

UPPER SHADES CREEK FLOOD HAZARD MITIGATION PLAN

A Comprehensive Risk Assessment and Mitigation Strategy



- Birmingham
- Homewood
- Mountain Brook
- Irondale

December 16, 2003



JEFFERSON COUNTY EMERGENCY MANAGEMENT AGENCY

BIRMINGHAM, ALABAMA

Upper Shades Creek Flood Hazard Mitigation Plan


This plan is the culmination of the most comprehensive study of flooding ever conducted within Jefferson County, Alabama. Total study costs exceeded \$536,500. It was funded in part through a \$369,000 grant awarded by the Alabama Emergency Management Agency to the Jefferson County Emergency Management Agency (EMA) under the Federal Emergency Management Agency (FEMA) Hazard Mitigation Grant Program and through the Technical Assistance Program of the U.S. Army Corps of Engineers, Mobile District (\$3,250). Project support was provided through in-kind services performed by the Storm Water Management Authority, Inc. (\$90,000) and the City of Birmingham Department of Planning, Engineering, and Permits (\$10,000). The City of Mountain Brook and Evson, Inc. supplied supplemental funding (\$64,250). An intergovernmental agreement to participate in and support this effort was entered into by the cities of Birmingham, Homewood, Mountain Brook, and Irondale. The planning process began in September 2000.

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EXECUTIVE SUMMARY

Scope and Purpose. This plan responds to the serious flood hazard and safety threats to property and lives within the flood plains of the upper reaches of Shades Creek. Without appropriate remedial measures, flooding presents a continuing risk for severe property damages and an ongoing threat to public safety. The intent of this plan to protect the public health, safety, and general welfare through a comprehensive program of mitigation measures that mobilizes all available private sector and local, state and federal public resources. This plan presents workable mitigation actions for the cities of Homewood, Mountain Brook, Birmingham, and Irondale.

Study Methodology. Principal tools for analyses included programs supplied through the Corps of Engineers Hydrologic Engineering Center: HEC-1 for computation of watershed hydrology/storm water flow rates, HEC-RAS for computation of stream hydraulics/flood elevations, and HEC-FDA for economic impact/flood damage assessment. The study team compiled, organized, and evaluated digital parcel maps, digital elevation model data, aerial imagery, field survey data, property owner questionnaires, real estate sales data, and property tax data. A series of community meetings at the beginning of the planning process helped focus the study on the most critical issues of concern to affected property owners.

Study Area. The study area includes those areas threatened by the flooding of Shades Creek and its tributaries as they flow through portions of the cities of Birmingham, Irondale, Mountain Brook, and Homewood. The Shades Creek study limits begin at the bridge crossing at West Oxmoor Road in Homewood and ends at the origins of its basin above Irondale. Its tributaries include Scott's Branch and Griffin Creek in Homewood and Watkins Brook, Crestline Tributary, and Furnace Branch in Mountain Brook.

Flood Hazard Risks. Since the October 1995 floods of Hurricane Opal, flooding has become a recurring hazard that has cost millions in damages to properties within the flood plains of Upper Shades Creek Basin and its tributaries. In particular, the floods of June 1999 and September 2002, demonstrate the vulnerability homes and businesses to flood damages. Close to 1,400 structures valued at over \$592 million with an estimated \$755 million in contents and equipment value are located within these flood plains. A 100-year flood occurrence could result in close to \$50 million in total damages.

Environmental Guidelines. The Shades Creek channel, flood plains and wetlands are essential elements of the natural ecological system. These elements help preserve the quality of the surface water and groundwater, support living resources by providing habitat, and exist as natural storm water and flood management systems. This plan presents guidelines for the protection and enhancement of these natural resources and for maintaining healthy channel conditions.

Plan Alternatives. A multi-disciplinary planning team examined each of the available planning approaches to determine the best strategy for mitigating the damage risks to properties throughout the study area, including both non-structural and structural plan alternatives. No property acquisition alternatives were found to be feasible. Two structural plans were found to be potentially feasible projects for reducing flood damages for Watkins Brook in Mountain Brook Village and Scott's Branch in West Homewood, each with positive B/C (benefit to cost) ratios.

Flood Hazard Mitigation Strategy. This plan presents a comprehensive program for each of the participating cities, including recommended goals, objectives, and mitigation policies for prevention, property protection, public education and outreach, natural resources protection, emergency services, and structural projects.

