limits. Play a supporting role in securing disaster recovery funds by using the Community Development Disaster Recovery Assistance Program. This program supplements disaster recovery funding from the Small Business Administration, USACE and FEMA.
	Assist in providing public education regarding flood mitigation issues to residents and businesses.	Support	<ul style="list-style-type: none"> Play a supporting role with the DPEP and the Division of Economic Development in developing business flood plans such as post-disaster business recovery plans, business flood preparedness plans and business flood audits for businesses located in floodplains. Play a supporting role in the planning and logistics of proposed public education and flood preparedness seminars on various flood protection topics for flood prone businesses, critical facilities and residences.
Division of Economic Development Assists in facilitation of meetings between floodplain management staff, developers and existing business owners with flood problems.	Assist business owners located in 100-year floodplain with potential relocation efforts.	Lead	<ul style="list-style-type: none"> Play a lead role in developing business retention and protection programs for businesses located in floodplain. This retention program should include relocation and property protection incentives.

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Table 11.2
Recommended Program Role Enhancements by Department / Agency

Department / Agency	Current Role	Lead or Supporting Role	Enhanced Role
Division of Economic Development continued	Assist business owners with existing and reoccurring flooding problems (not a formal program).	Co-Lead	<ul style="list-style-type: none"> Play a joint lead role along with the DPEP in developing a flood protection / education program for floodplain businesses and critical facilities. This program should focus on providing both flood educational, advisory, and technical assistance to business owners and operators of critical facilities. Play a joint lead role along with the DPEP in developing business flood plans such as post-disaster business recovery plans, business flood preparedness plans and business flood audits for businesses located in floodplains. Play a lead role in identifying business partners that could aid in funding the City's overall floodplain management and stormwater management program. The intent would be to persuade business partners within the City to mitigate flooding and stormwater management problems. Play a lead role in securing disaster recovery funding from the Economic Develop Administration and the Small Business Administration for flood prone businesses.
Department of Information Management Services	Provides hardware and software support for flood warning system. Provides website services.		<ul style="list-style-type: none"> Work with Jefferson County EMA and NWS to fully integrate ALERT system and automate information dissemination. Assist in enhancement of website for floodplain / stormwater management.

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**Table 11.2
Recommended Program Role Enhancements by Department / Agency**

Department / Agency	Current Role	Lead or Supporting Role	Enhanced Role
<p>Stormwater Management Authority Responsible for ensuring that its 23 member municipalities satisfy the stormwater permitting requirements as set forth by the National Pollutant Discharge Elimination System (NPDES) program and the Alabama Department of Environmental Management.</p>	<p>Performs several stormwater management tasks comprising the stormwater management program, mainly relating to stormwater quality.</p>	<p>Lead / Support</p>	<ul style="list-style-type: none"> Play a lead role in the development of a pro-forma stormwater control ordinance that incorporates both structural and non-structural water quantity control provisions. This ordinance would, like the Authority's erosion control ordinance, serve as a minimum standards ordinance for all of the Authority's member governments to adopt. Play a supporting role in the continuing development of the City's interim stormwater management policies addressing issues such as watercourse protection, regional detention vs. on-site detention, sub-surface detention vs. surface detention, multi-outlet control vs. single outlet control, site development runoff requirements for new development and significant redevelopment, open channel vs. closed channel conveyance, other system management and maintenance policies. Play a supporting role in the planning and development of detailed stormwater management policies such as streamside and channel management and maintenance policies, open channel vs. closed channel maintenance policies, detention / retention storage maintenance policies, etc.
<p>Jefferson County Emergency Management Agency (EMA) Primary program role is to coordinate the emergency support staff and resources needed for providing a coordinated emergency response before, during and after a major flood event.</p>	<p>Provides public work services, public health services and human resource services. Coordinates and assists requests for public and individual disaster assistance. Coordinates and assists with damage assessment.</p>	<p>Lead / Support</p>	<ul style="list-style-type: none"> Play a lead role in the development of emergency preparedness plans such as Post-Disaster Recovery and Reconstruction Plans and Multi-Hazard Mitigation Plans. Play a supporting role in developing business flood plans such as post-disaster business recovery plans, business flood preparedness plans and business flood audits for businesses located in floodplains. Play a lead role in providing critical facilities and key city staff with remote access to flood warning and flood forecasting system.
	<p>Operates a comprehensive flood warning system.</p>	<p>Lead</p>	<ul style="list-style-type: none"> Play a lead role in providing critical facilities and key city staff with remote access to flood warning and flood forecasting system.

11.3 Capabilities, Resources and Administrative Plan

As previously noted, at the local level there are seven primary participating departments or agencies involved in the Floodplain / Stormwater Management Program for the City of Birmingham including:

1. Department of Planning, Engineering and Permits (DPEP)
2. Department of Public Works (DPW)
3. Department of Community Development (DCD)
4. Mayor's Office of Economic Development (DED)
5. Department of Management Information Services (DMIS)
6. Stormwater Management Authority (SWMA)
7. Jefferson County Emergency Management Agency (JCEMA)

While the role of all seven agencies are important, for the City of Birmingham, the primary responsibility for administering, operating, enforcing and maintaining the Floodplain / Stormwater Management Program falls squarely on the Department of Planning, Engineering and Permits and the Department of Public Works.

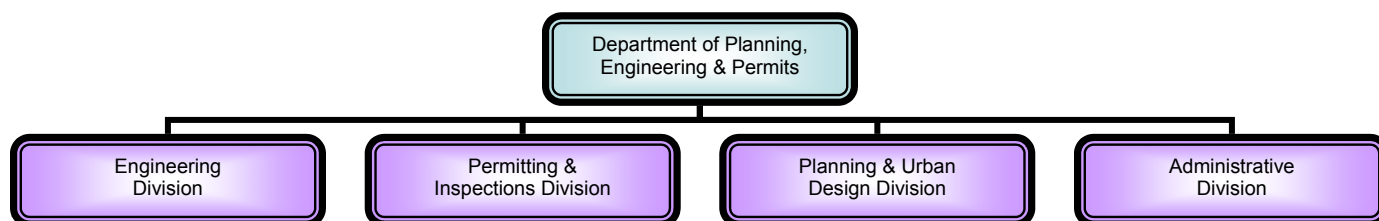
These two departments under the current organizational structure for the Floodplain / Stormwater Management Program have exhibited excellent capabilities. The DPEP has: effectively managed the NFIP program and administered the local floodplain ordinance; managed and administered the CRS program which is now credited with reducing insurance rates by 15% for the citizens of Birmingham; effectively and efficiently administered, managed and implemented numerous FEMA and USACE funded grants for flood hazard mitigation worth millions of dollars; assisted in emergency operations and post-disaster recovery response; and been actively involved in other greenway and watershed management planning studies. The DPW has continuously maintained the open and closed drainage system as well as natural waterways with limited resources during the course of the Floodplain / Stormwater Management Program.

Through the work of these city departments and cooperating agencies, they have established one of the premier, if not the premier Floodplain / Stormwater Management Programs within the State of Alabama. However, flooding and its associated impacts continued to be one of the dominant concerns of residents of the City of Birmingham. The administrative, as well as programmatic strategies and actions proposed in this plan are focused on addressing these flood related problems and concerns.

11.3.1 Administration and Resource Needs

Currently the DPEP is organized into four divisions as shown in **Figure 11.1** below.

Figure 11.1
Organization Structure for DPEP



The Floodplain / Stormwater Management Services group fall under the purview of the Planning and Urban Design Division. Two staff members are currently assigned to the Floodplain / Stormwater Management Services Group, the Floodplain Administrator and a Project Planner – Floodplain Management. These two staff members are responsible for the multitude of administration and management of the Floodplain/ Stormwater Management Program.

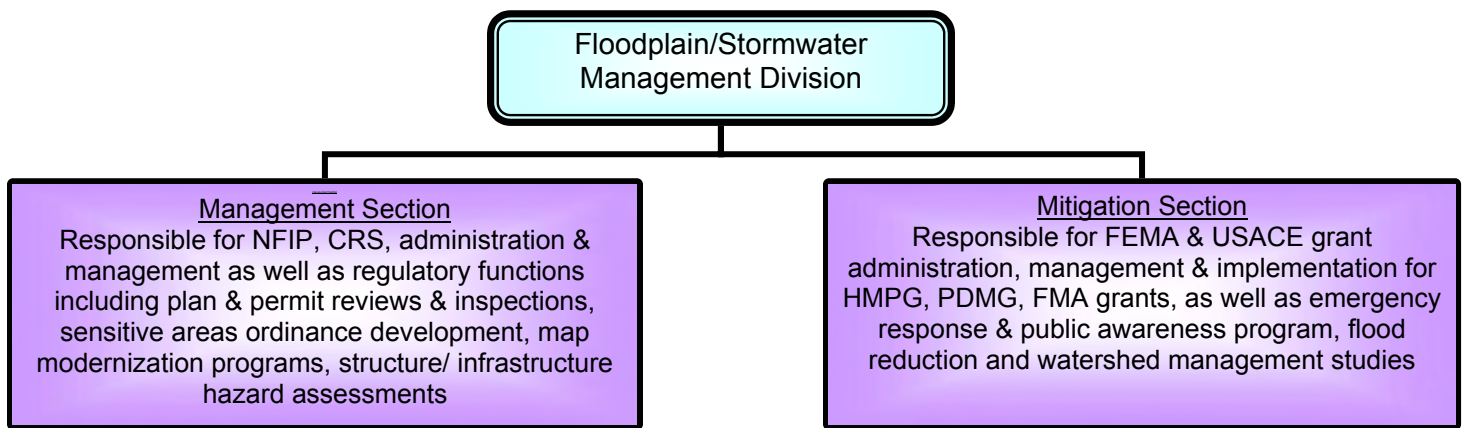
The Project Planner – Floodplain Management position is generally responsible for public awareness and outreach efforts required under the CRS program, assisting in grant administration for the Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant Program and Flood Mitigation Assistance Program as well as assisting in the management of the NFIP and CRS programs, and plan and permit reviews.