Action Program. Recommended actions for immediate implementation include the following highest priority mitigation measures:

- *The City of Mountain Brook should execute the Corps of Engineers cost sharing agreement and continue the feasibility phase to complete the studies initiated by this plan and secure the Federal funding opportunity made available through H.R. 2497. The Watkins Brook Plan (Plan 24) is a potentially feasible structural project that requires further investigation. The proposed feasibility phase study by the Corps of Engineers can complete the solution to the flooding problems along Watkins Brook within Mountain Brook Village and evaluate additional mitigation solutions for Furnace Branch.*
- *The City of Homewood should pursue the “Scott’s Branch Plan (Plan 2)” structural project to reduce flooding on Scott’s Branch.*
- *All cities should participate in the Jefferson County flood mitigation program and adopt its “Higher Regulatory Standards” model ordinance.*
- *All cities should immediately carry out measures for stream channel maintenance.*
- *Jefferson County should install a new stream gage site on Watkins Brook to monitor and alert the Mountain Brook Village area of impending flood events.*

ACKNOWLEDGMENTS

Participating Cities

- City of Birmingham - Mayor Bernard Kincaid
- City of Homewood - Mayor Barry R. McCulley
- City of Mountain Brook - Mayor Laurence T. “Terry” Oden
- City of Irondale - Mayor A. Allen Ramsey

Project Team

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Chapter 1:

INTRODUCTION

Background and Purpose

Hurricane Opal began a new cycle of flooding disasters throughout the Birmingham metropolitan area. Since the floods of that October 1995 hurricane, flooding has become a recurring hazard that has cost millions in property damages. This plan responds to flood hazards within the upper reaches of Shades Creek as it affects properties within the cities of Homewood, Mountain Brook, Birmingham, and Irondale. It presents workable mitigation actions for each of the participating cities. Flood hazard mitigation is any action taken to permanently reduce or eliminate long-term risk to people and their property from the effects of flooding.

The mayors of all four participating cities - Birmingham, Homewood, Irondale, and Mountain Brook - executed an intergovernmental agreement to support this planning effort and consider implementation of the mitigation strategies presented in this plan.

Flood hazard mitigation serves to lessen a community's vulnerability to the hardships and costs of flooding. Mitigation planning is a key component to achieving a sustainable community and must be closely coordinated with each community's long-term planning activities.

In the process of plan development, the project team completed a number of studies, which provide the basis for the recommendations of this plan. These studies, which are available through the Jefferson County EMA, are made a part of this plan by reference:

- Comprehensive hydrology (estimates of water quantities flowing through the basin) based on existing development;
- A forecast of future hydrology based on future urbanization of the basin over the next 25 years;
- A complete update of estimated flood elevations at any given location along all studied streams;
- An inventory of over 1800 properties located within the 100-year and 500-year flood plains of Upper Shades Creek and its tributaries, as described by the most recent FIRM;
- A geographic information system (GIS) which includes recent aerial and satellite photography and computer mapping of tax parcel boundaries, flood plain limits, stream locations, basin divides, topography, and other land base features;
- Compilation of 2001 Jefferson County tax assessment data for all properties, including ownership, improvement values, and land values;
- A complete study of the relationship between market values and tax assessment values to estimate fair market value (or cost less depreciation) of all structures and lands within the study limits;
- Estimated values for all structures, including contents, and equipment;
- Land use classifications for all structures;

- A complete survey of finished floor elevations, lowest adjacent grades, and geographic coordinates of all structures;
- Estimated flood damages to structures, contents, and equipment for all storm events from two-year through 500-year frequencies; and
- A complete digital photo inventory of all structures.

Funding

Funding for the Upper Shades Creek Flood Hazard Mitigation Plan was provided by a Federal grant under the FEMA Hazard Mitigation Grant Program to the Jefferson County EMA through the Alabama Emergency Management Agency. U.S. Congressional Representative Spencer Bachus was instrumental in the awarding of the grant to the County. The following listing provides a breakdown of project funding:

Federal Share:

- \$369,000 FEMA Hazard Mitigation Grant Program
- \$3,250 U.S. Army Corps of Engineers Technical Assistance Program

Local In-Kind Contributions:

- Approximately \$90,000 in-kind contributions from the Storm Water Management Authority for GIS and database support.
- Approximately \$10,000 in-kind contributions from the City of Birmingham for surveying of structures within the City of Birmingham.
- Undetermined in-kind contributions from the Cities of Homewood and Irondale for support of community meetings.

Local Cash Contributions:

- \$32,125 cash contribution from the City of Mountain Brook.
- \$32,125 cash contribution from Evson, Inc.

Chapter 2:

STUDY METHODOLOGY

Public Participation

The planning process began in the fall of 2000 following the Jefferson County EMA's receipt of Federal grant funds. The project team initiated the planning process with three community meetings – one in the Irondale Senior Citizens Center, one at Mountain Brook City Hall and the third at Homewood City Hall - in which the public was invited to make their flood hazard concerns known to the project team.

The final plan document was presented to the mayor of each participating city. Each city had the option to receive comments through a second public hearing and adopt the plan.

Preliminary Planning

Following the initial community meetings, the project team assembled to establish the broad parameters for project alternatives to be evaluated in the study process. These preliminary projects addressed structural or engineered flood reduction measures, such as floodwater detention, off-channel flood storage, channel improvements, and bridge openings, and possible acquisitions of flood-prone properties.

A comprehensive range of other mitigation measures were also evaluated – such as, retrofitting buildings, development regulations, public outreach, and emergency services enhancements – and, if deemed effective, are recommended by this plan.

GIS Development

To begin detailed studies, comprehensive mapping of the physical characteristics of the study area was compiled into a geographic information system (GIS). GIS data and parcel identification information for the 62 sections of the study area was compiled for approximately 30 square miles of the basin. The GIS information included digital elevation model data (DEM), ortho photos, and vector parcel information. The data was formatted and organized for application in the various study models.

Property Information Database

All insurable structures located within the 500-year flood zone, as determined by the FIRM, were surveyed. Each surveyor recorded the structure's geographic coordinates, finished floor elevation, the lowest elevation of the ground adjacent to the structure, location on the left or right bank of the stream, the building type, and foundation type. The data collected by the land surveyors was entered into a database for further evaluation in the various models.

Survey of Businesses

Business surveys were conducted for all the commercial and industrial establishments in the study area. A survey was mailed to all business owners along with a letter explaining the study and the importance of their cooperation. Any business that did not respond was visited in person. Data gathered through the business survey included: the typical cost, high cost and low cost of their inventory and equipment that would be affected by flooding of their property. This information was entered into the property inventory database for evaluation in the economic model for flood damage assessment.

Real Estate Valuations

Real estate appraisers conducted property valuation studies to compare actual market sales against tax assessment values over a number of years. Appraisers performed a statistical sampling and analysis for all residential sales by market location and non-residential sales by commercial, industrial, office, and institutional use. These studies provided coefficients to adjust the tax assessment values to estimated market values of land and depreciated values of buildings.

Environmental Assessments

A preliminary environmental assessment of the study area was conducted to avoid possible adverse environmental impacts by the structural projects. The National Environmental Policy Act (NEPA) criteria were applied to each project. Any project alternative having possible adverse environmental impacts on any NEPA criteria were dropped from consideration.

The project team's environmental consultant surveyed the stream corridors to identify opportunities for restoration of natural and beneficial functions of the flood plain, including open space conservation, greenways, stream bank restoration, water quality improvements, and creation of wetlands. Further, the consultant researched available records to identify any endangered species, unique flora, and historically significant structures that might be affected by the flood mitigation projects. Finally, the environmental consultant assessed channel degradation problems and developed guidance for each jurisdiction's maintenance of its stream corridors.

Hydrologic/Hydraulic Modeling

Project engineers developed two hydrologic/hydraulic simulation models supplied by the Corps of Engineers Hydrologic Engineering Center (HEC). The HEC-1 hydrologic model was used to simulate the stream flows within all sub basins in the study area according to existing conditions and future urbanization. The HEC-RAS (River Analysis System) hydraulic model was used to simulate current and future flooding elevations along the streams and evaluate possible resolutions to reduce flooding heights.

The GIS and imagery data were used to develop a base map with topography and land cover for development of the HEC-1 model. Engineers and surveyors compiled additional detailed data of stream cross-sections, bridges, drainage structures, and channel characteristics that were entered into the HEC-RAS model.