While the current staffing of the Floodplain / Stormwater Management Services group has been adequate in the past, some additional personnel and equipment resources may be required to effectively implement the proposed strategies and actions laid out in this plan due to the following reasons:

- Proposed implementation of an aggressive CRS strategy to reduce flood insurance rates within the community;
- Aggressive pursuit of the Map Modernization Program for the City of Birmingham;
- Increased flood hazard mitigation grant application preparation and management to maximize Federal funding to the Birmingham region;
- Increased participation in plan and permit reviews, especially during the early planning stages to maximize incorporation of flood hazard mitigation and stormwater management principals, as well as best management practices;
- Increased participation in the flood damage assessment phase; and
- Active and aggressive participation in flood reduction studies within major drainage basins in the City.

Over the 5-year horizon, the following administrative and personnel resource additions should be considered relevant to the Floodplain / Stormwater Management Services group. A slight modification to the organizational structure of the DPEP should be considered, whereas the Floodplain / Stormwater Management Services Group would either become a separate division and/or a sub-division of the Administrative Division. The Structure of the Division is proposed as follows.

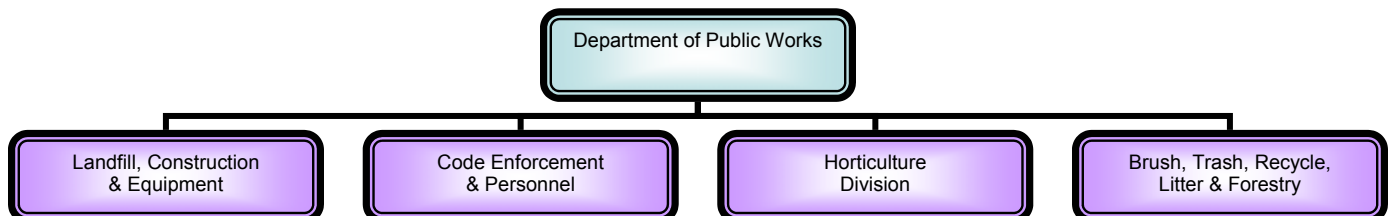
Figure 11.2
Revised Organization Structure for DPEP



Within the 5-year horizon two additional staff positions would be needed including a Floodplain Development Officer to handle the plan, permit and compliance reviews including field inspections for quick turnaround. The second staff position would be a Civil Engineer—Floodplain Management with H&H modeling responsibilities to manage and assist in H&H modeling tasks associated with the MMP, development of predictive models for the ALERT system and to manage and expedite flood reduction studies at both the watershed and local level.

The Department of Public Works is currently divided into four divisions as indicated below.

Figure 11.3
Organization Structure for DPW



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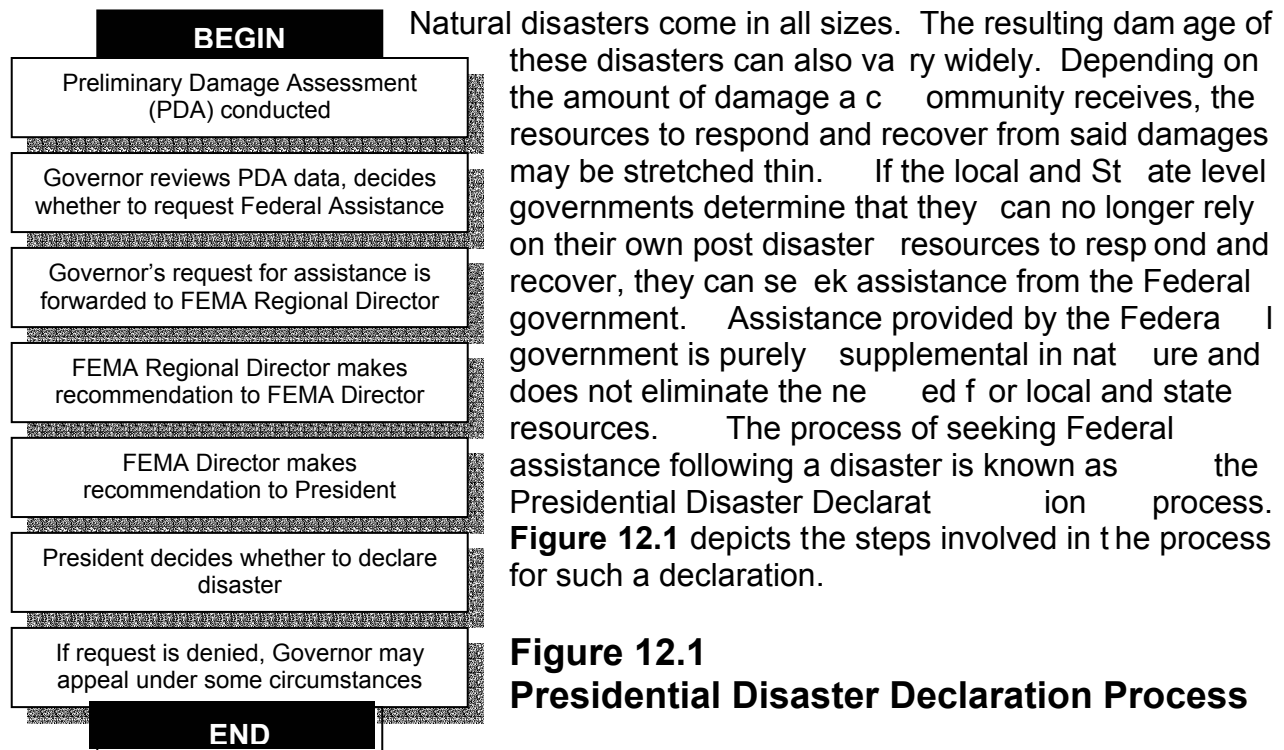
Each division has some drainage maintenance related function. The Code Enforcement Division is responsible for enforcing drainage system related maintenance for private property owners and illegal dumping of debris or trash into local waterways. The Landfill, Construction and Equipment Division is responsible for creek maintenance, and is currently equipped with two slash busters, one long reach excavator, and two dump trucks. The Horticulture Division is responsible for maintaining ditch right-of-ways relevant to vegetation management / mowing. The Brush, Trash, Recycle Litter and Forestry Division is responsible for the maintenance of the closed storm sewer system.

There are currently five crews assigned to maintain the closed storm sewer system. Four crews have assigned routes or sections of town, with one random crew to address miscellaneous priority problems. There are 99 neighborhoods within the City of Birmingham, requiring each crew to maintain the closed storm sewer system for approximately 25 neighborhoods per year. The majority of major complaints are broken or dislodged inlet tops. According to the DPW Group, there appears to be adequate personnel resources to maintain the closed storm sewer system.

The problem area appears to be the open drainage system or ditches, of which there are literally hundreds of vegetated channels which require mowing or maintenance several times per year. Currently there are only two crews to handle all ditch mowing needs.

While no organizational or administrative changes appear necessary within the DPW, addressing vegetative channel maintenance is an issue. However, the actual benefit of allocating significantly more personnel resource to address this primarily visual and nuisance problem may not be justified relevant to flood mitigation. Prior to making a commitment to additional personnel resources, the options should be considered to use herbicidal treatments and invest in more efficient equipment. If this does not appear to be a viable solution, adding one or two additional crews should be considered.

12.0 POST DISASTER RECOVERY AND RECONSTRUCTION ACTION PLAN

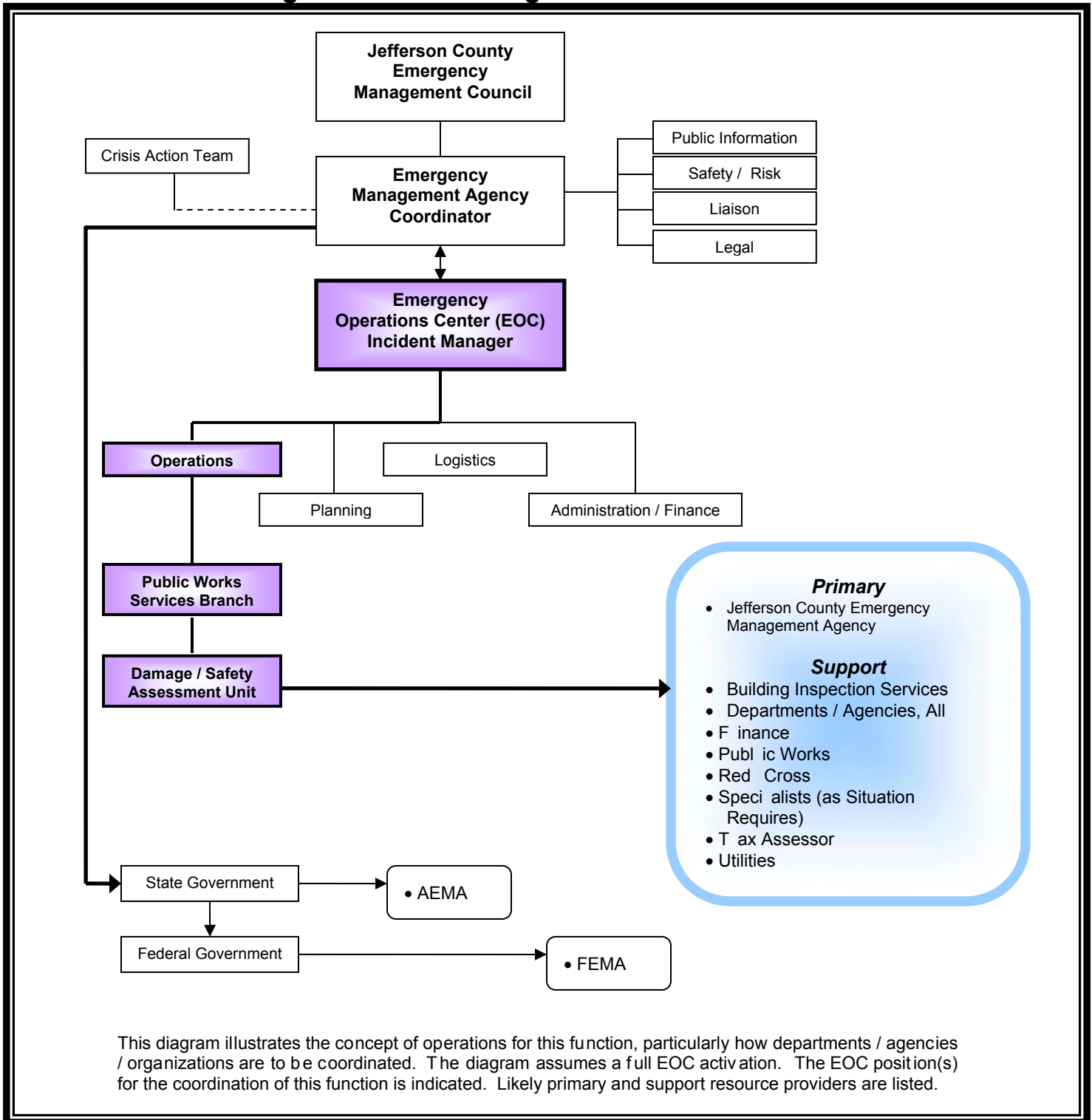


12.1 City of Birmingham's Current Disaster Recovery Actions

The City of Birmingham currently operates under the Jefferson County Emergency Management Plan (CEMP). The CEMP provides direction to jurisdictions in Jefferson County immediately following a disaster and continuing through the recovery phase. While the CEMP plan provides discussions regarding the response capabilities and responsibilities of agencies and departments, the focus of this Action Plan is on the recovery capabilities and responsibilities of said agencies and departments.

Damage Assessments are one of the first actions that typically mark the beginning of the recovery and reconstruction phase. It is imperative to establish procedures for assessing and reporting damage to public and private facilities following a disaster. Annex 3 of the CEMP, outlines the Damage Assessment process (see **Figure 12.2**). Key elements relevant to the damage assessment responsibilities at the local level, as outlined in Annex 3 of the CEMP, include the discussion in the following paragraphs.

Figure 12.2
Damage Assessment Organizational Coordination



Source: Jefferson County Emergency Management Agency; Comprehensive Emergency Management Plan (CEMP)

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Jefferson County EMA is the lead agency responsible for organization and mobilization of this function following a disaster. The City of Birmingham should identify a local point of contact for implementation.

The City of Birmingham's appointed person should maintain pre-disaster maps, photos, and other documents; train and maintain damage assessment teams; activate and deploy damage assessment teams; collect and maintain damage reports; maintain records of damage reports; compile damage assessment reports and provide information on damages to Jefferson County EOC; determine unsafe facilities; and maintain accurate records of funds, materials, and man-hours expended as a result of the disaster; receive, record and consolidate all damage reports made by private citizens. In the event that the capabilities of the City of Birmingham are exceeded, Jefferson County EMA can provide support in the following areas:

- Building Inspection Services
- Assist all departments and agencies in compiling initial damage reports as per field observations and reports from the general public.
- Appraisal Services – provide appraisers
- Public works – assist with the initial infrastructure (roads, bridges, etc) damage assessment.
- Utilities – conduct infrastructure damage assessments of utility “life lines” such as water, power, natural gas, telecommunications, sewer, and waste services.

The CEMP outlines a 3-phase process for damage assessments. The first phase, Phase I, is a “quick overview of what happened”. In this phase, Situation Reports (initial and informal damage survey) are provided to the Crisis Action Team (CAT) / EOC manned or staffed by the City of Birmingham employees and others. The next phase, Phase II, is “a closer look at what the needs and priorities are” for the City. During Phase II, trained damage assessment teams are deployed throughout disaster stricken areas. The third and final phase, Phase III, is the “Validation of damages, defining repairs and costs”. This is when local / State / Federal Damage Assessment Teams are performing assessments throughout the damaged areas.

The Jefferson County Comprehensive Emergency Management Field Plan, Field Operating Guide contains hazard specific checklists that are to be used during and after a disaster. Checklists for hazards are broken into 3 separate lists, “Advisory / Warning Phase Checklist”; “Response Phase Checklist”; and “Recovery Phase Checklist”. Checklists are provided for use before, during and after a flood event.

The Response Phase Checklist contains items that pertain to Disaster Recovery. They are as follows:

Secondary Actions

- Document the cost of materials and labor involved with the emergency
- Does the situation warrant a Disaster Declaration?

- Form a task force to document and estimate damage to public and private property.

The Recovery Phase Checklist is as follows:

Stabilization Actions

- Initiate a survey of the area and correct safety hazards as soon as possible.
- Continue cleanup of debris, if applicable
- Continue restoration of utilities, telephone service and transportation links. Essential facilities such as clinics, emergency operations center, nursing homes, fire and police dispatch centers, emergency shelters and schools will be given priority.
- When safe access is established, arrange for the return of evacuees to assess damage.
- Use roadblocks and a permit system to control access and maintain security.
- Open volunteer resource center, if necessary
- Initiate individual rehabilitation programs. Initiate services to help victims cope with the situation and to provide temporary food, clothing, basic supplies and shelter for people displaced by the disaster.
- Critical Incident Stress Debriefing

Re-Entry

- Arrange for return of evacuees (Check with Incident Commander or Emergency Operations Center)
- Ensure all victims have received a safety briefing concerning animals, driving during flood conditions, electrocution hazards and safe drinking water practices, if applicable.
- Contact Emergency Operations Center or EMA for transportation requirements