The HEC-1 model was used to evaluate the benefits of creating a system of ponds and/or reservoirs to store floodwaters away from developed flood hazard areas. The quantity values created by running the HEC-1 model were then imported into the HEC-RAS model to determine the beneficial effects on flood levels of the storage alternatives.

Engineers further applied the HEC-RAS model to analyze the controlling features of the streams that determine flood elevations, including the stream channel, bridges and drainage structures. HEC-RAS was also applied to analyze various structural alternatives to reduce flood elevations, such as the enlargement of bridges, culverts, and channel areas.

Economic Impact Modeling

The property information database and the results of the HEC-1/HEC-RAS simulations were imported into the HEC-FDA (Flood Damage Assessment) economic impact model. This model applied a series of factors that estimate flood damages according to the depth of flooding in relation to the finished floor of a structure. The flood profiles for each structural plan alternative were imported into the model to estimate the extent of flooding for each structure. Given these estimates, the model calculated the amount of potential damage under existing conditions and future urbanization. The results of each plan alternative were compared against the “without project” alternative. A comparison of annualized costs of each plan against the annualized reduction in flood damages provided a “benefit to cost ratio” or B/C. A B/C of 1.0 or greater was used to conclude the economic feasibility of a plan. That means the expected savings in flood damages outweighs the estimated cost of the plan. Property acquisition plans were also evaluated according to this method. Only economically feasible projects with no adverse environmental impacts are recommended by this plan.



Chapter 3:

STUDY AREA CHARACTERISTICS

Study Delineation

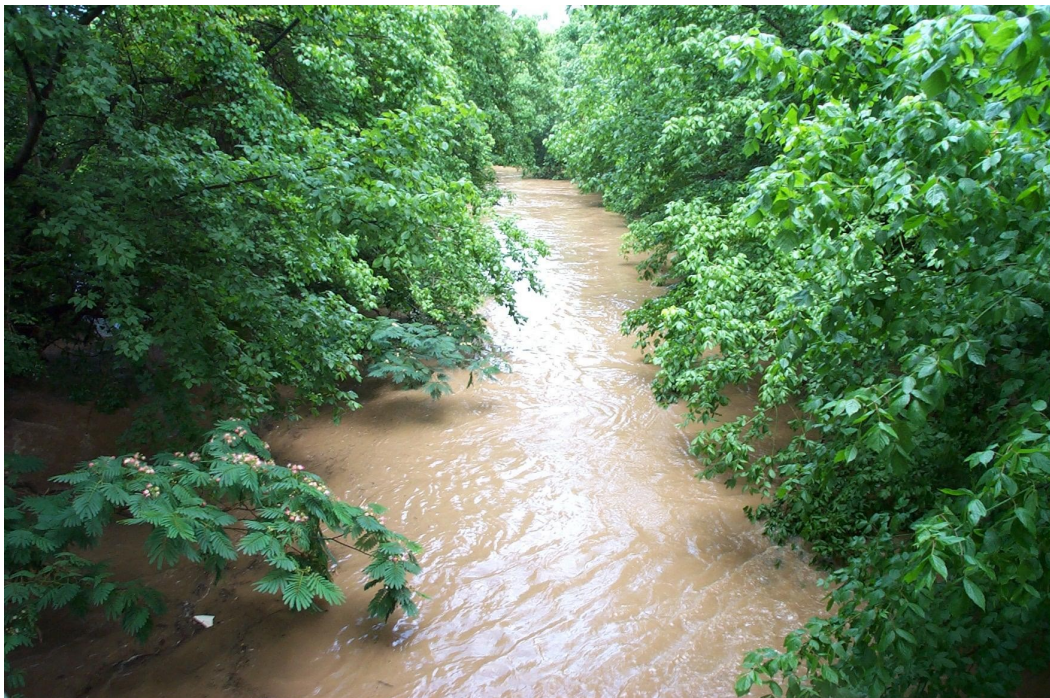
This plan evaluates the areas threatened by the flooding of Shades Creek and its tributaries as they flow through portions of the cities of Birmingham, Irondale, Mountain Brook, and Homewood. The Shades Creek study limits begin at the bridge crossing at West Oxmoor Road in Homewood and ends at the origins of its basin above Irondale. Its tributaries include Scotts Branch and Griffin Creek in Homewood and Watkins Brook, Crestline Tributary, and Furnace Branch in Mountain Brook. (See map 3-1. Upper Shades Creek Study Area)

Scope of Study

The plan addresses all known causes of flooding in the study area and responds with both structural and non-structural measures for flood hazard mitigation and environmental enhancement.