Recovery Efforts from May 2003 Flood

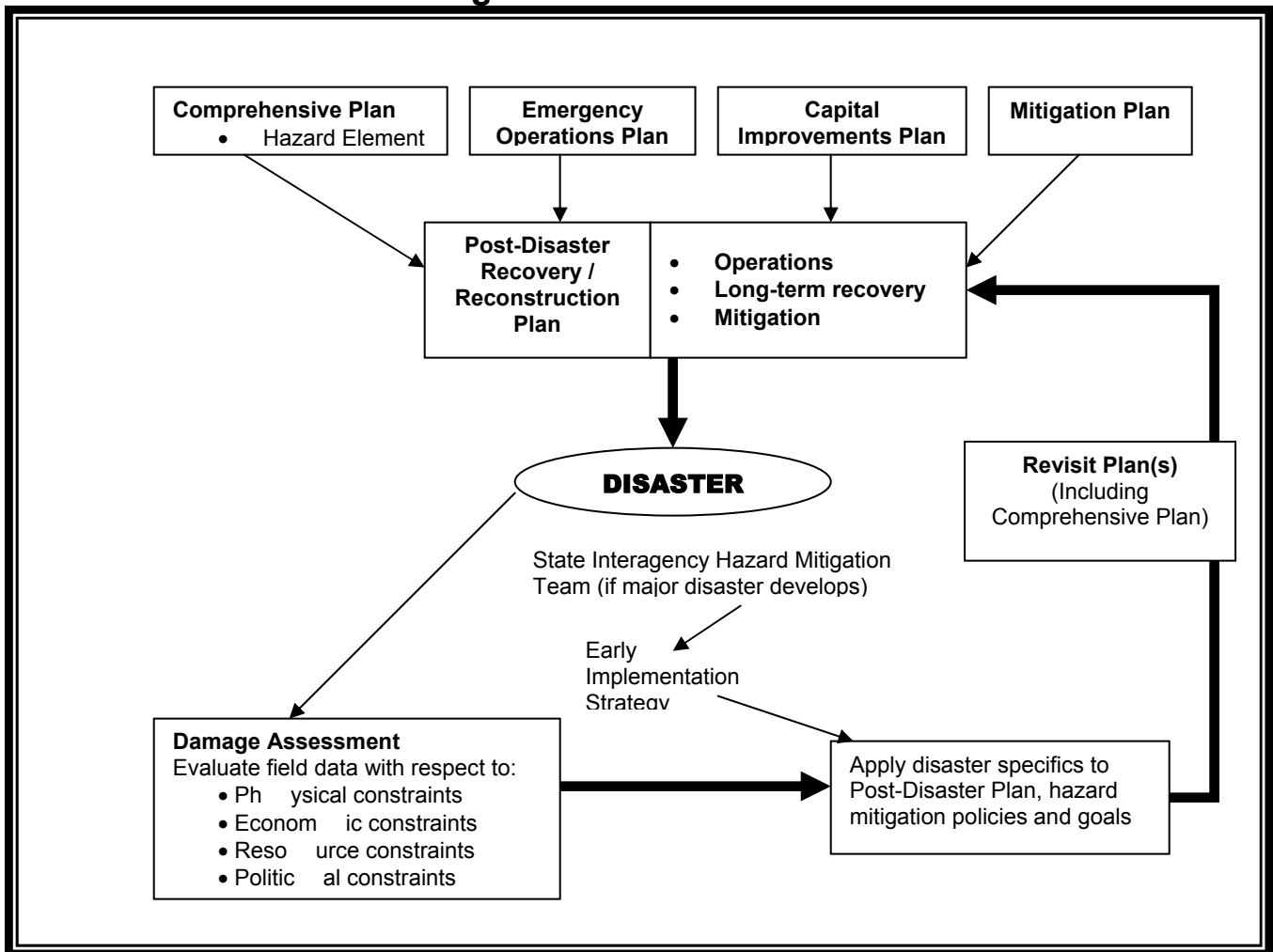
The City of Birmingham's Floodplain Administrator coordinated the initial damage assessment process for the City through the Birmingham Flood Assessment Team. He coordinated with staff inside and outside the Department of Planning, Engineering and Permitting to establish teams that would be deployed to perform the assessments. This was primarily coordinated with the permitting and inspection staffs, but utilizing staff from other departments when necessary. This effort included providing GIS produced maps detailing the extent of the flood event and overlaid onto the floodplain layer for staff to use in the post-disaster permitting process. Development permits for properties located outside of the floodplain were to be handled by the zoning staff. Any properties located in the floodplain that requested building permits following the May 2003 flood event were forwarded to the City of Birmingham Floodplain Administrator. As floodplain properties are subject to substantial damage/improvement requirements under the National Flood Insurance Program, substantial damage calculations were performed prior to issuing a building permit.

The maps were also to be used by inspections staff to determine areas where un-permitted repair work may have been occurring in the floodplain, so that it could be stopped and properly permitted and repaired in accordance with the City of Birmingham's flood ordinance. Following the Presidential disaster declaration the Flood Mitigation staff assisted FEMA in the Federal assessment process. Flood Mitigation Staff worked with residents of the City of Birmingham to assist them in the FEMA Disaster Assistance Application Process as well as other financial recovery programs. The City of Birmingham waived all permitting and inspections fees for building permits associated with the May 2003 flood. The flood mitigation staff also worked with the PA / IA and Mitigation teams as well as prepared three mitigation grant applications to address properties most impacted by the flood.

12.2 Planning Guidance for Recovery and Reconstruction / Evaluation of Birmingham's Post-Disaster Recovery Procedures

During the disaster declaration process and subsequent recovery and reconstruction, it is essential to create an inventory of potential (structural) damage throughout the disaster stricken areas. Estimates should be made for damage to public and private infrastructure. From this, damage assessment teams and City officials create projections to estimate all indirect and direct losses. **Figure 12.3** depicts the damage assessment process as it relates to disaster recovery efforts.

Figure 12.3
Damage Assessment Process



Source: Planning for Post-Disaster Recovery and Reconstruction. FEMA

Agency Roles/ Responsibilities

Numerous agencies within the City and County are involved in the post-disaster recovery / reconstruction processes. **Table 12.1** identifies agencies within the City and County that have a role in the process and notes their basic daily functions.

Table 12.1
Agency / Department Roles and Responsibilities
Pertaining to the City of Birmingham

Department/ Agency	Current Role	Lead or Supporting Role
Department of Planning, Engineering & Permits (PEP)	Administer NFIP Program and existing Floodplain Ordinance	Lead
	Administer CRS Program	Lead
	Review proposed development plans and permits for floodplain related development including review of soil and erosion control permits, civil construction permits, all utility related permits and building permits in the floodplain	Lead
	Assist in disaster and post disaster recovery efforts in coordination with JC EMA, including damage assessments	Support
	Administer and provide greenways and watershed planning activities	Lead
	Prepare an administer public awareness program for flood mitigation and stormwater management	Co-Lead
	Administer the stormwater management program for the City	Lead
Department of Public Works	Performs maintenance of open and closed stormwater drainage system	Lead
	Operates landfills and refuse collection	Lead
	Provides clean up of down trees	Lead
Department of Community Development	Provide housing rehabilitation loans and grants	Lead
	Provides relocation, clean-up, and repair assistance	Lead/ Support
	Assist in providing public education regarding flood mitigation issues to residents and businesses	Support
Mayor's Office of Economic Development	Assist business owners located in the 100-year floodplain with potential relocation efforts	Lead
	Assist business owners with existing and reoccurring flooding problems	Co-Lead

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Department/ Agency	Current Role	Lead or Supporting Role
Jefferson County Emergency Management Agency (EMA)	Provides public work services, public health services, and human resource services.	Lead
Jefferson County Emergency Management Agency (EMA)	Coordinates and assists requests for public and individual disaster assistance.	Support
	Coordinate and assists with damage assessments.	Lead
Public Safety (Police & Fire)	Provides law enforcement. Enforces curfews.	Lead/ Support
	Provides rescue assistance and fire suppression.	Lead
Traffic Engineering Department	Ensure the safe, efficient movement of vehicles, pedestrians and commodities.	Lead
	Installation and repair of traffic signals, roadway lights, traffic parking control signs	Lead
Legal Department	Represents the City in real estate transactions	Lead
	Provides opinions on points of law, interpretation and applicability of federal, state, and local laws, statutes, ordinances and resolutions.	Lead
	Drafts City ordinances and resolutions	Co-Lead
Department of Information Management Systems – Telecommunications Division	Responsible for timely diagnosis, repair, and restoration of telecommunication system and network components for the City of Birmingham.	Lead
	Provides additional technical services to the City, such as system planning, installation, testing, programming and any other such services as are required to assure reliable telecommunications support for the City of Birmingham.	
	Installs and repairs all mobile and portable radios, equips all public safety vehicles and other City departments with Radios, light bars, sirens, and other ancillary equipment	

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Department/ Agency	Current Role	Lead or Supporting Role
City Clerk	Prepares and publishes all required legal advertisements and public notices of City business	Lead
City Clerk	Provides official notice to property owners of public improvements and public assessments	Lead
Department of Parks and Recreations	Operates dozens of recreation centers throughout the city, as well as other recreational features.	Lead
Department of Finance	Responsible for Capital Financing	Lead
	Responsible for the purchasing of all materials, supplies, equipment and services	Lead
Birmingham Historical Commission	Recommends historic districts and sites for local designation.	Lead
	Local historic districting provides that the Birmingham City Council establishes design review standards for historic districts in neighborhoods that have requested local historic district designation.	Support
Alabama Emergency Management Agency (AEMA)	Administers FEMA Federal disaster funding programs at the State level, in addition to providing disaster response.	Lead
Stormwater Management Authority (SWMA)	Ensures that its members, including the City of Birmingham, comply with the Clean Water Act and NPDES	Lead

In the event of a disaster, these agencies have special functions that they may need to perform. The department / agency responsible for building code enforcement has two key concerns that require additional expertise beyond basic enforcement of building codes. This includes knowledge, or a familiarity, of the National Flood Insurance Program (NFIP). Following a disaster, requirements for floodproofing and/or elevating a structure is dependent upon the structure's standing as to whether or not it has become classified as a substantially damaged or improved structure. The City of Birmingham's Floodplain Administrator took steps to address this following the May 2003 flood. As stated earlier, all permit applications for properties located in the floodplain were reviewed by the floodplain administrator to determine if it was substantially damaged and would then be subject to more stringent reconstruction regulations. The second area of knowledge is regarding historic preservation and determination. This is an area that the City of Birmingham has not identified in their 2003 flood recovery efforts.

In FEMA's publication entitled Planning for Post-Disaster Recovery and Reconstruction, a suggested planning process for local municipalities, such as the City of Birmingham,

CITY OF BIRMINGHAM FLOOD MITIGATION / STORMWATER MANAGEMENT PLAN

is outlined. With respect to department assignments and roles following a disaster and during recovery and reconstruction, **Table 12.2** outlines general functions encountered by agencies and indicates the agencies that would typically be responsible in carrying out those post-disaster recovery actions. While this table is general in nature and would be further refined in a detailed Post-Disaster Recovery Plan the following paragraphs provide a brief discussion highlighting some of City agency post-disaster recovery functions.

The Finance Department for the City could be tasked with recovery activities like setting up accounting systems to track the dollars spent by the City on recovery efforts, post-disaster loan processing, and assist with the financial recovery process.

In the days and weeks following a disaster and during the recovery period, Building Code Enforcement personnel will have numerous tasks to perform. Most of them should be associated with the rehabilitation and planning for the future with regard to damaged stricken areas. Specific tasks that should fall to the Permitting and Inspections Services Division or the Department of Planning, Engineering, and Permits, are damage assessments; re-occupancy and emergency permitting; emergency demolition of unsafe structures, including the declaration of condemnation; historic preservation issues relevant to the stricken areas; mutual aid agreements; and the implementation of building moratoriums in damage stricken areas.

Prior to the time a disaster strikes, the City Attorney's office can officially establish a Post-Disaster Recovery Task Force. In addition to providing legal advice to the task force, the City Attorney's office should advise the Department of Planning, Engineering and Permits on any building or permit moratoriums that they wish to implement during the response and recovery periods. A sample building moratorium should be established by the City Attorney, and Department of Planning, Engineering and Permits, prior to a natural disaster so that when one does occur, the sample language can be updated and implemented in a timely fashion by the City Attorney, upon direction from the Department of Planning, Engineering and Permits.

The Department of Community Development could serve as a vital link to the citizens of Birmingham in a post-disaster recovery effort. This department would be associated with establishing temporary housing for displaced citizens, assisting and processing disaster loans, assisting with the redevelopment and planning of disaster stricken areas and with the evaluation and update of the Post-Disaster Recovery Plan.

Table 12.2 identifies typical agency assignments for post-disaster recovery and reconstruction actions. Below is a key to Department / Agency Abbreviations to assist in reading **Table 12.2**.

CITY OF BIRMINGHAM
FLOOD MITIGATION / STORMWATER MANAGEMENT PLAN

Key to Department / Agency Abbreviations in Chart:			
BF	Budget and Finance	HP	Historic Preservation Commission
CA	City Attorney	PB	Planning, Engineering & Permits (Building Inspections)
CD	Community Development	PE	Planning, Engineering & Permits (Zoning)
CM	Mayor	PR	Parks and Recreation
ED	Economic Development	PS	Public Safety (police / fire / emergency medical crews)
EM	Emergency Management	PW	Public Works (including publicly owned utilities, Solid Waste/ Sanitation)
EN	Environment	RD	Redevelopment Agency
HE	Health	TR	Traffic / Transportation

Figure 12.4 depicts a typical timeline for activities for a community associated with recovery from a disaster. These activities are general in scope and their timing is not fixed. Variations in the sequence of when the post-disaster recovery actions take place can and will vary based on the individual community. However, **Figure 12.4** provides a logical starting point for the City of Birmingham planning for the events following a natural disaster.

**CITY OF BIRMINGHAM
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Table 12.2

Typical Agency Assignments for Post Disaster Recovery and Reconstruction Actions

RESPONSE / EARLY RECOVERY	BF	CA	CD	CM	ED	EM	EN	HE	HP	PB	PE	PR	PS	PW	RD	TR
Evacuation						X							X			
Urban search and rescue													X			
Emergency shelter provisions						X					X	X				
Mass care (food, water, medicine)						X		X					X			
ORGANIZATION AND AUTHORITY																
Empower recovery task force		X		X												
Designate lead agency				X												
Operations policy				X												
Set up disaster accounting systems	X			X												
Coordinate with emergency manager				X		X					X	X				
Public participation and hearings											X				X	
REHABILITATIVE																
Temporary housing			X							X				X		
Refuse disposal											X			X		X
Damage assessment			X	X						X						
Restoration of utility services														X		
Establish reconstruction priorities		X				X			X		X	X	X			
Re-occupancy permits																
Emergency demolition		X		X						X	X					
Emergency permitting				X							X	X				
Loan processing	X		X		X										X	
Toxic cleanup							X	X						X		
LAND USE																
Identify sites for emergency operations											X			X		
Identify new lessons						X				X	X			X		
Compliance with regulations from lessons						X					X				X	
Re-planning of stricken areas			X					X		X	X		X	X	X	X
Re-examine street patterns for access				X							X	X	X	X	X	X

**CITY OF BIRMINGHAM
FLOOD MITIGATION / STORMWATER MANAGEMENT PLAN**

FUNCTION	BF	CA	CD	CM	ED	EM	EN	HE	HP	PB	PE	PR	PS	PW	RD	TR
Feasibility of emergency evacuation						X					X		X			X
Historic preservation									X	X	X					X
Implement area building moratoria		X			X					X	X					
Re-evaluation and update of plan			X	X	X	X				X	X				X	
REGIONAL COORDINATION																
Coordination with relief agencies							X									
Temporary housing			X								X					
Financial assistance channels	X		X	X	X										X	
Transportation repairs / restoration													X			X
Emergency legislation		X			X											
Media contact				X												
Mutual aid agreements		X						X			X			XX		

Source: Planning for Post-Disaster Recovery and Reconstruction, FEMA.

**CITY OF BIRMINGHAM
FLOOD MITIGATION / STORMWATER MANAGEMENT PLAN**

**Figure 12.4
Timeline for Post-Disaster Plan Elements**

FUNCTION	PRE-DISASTER	EMERGENCY PERIOD	SHORT-TERM RECOVERY	LONG-TERM RECONSTRUCTION
ORGANIZATION AND AUTHORITY				
Select recovery task force				
Empower recovery task force				
Designate lead agency				
Operations policy				
Set up accounting systems for disaster assistance				
Coordinate with emergency manager				
Public participation and hearings				
REHABILITATIVE				
Temporary housing	Identify sites			
Refuse disposal	Identify sites			
Damage assessment	Train teams, set MOUs			
Restore utility services				
Establish reconstruction priorities				
Re-occupancy permits	Set policies			
Emergency demolition	Set policies			
Emergency permitting	Set policies			
LAND USE				
Identify new lessons for damage assessments	Review case studies			
Compliance of building with regulations from new lessons				
Re-planning of stricken areas	Identify nonconforming uses, pre-FIRM bldgs.			
Identify sites for emergency operations				
Re-examine street patterns	Plan			
Feasibility of emergency evacuation plans	Identify shelters, road capacity, vulnerability			

CITY OF BIRMINGHAM FLOOD MITIGATION / STORMWATER MANAGEMENT PLAN

FUNCTION	PRE-DISASTER	EMERGENCY PERIOD	SHORT-TERM RECOVERY	LONG-TERM RECONSTRUCTION
Historic preservation	Identify vulnerable structure			
Implement area building moratoria	Adopt policies			
Re-evaluation and update of plan				
REGIONAL COORDINATION				
Coordination with relief agencies	Pre-disaster planning			
Temporary housing	Identify sites			
Financial assistance channels	Prepare inventory			
Transportation	Plan			
Emergency legislation				
Media contact	Pre-disaster education			
Mutual aid agreements		Put into effect		

Source: Planning for Post-Disaster Recovery and Reconstruction, FEMA.

12.3 Post-Disaster Recovery and Reconstruction Action Plan

The City of Birmingham has made a decision to plan for post-disaster recovery and reconstruction. The Planning, Engineering and Permits Department has taken the lead in the process and worked closely with the TAB and Stakeholder Committee to help guide development of an Action Plan for Post-Disaster Recovery and Reconstruction. During the development of this study, flooding hazards and risks to Birmingham, along with education materials on post-disaster recovery and reconstruction have been documented and presented to the TAB, Stakeholders Committee and public. A general consensus has been built to enhance post-disaster recovery efforts. The following are documented action items intended to enhance post-disaster recovery and reconstruction efforts for the City of Birmingham.

1. A primary point-of-contact for the City of Birmingham should be appointed to coordinate post-disaster recovery efforts with Jefferson County EMA regarding flood hazards.
2. The City should maintain pre-disaster maps, records, pictures of pre-disaster conditions for special flood hazard areas, and other known areas of flooding.
3. The City should appoint, train and maintain a Damage Assessment Team likely including Inspections and Permitting staff. Annual training of staff should be conducted. The Team would also function as the Crisis Action Team (CAT) and be responsible for preparation of Situation Reports (initial damage surveys).
4. A formal process to maintain and file damage assessment reports and receive and record all damage reports made by private citizens should be developed.
5. A process to maintain accurate records of funds, materials and man hours expended as a result of the disaster should be developed.
6. Trained City of Birmingham Damage Assessment personnel should be assigned to assist in Phase II and III Damage Assessments.
7. Once accurate damage assessment data has been developed, GIS maps detailing the extent of flooding should be delineated with an overlay of SFHA. The process to assure all building permit requests in SFHAs are reviewed by Floodplain Management staff to verify compliance with substantial damage NFIP requirements should be enhanced and documented in detail. A Substantial Damage Determination and Permitting Compliance Team should be designated and training initiated. A provision that allows for the waiver of building permit fees associated with flood damages should also be developed.

8. Using **Table 12.2** as an example, detailed responsibilities by agency, relevant to post-disaster recovery and reconstruction should be defined.
9. A Recovery and Reconstruction Task Force should be established to guide the recovery and reconstruction efforts following a disaster.
10. Consideration should be given to developing a Post-Disaster Recovery Ordinance where the main policy objective is restoring a normal economic activity and making normal economic activity more resistant to disaster.
11. Consideration should be given to developing a detailed Post-Disaster Recovery and Reconstruction Plan formally documenting planning efforts, procedures, protocols and administration of the program.

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APPENDIX A

STAKEHOLDER COMMITTEE MEMBERSHIP

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COLLEGE NEIGHBORHOOD PRES
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TUXEDO NEIGHBORHOOD PRES
1709 AVENUE I
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BLACK WARRIOR CWP
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GRAYMONT NEIGHBORHOOD PRES
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ENSLEY NEIGHBORHOOD PRES
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HOOPER CITY NEIGHBORHOOD PRES
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BIRMINGHAM AL 35207

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SMITHFIELD NEIGHBORHOOD PRES
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STERLING FIELDS
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224 CORDOVA AVENUE
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APPENDIX B

MAY 20TH, 2004 QUESTIONNAIRES, COMMENTS AND RESPONSES; AND SEPTEMBER 23RD, 2004 COMMENTS



**CITY OF BIRMINGHAM
FLOOD PLAIN / STORM WATER MANAGEMENT
STAKEHOLDER COMMITTEE MEETING
SURVEY FORM**

**May 20th, 2004
8:30-11:00 A.M.**

Contact Information

Name: _____
Agency: _____
Address: _____
Fax: _____
Email: _____

Are there any flood problem areas within the city limit of Birmingham that affect your organization or agency? If so, where are they located?

Please prioritize the flood problem areas beginning with the most severe flooding problems. (1-5, etc).

Do known causes exist for the flooding at these locations (i.e. development in the floodway, undersized culverts, etc)? If so, please describe.

Are there any current programs/ projects in the funding pipeline that address these noted flooding problems? Please describe.

What role does your organization or agency have regarding flood mitigation planning, operations and maintenance, or post-disaster response?

Do you have any suggestions or recommendations for ways to eliminate, minimize or mitigate these flooding problems?



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CITY OF BIRMINGHAM FLOOD PLAIN / STORM WATER MANAGEMENT PUBLIC SURVEY FORM

**May 20th, 2004
6:30-8:30 P.M.**

OPTIONAL: Contact Information

Name: _____

Address: _____

Where is your home or business located? _____

Has your home or business ever flooded (i.e. water inside the structure)? _____

If so, how many times and when (i.e. May 2003 flood)? _____

What was the estimated depth of water in the structure? _____

Does your yard flood? _____

How often does it flood? _____

Does your street flood? _____

Are the catch basins free of debris on a regular basis? _____

Do you know the causes of flooding in your area? If so, please list. _____

Do you have flood insurance? _____

What steps have you taken to protect yourself and your property against flooding?

Do you have any suggestions as to how to eliminate or reduce flood problems? Please describe.



This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

October

11, 2004

Attn: Mr. Edwin Revell, EI,CFM,
Civil Engineer,
City of Birmingham
Flood Plain Administrator
Department of Planning,
Engineering & Permits
City Hall/ Room 500
710 North 20th Street
Birmingham, Alabama 35203

Subject: Comments for Inclusion
in the City of Birmingham's
Flood Mitigation/ Storm
Water Management Plan/
Public Information
Program Strategy

Dear Mr. Revell:

As a participant on the Stakeholder Committee for the Flood Mitigation/ StormWater Management Plan, I have reviewed the specific information in the draft document pertaining to the Public Information Program Strategy.

I have reviewed the proposed detailed actions involved in implementing the Public Information Program Strategy in the Immediate Term Action and Implementation Schedule, as well as, in the Near Term Action Item and Implementation Schedule.

I would like to suggest some additional proposed Public Outreach Activities for inclusion in the Plan.

1. Designate a month as **Flood Awareness Month**, as we have discussed, this would be the time to provide a Public Information Blitz, to really, bring attention to Flood Preparedness Information, prior to the rainy or storm seasons to encourage citizens to be proactive, instead of reactive concerning Flood Protection matters.

Comments for the
Flood Mitigation/ Storm
Water Management Plan
City of Birmingham
October 11, 2004
Page 2 of 2

2. Work in coordination with the established, **Citizen's Participation Program** to inform and train volunteer neighborhood **Champions** (citizens) to help keep this information on the agendas of their neighborhood meetings, to help promote a good understanding of the processes involved in the provision of flood related information. An information handbook for the officers of the neighborhoods would be helpful.
3. As an Outreach Activity, coordinate with **Utility Provider Information Programs** to help with the dissemination of Flood Preparedness Information throughout the community. (i.e., share pertinent information with utility providers: electric companies; gas companies; fire prevention programs; and any other crisis utility information programs - for handicap and disabled citizens).
4. Develop an **Educational Information Program** to help inform and teach students in the local school system Flood Safety Measures.

These are some additional activities that would be beneficial to citizens in implementing the Public Information Program Strategy for the Flood Mitigation/ StormWater Management Plan.

Thank you for permitting comments.

Sincerely,

Jacqueline

L. Franklin

C. Ms. Denise L. Pruitt, Project Planner, Flood Plain Management

APPENDIX C

CITY OF BIRMINGHAM CAPITAL IMPROVEMENT PROGRAM, PROJECT LIST

**CITY OF BIRMINGHAM
FLOOD MITIGATION / STORMWATER MANAGEMENT PLAN**

**REQUESTED PROJECTS FOR CAPITAL BUDGET (BY CATEGORY)
FY 2003 – 2007**

INDEX	CATEGORY	TITLE	BOND REQUEST	DISTRICT	COUNCIL REQUESTED	FLOODPLAIN COMMENTS
501	City Equipment	311 Call Center (Non Emergency)	\$1,350,000	City Wide	No	
502	City Equipment	Fire Department Equipment	\$1,945,000	City Wide	No	
503	City Equipment	Landfill Rolling Stock Equipment	\$3,055,000	City Wide	No	
504	City Equipment	Police Communications	\$650,000	City Wide	No	
1001	Economic Development	Ensley Urban Renewal Corridor	\$2,500,000	City Wide	No	
1002	Economic Development	Hope VI Infrastructure	\$2,150,000	District 5	No	
1003	Economic Development	Industrial Parks	\$1,000,000	City Wide	No	
1004	Economic Development	Slossfield Community Center	\$25,000	City Wide	No	
1005	Economic Development	Commercial District Revitalization	\$1,200,000	City Wide	No	
1006	Economic Development	Ensley Mixed Use Business Park	\$225,000	City Wide	No	
1007	Economic Development	Tech Center – Lawson State Infrastructure	\$400,000	City Wide	Yes	
1008	Economic Development	Downtown Redevelopment Project	\$500,000	City Wide	No	
2001	Housing	Hope VI Infrastructure	\$1,500,000	District 5	No	
2002	Housing	Strategic Residential Land banking	\$4,800,000	City Wide	No	
2003	Housing	Residential Infrastructure Support	\$2,050,000	City Wide	No	
2004	Housing	Sandy Vista (B.E.A.T.)	\$50,000	District 9	No	
2005	Housing	Titusville Affordable Housing	\$100,000	District 6	No	In floodplain; shall require flood review
2006	Housing	Fountain Heights – Phase II	\$500,000	District 5	No	
2007	Housing	Acipco Finley Plan – Phase I	\$500,000	District 9	No	
2008	Housing	Arlington/ West End Plan – Phase I	\$500,000	District 6	No	
3001	Libraries	Program Management	\$150,000	City Wide	No	
3002	Libraries	Springville Road Regional Library	\$660,000	City Wide	No	
3003	Libraries	Avondale Regional Library	\$1,300,000	City Wide	No	
3004	Libraries	Ensley Branch Library	\$225,000	City Wide	No	
3005	Libraries	Slossfield Branch Library	\$660,000	City Wide	No	
3006	Libraries	Southwest Branch Library	\$1,000,000	City Wide	No	In or near floodplain; may require flood review
3007	Libraries	Brummitt Heights Branch Library	\$955,000	City Wide	Yes	

**CITY OF BIRMINGHAM
FLOOD MITIGATION / STORMWATER MANAGEMENT PLAN**

INDEX	CATEGORY	TITLE	BOND REQUEST	DISTRICT	COUNCIL REQUESTED	FLOODPLAIN COMMENTS
4001	Museum / Cultural Venues	Program Management	\$150,000	City Wide	No	
4002	Museum / Cultural Venues	Museum of Art Roof Repair	\$500,000	City Wide	No	
4002	Museum / Cultural Venues	Museum of Art Design for Expansion	\$65,000	City Wide	No	
4002	Museum / Cultural Venues	Museum of Art Office Construction	\$20,000	City Wide	No	
4002	Museum / Cultural Venues	Museum of Art Exterior Uplighting	\$40,000	City Wide	No	
4002	Museum / Cultural Venues	Museum of Art Replace 8 th Avenue North Entrance	\$200,000	City Wide	No	
4003	Museum / Cultural Venues	Boutwell Exterior Tuckpointing	\$400,000	City Wide	No	
4004	Museum / Cultural Venues	Jazz Hall of Fame Marquis	\$30,000	City Wide	No	
4004	Museum / Cultural Venues	Carver Theatre Roof Replacement	\$100,000	City Wide	No	
4004	Museum / Cultural Venues	Carver Theatre Hydraulic Stage Extension	\$240,000	City Wide	No	
4004	Museum / Cultural Venues	Carver Theatre Lighting	\$130,000	City Wide	No	
4005	Museum / Cultural Venues	Arlington Iron Fence Extension	\$150,000	City Wide	No	In or near floodplain; may require flood review
4006	Museum / Cultural Venues	Southern Museum of Flight Alterations	\$475,000	City Wide	No	In floodplain; shall require flood review
4007	Museum / Cultural Venues	Sloss Furnaces Restoration	\$1,000,000	City Wide	No	
4008	Museum / Cultural Venues	Ruffner Mtn Nature Center Museum	\$250,000	City Wide	Yes	
4009	Museum / Cultural Venues	Smithfield Cultural Historic Center	\$200,000	City Wide	No	
5001	Parks & Recreation	Program Management	\$460,000	City Wide	No	
5002	Parks & Recreation	Legion Field Structural Improvement	\$2,000,000	District 5	No	
5002	Parks & Recreation	Legion Field Lighting	\$1,250,000	District 5	No	
5003	Parks & Recreation	Botanical Gardens Repairs	\$2,030,000	District 3	No	
5004	Parks & Recreation	Hawkins Golf Course Fencing	\$250,000	District 2	No	In floodplain; shall require flood review
5005	Parks & Recreation	Caldwell Park Improvements	\$220,000	District 3	Yes	
5006	Parks & Recreation	Youth Sports Venue Upgrades	\$1,400,000	City Wide	No	
5007	Parks & Recreation	Pool Rehabilitation Program	\$225,000	City Wide	No	
5008	Parks & Recreation	Vulcan Park Elevator	\$1,000,000	District 3	No	
5009	Parks & Recreation	Fairgrounds Recreational Facilities	\$210,000	District 8	No	In or near floodplain; may require flood review

**CITY OF BIRMINGHAM
FLOOD MITIGATION / STORMWATER MANAGEMENT PLAN**

INDEX	CATEGORY	TITLE	BOND REQUEST	DISTRICT	COUNCIL REQUESTED	FLOODPLAIN COMMENTS
5010	Parks & Recreation	Inglenook Recreation Center Parking	\$25,000	District 4	Yes	
5011	Parks & Recreation	Ensley Park Improvements	\$44,000	District 8	Yes	
5011	Parks & Recreation	Ensley Park Recreation Center Restrooms	\$66,000	District 8	Yes	
5012	Parks & Recreation	Kelly Ingram Park	\$85,000	District 5	No	
5013	Parks & Recreation	Tennis Court Rehab Program	\$1,000,000	City Wide	No	
5014	Parks & Recreation	Harrison Park Recreation Center Expansion	\$285,000	District 6	Yes	
5015	Parks & Recreation	Apple Valley Recreation Center	\$1,000,000	District 1	Yes	
5016	Parks & Recreation	George Ward Park Improvements	\$750,000	District 3	Yes	
5017	Parks & Recreation	Memorial Park Expansion	\$125,000	District 6	Yes	
5018	Parks & Recreation	Cooper Green Park Baseball Field	\$110,000	District 6	Yes	
5019	Parks & Recreation	Railroad Reservation	\$300,000	District 5	Yes	
5020	Parks & Recreation	Garden Walk Improvements	\$100,000	District 5	No	
5021	Parks & Recreation	Bradford Tennis Center	\$750,000	District 1	No	
5022	Parks & Recreation	Lewis Park	\$75,000	District 3	No	In or near floodplain; may require flood review
6001	Public Facilities	Program Management	\$520,000	City Wide	No	
6002	Public Facilities	Fairgrounds Arena/ Expo Roof	\$120,000	City Wide	No	
6002	Public Facilities	Fairgrounds Arena Lighting	\$30,000	City Wide	No	
6002	Public Facilities	Fairgrounds Arena Seating	\$150,000	City Wide	No	
6002	Public Facilities	Fairgrounds Expo Electrical Upgrade	\$70,000	City Wide	No	
6002	Public Facilities	Fairgrounds Expo Restroom Renovations (ADA)	\$30,000	City Wide	No	
6002	Public Facilities	Fairgrounds Expo Elevator	\$30,000	City Wide	No	
6002	Public Facilities	Fairgrounds Expo Lobby Renovation	\$30,000	City Wide	No	
6002	Public Facilities	Fairgrounds Industrial Arts Building Renovation	\$825,000	City Wide	No	
6002	Public Facilities	Fairgrounds Grandstand Doors	\$50,000	City Wide	No	
6004	Public Facilities	PD – Mounted Patrol Administration Building	\$100,000	City Wide	No	In or near floodplain; may require flood review

**CITY OF BIRMINGHAM
FLOOD MITIGATION / STORMWATER MANAGEMENT PLAN**

INDEX	CATEGORY	TITLE	BOND REQUEST	DISTRICT	COUNCIL REQUESTED	FLOODPLAIN COMMENTS
6005	Public Facilities	PD – Demo Old Administration Building	\$60,000	City Wide	No	
6006	Public Facilities	PD – F.A.T. and K-9 Headquarters	\$120,000	City Wide	No	
6007	Public Facilities	PD – New East Precinct	\$760,000	City Wide	No	
6008	Public Facilities	PD – Demo Old East Precinct	\$70,000	City Wide	No	In floodplain and floodway; shall require flood review
6009	Public Facilities	PD – New South Precinct	\$2,950,000	City Wide	No	
6010	Public Facilities	PD – New West Precinct	\$2,900,000	City Wide	No	
6011	Public Facilities	Fire Station #22 (Clairmont) Replacement	\$750,000	City Wide	No	
6012	Public Facilities	Fire Station #14 (Graymont) Replacement	\$1,390,000	City Wide	No	
6013	Public Facilities	Fire Department Drill Tower Repairs	\$50,000	City Wide	No	In floodplain; shall require flood review
6014	Public Facilities	Fire Station #26 (Eastwood) Replacement	\$1,200,000	City Wide	No	
6015	Public Facilities	Traffic Engineering Operations Facility	\$1,240,000	City Wide	No	
6018	Public Facilities	DPW – Eastern District OP Facility	\$500,000	City Wide	No	
6019	Public Facilities	DPW – Ensley District OP Facility	\$500,000	City Wide	No	In floodplain and floodway; shall require flood review
6020	Public Facilities	DPW – Equip. Sheds Repair	\$15,000	City Wide	No	
6021	Public Facilities	DPW – Gas Island Canopy	\$15,000	City Wide	No	
6022	Public Facilities	DPW – Construction Division Renovations	\$50,000	City Wide	No	
6023	Public Facilities	City Council Office Renovations	\$750,000	City Wide	No	
6023	Public Facilities	City Hall Security Program	\$2,000,000	City Wide	No	
6024	Public Facilities	Boutwell Auditorium Renovations	\$1,175,000	City Wide	No	
6025	Public Facilities	City Owned Buildings Renovations	\$470,000	City Wide	No	
6026	Public Facilities	City Owned Buildings Roof Repair	\$1,000,000	City Wide	No	
7001	Schools	South Hampton School	\$20,000	City Wide	No	

**CITY OF BIRMINGHAM
FLOOD MITIGATION / STORMWATER MANAGEMENT PLAN**

INDEX	CATEGORY	TITLE	BOND REQUEST	DISTRICT	COUNCIL REQUESTED	FLOODPLAIN COMMENTS
7002	Schools	Jackson-Olin HS Access Improvements	\$300,000	City Wide	No	In or near floodplain; may require flood review
7003	Schools	MLK Jr. HS Access Improvements	\$500,000	City Wide	No	
7004	Schools	Parker HS Access Improvements	\$500,000	City Wide	No	
7005	Schools	Western Area MS Access Improvements	\$250,000	City Wide	No	
7006	Schools	Lincoln-Wilkerson MS Improvements	\$300,000	City Wide	No	
7007	Schools	Robinson ES Access Improvements	\$300,000	City Wide	No	
7008	Schools	Wylam ES Access Improvements	\$450,000	City Wide	No	
7009	Schools	Glen Iris ES Access Improvements	\$500,000	City Wide	No	
7010	Schools	Woodlawn HS Access Improvements	\$500,000	City Wide	No	
7011	Schools	East Area HS Access Improvements	\$500,000	City Wide	No	
7012	Schools	Wenonah ES Access Improvements	\$300,000	City Wide	No	
7013	Schools	Bush ES Access Improvements	\$300,000	City Wide	No	
7014	Schools	Council ES Access Improvements	\$300,000	City Wide	No	In or near floodplain; may require flood review
7015	Schools	Elyton ES Access Improvements	\$300,000	City Wide	No	In or near floodplain; may require flood review
7016	Schools	Gate City ES Access Improvements	\$300,000	City Wide	No	In or near floodplain; may require flood review
7017	Schools	Gibson ES Access Improvements	\$300,000	City Wide	No	
7018	Schools	Lewis ES Access Improvements	\$300,000	City Wide	No	
7019	Schools	Price ES Access Improvements	\$300,000	City Wide	Yes	In or near floodplain; may require flood review
7020	Schools	Washington ES (K-8) Access	\$300,000	City Wide	No	In or near floodplain; may require flood review

**CITY OF BIRMINGHAM
FLOOD MITIGATION / STORMWATER MANAGEMENT PLAN**

INDEX	CATEGORY	TITLE	BOND REQUEST	DISTRICT	COUNCIL REQUESTED	FLOODPLAIN COMMENTS
7021	Schools	Princeton ES Access Improvements	\$300,000	City Wide	No	In or near floodplain; may require flood review
7022	Schools	Jackson ES Access Improvements	\$300,000	City Wide	No	
7023	Schools	North Birmingham ES Access Improvements	\$300,000	City Wide	No	
7024	Schools	Projects to Be Identified	\$3,000,000	City Wide	No	
7501	Solid Waste / Landfill	Landfill Cell Development	\$8,200,000	City Wide	No	
7502	Solid Waste / Landfill	Eastern Access Road Guardrails	\$50,000	City Wide	No	
7504	Solid Waste / Landfill	Landfill Monitoring Wells	\$250,000	City Wide	No	
7505	Solid Waste / Landfill	Landfill Equipment	\$1,200,000	City Wide	No	
8000	Sanitary Sewers	Dolomite – Phase II	\$600,000	District 9	Yes	
8001	Sanitary Sewers	Liberty Highlands	\$3,150,000	District 2	No	
8002	Sanitary Sewers	Maple Grove/Lawson Road – Phase I	\$280,000	District 2	Yes	
8003	Sanitary Sewers	Oak Ridge – Phase II	\$600,000	District 9	No	
8005	Sanitary Sewers	Sand Ridge – Phase II	\$1,300,000	District 7	No	
8500	Storm Sewers	1 st Ave S – 6500 Block	\$455,000	District 4	No	
8501	Storm Sewers	24 th Street SW #2139	\$6,000	District 7	No	
8502	Storm Sewers	33 rd Street North Alley	\$160,000	District 4	No	In floodplain; shall require flood review
8503	Storm Sewers	34 th Street North #3392	\$235,000	District 4	No	
8504	Storm Sewers	4 th Street West #3540	\$840,000	District 9	No	
8505	Storm Sewers	6 th Avenue South Underpass	\$1,231,000	District 6	No	
8506	Storm Sewers	30 th Avenue North 3200 Block	\$135,000	District 4	No	In floodplain; shall require flood review
8507	Storm Sewers	83 rd Place South – Phase II	\$176,000	District 2	No	
8508	Storm Sewers	Airport Road #9500	\$85,000	District 2	No	
8509	Storm Sewers	Bridlewood Ditch	\$840,000	District 1	No	In or near floodplain; may require flood review
8510	Storm Sewers	Calico Winewood Ditch – Phase III	\$650,000	District 1	No	
8511	Storm Sewers	Davenport Drive #1525	\$102,000	District 2	No	
8512	Storm Sewers	Division Ave	\$860,000	District 4	No	
8513	Storm Sewers	Grassell Avenue SW	\$450,000	District 7	No	

**CITY OF BIRMINGHAM
FLOOD MITIGATION / STORMWATER MANAGEMENT PLAN**

INDEX	CATEGORY	TITLE	BOND REQUEST	DISTRICT	COUNCIL REQUESTED	FLOODPLAIN COMMENTS
8514	Storm Sewers	Jeannine Court	\$905,000	District 1	No	
8515	Storm Sewers	Lawson Road	\$1,000,000	District 2	No	In floodplain; shall require flood review & corps review
8516	Storm Sewers	Lowery Park	\$175,000	District 6	No	
8517	Storm Sewers	Martinwood Lane, 1000 Block	\$135,000	District 1	No	
8518	Storm Sewers	Ostlin Street Storm Drainage	\$25,000	District 7	No	In or near floodplain; may require flood review
8519	Storm Sewers	Pine Knoll Vista	\$1,540,000	District 2	No	
8520	Storm Sewers	Program Management	\$540,000	City Wide	No	
8521	Storm Sewers	Projects to be Identified	\$630,000	City Wide	No	
8522	Storm Sewers	Valley Creek Ditch	\$210,000	District 7	No	In floodplain; shall require flood review
8523	Storm Sewers	Walnut Avenue Ditch	\$300,000	District 1	Yes	
8524	Storm Sewers	27 th Avenue North & Vanderbilt Road	\$70,000	District 4	No	In floodplain; shall require flood review
8525	Storm Sewers	Roebuck Drive #356	\$51,000	District 1	No	
8526	Storm Sewers	Harrison Park Ditch	\$130,000	District 6	No	
9001	Storm Sewers	Hope VI Infrastructure	\$2,700,000	District 5	No	
9002	Street Improvements	Citywide Resurfacing	\$6,000,000	City Wide	No	
9003	Street Improvements	Program Management	\$445,000	City Wide	No	
9004	Street Improvements	11 th Avenue North Phase I	\$680,000	District 4	Yes	In or near floodplain; may require flood review
9007	Street Improvements	Five Mile Road – Phase I	\$1,080,000	District 1	Yes	In floodplain; shall require flood review
9008	Street Improvements	19 th Avenue North	\$245,000	District 4	No	
9009	Street Improvements	18 th Place SW – Phase I	\$110,000	District 7	No	
9010	Street Improvements	20 th Avenue South	\$115,000	District 3	Yes	
9011	Street Improvements	35 th Street North	\$100,000	District 4	No	
9012	Street Improvements	Wylam – Phase II	\$300,000	District 9	No	
9013	Street Improvements	Meehan Avenue #912	\$130,000	District 9	Yes	
9014	Street Improvements	East Lake Blvd. Slide Stabilization	\$115,000	District 4	No	

**CITY OF BIRMINGHAM
FLOOD MITIGATION / STORMWATER MANAGEMENT PLAN**

INDEX	CATEGORY	TITLE	BOND REQUEST	DISTRICT	COUNCIL REQUESTED	FLOODPLAIN COMMENTS
9015	Street Improvements	Montgomery Hwy @ Valley Avenue	\$180,000	District 3	No	
9016	Street Improvements	30 th Way North	\$385,000	District 9	Yes	
9017	Street Improvements	42 nd Avenue North	\$75,000	District 4	Yes	
9018	Street Improvements	9 th Avenue West	\$255,000	District 5	Yes	
9019	Street Improvements	Florida Avenue	\$350,000	District 8	Yes	
9020	Street Improvements	Lakeshore Pkwy Turn Lane	\$280,000	District 7	No	
9021	Street Improvements	Walnut Street	\$625,000	District 2	No	
9022	Street Improvements	47 th Street North – 10 th – 14 th Avenue North	\$405,000	District 4	No	
9023	Street Improvements	Dawson Avenue SW	\$430,000	District 7	No	
9024	Street Improvements	Hooper City – Phase IV	\$850,000	District 9	No	
9025	Street Improvements	Martinwood Lane	\$860,000	District 1	No	
9027	Street Improvements	Carver Avenue SW (Tarpley City)	\$225,000	District 7	No	
9028	Street Improvements	Wylam – Phase III	\$325,000	District 9	No	
9029	Street Improvements	1 st Avenue South – 2200 Block	\$100,000	District 5	Yes	
9030	Street Improvements	Gate City Street Improvements	\$300,000	District 3	No	
9031	Street Improvements	Clairmont Streetscape	\$255,000	District 3	No	

APPENDIX D

ACRONYMS

ACRONYMS

AEMA	Alabama Emergency Management Agency
AFMMP	Alabama Flood Map Modernization Program
BFE	Base Flood Elevation
BMP	Best Management Practices
CAT	Crisis Action Team
CDBG	Community Development Block Grant
CEMP	Jefferson County Comprehensive Emergency Management Plan
CIP Capital	Improvement Program
CRS	Community Rating System
DCD	Department of Community Development
DCNR Alabama	Department of Conservation and Natural Resources
DED	Department of Economic Development
DMA 2000	Disaster Mitigation Act of 2000
DMIS	Department of Information Management Services
DOA	Department of Agriculture
DPW	Department of Public Works
EDA	United States Economic Development Administration
EMA	Emergency Management Agency
EOC	Emergency Operations Center
EPA U.S.	Environmental Protection Agency

CITY OF BIRMINGHAM
FLOOD MITIGATION / STORMWATER MANAGEMENT PLAN

FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FMA	Flood Mitigation Assistance
FMMP	Floodplain Map Modernization Program
FPE	Flood Protection Elevation
GIS	Geographic Information System
H&H	Hydrologic and Hydraulic
HMGP	Hazard Mitigation Grant Program
HUD	Department of Housing and Urban Development
IA Individual	Assistance
ICC	Increased Cost of Compliance
JCEMA	Jefferson County Emergency Management Agency
MMP	Map Modernization Program
MOU	Memorandum of Understanding
NFIP	National Flood Insurance Program
NOAA	National Oceanographic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resource Conservation Service
NWR	NOAA Weather Radio
NWS	National Weather Service
OWR	Office of Water Resources
PA Public	Assistance

CITY OF BIRMINGHAM
FLOOD MITIGATION / STORMWATER MANAGEMENT PLAN

PEP	City of Birmingham, Department of Planning, Engineering & Permits
PDA	Preliminary Damage Assessment
PDM	Pre-Disaster Mitigation Grants
RPL	Repetitive Loss Property
SBCCI	Southern Building Code Congress International
SF Square	Foot
SFHA	Special Flood Hazard Area
SWMA	Storm Water Management Authority, Inc.
TAB	Technical Advisory Board
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey

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