Population and Growth Characteristics

The City of Birmingham had a population of 242,820 in 2000; median household income of \$26,375; and a median housing value of \$62,100. The area affected by flooding is within the Crestline neighborhood of Birmingham, where average housing values and household incomes significantly exceed citywide averages. This is a stabilized area with no appreciable growth anticipated. The Roebuck-Race Track area at the upper basin has large undeveloped land tracts available for future urbanization. A portion of the Wildwood retail complex lies within the western portion of the study area.



The City of Irondale had a population of 9,813 in 2000; median household income of \$56,203; and a median housing value of \$99,900. Properties affected by flooding include a mobile home park and a number of commercial properties along U.S. 78. Sewer service expansion is expected to facilitate future commercial development in this portion of the basin.

The City of Mountain Brook had a population of 20,600 in 2000; median household income of \$100,483; and a median housing value of \$336,300. Properties affected by flooding are primarily commercial along the Watkins Brook tributary; multi-family residential along Furnace Branch; and residential along Crestline Tributary. The Shades Creek basin lands within the City are almost entirely developed. Future urbanization should be limited to infill and redevelopment.

The City of Homewood had a population of 25,403 in 2000; median household income of \$45,431; and a median housing value of \$160,700. Properties affected by flooding are primarily light industrial along Scotts Branch in West Homewood. The Griffin Creek flood plain is mostly residential, although non-residential properties are affected in the upper reaches. Most developed lands along the main Shades Creek flood plains lie within the City of Homewood. These are mostly large, planned developments of offices, retail, and apartments. Homewood has relatively small pockets of land available for future urbanization.

Physical Features

Jefferson County is located in the foothills of the Appalachian Mountains. The primary topographic features are a series of parallel ridges and valleys ranging from 300 to 1,200 feet in elevation running through the county in a northeast to southwest direction. Located in southeastern Jefferson County, Shades Mountain at 1,150 feet is the county's highest elevation, followed by Red Mountain at 950 feet. Shades Valley, which is characterized by steep valley walls and a narrow floor, lies between the two mountains. A low, meandering ridge known as Little Shades Mountain splits Shades Valley. Sand Mountain, which rises to an elevation of 700 feet, is located northwest of Red Mountain. Jones and Opossum Valleys, which are wide and flat-bottomed valleys, lie between Red and Sand Mountains. Slopes generally range from 0 to 20 percent. Most of the flat land is located in the Jones, Opossum, Pinson and Shades valleys. The majority of the county's geology consists of deposits of sandstone, shale, chert, dolomite and limestone.

The county generally drains in a westerly direction into either the Warrior or Cahaba River. Shades Creek, Little Shades Creek, and Patton Creek flow into the Cahaba, while Valley Creek and Village Creek are the major streams draining into the Warrior River. Numerous other smaller tributaries feed into these larger basins.

The Upper Shades Creek basin flows into the Cahaba River, which drains into the Alabama River, then into the Mobile River on into the Gulf of Mexico. It lies in the Valley and Ridge Province. This province is characterized by parallel valleys and alternating ridges of resistant rock. The narrow flood plains and steep slopes contribute to the rapid accumulation of storm runoff into the creek.

The rock formation in which the creek lies is the Pottsville Formation. The Pottsville Formation has alternating beds of gray sandstone, conglomerate, siltstone and shale with beds of coal and underclay. The maximum thickness is 9,000 feet.

The soil association is the Montevallo-Enders-Townley association. This soil is shallow to moderately deep, well drained over shale and sandstone. It is fairly poor for plant growth due to its shallow soil depth and depth to bedrock, low available water capacity and steep slopes. The resulting factor is plants that easily become detached from the surrounding soil and fall into the creek, causing blockage and debris build-up in the waterway. The build-up of debris slows the flow of the water downstream leading to the water overflowing the creek's banks.

Encroachment into the flood plain by industrial, commercial and residential development is a major contributor to flooding of Upper Shades Creek and its tributaries. Since the land is no longer available to absorb the rain, the water flows down to the creek and its tributaries at a much faster rate than if the land was available to absorb the water and slowly release it into the waterway. The rapid runoff does not give the water in the creek enough time to flow downstream, so the water begins to back-up and spill out into the flood plain.

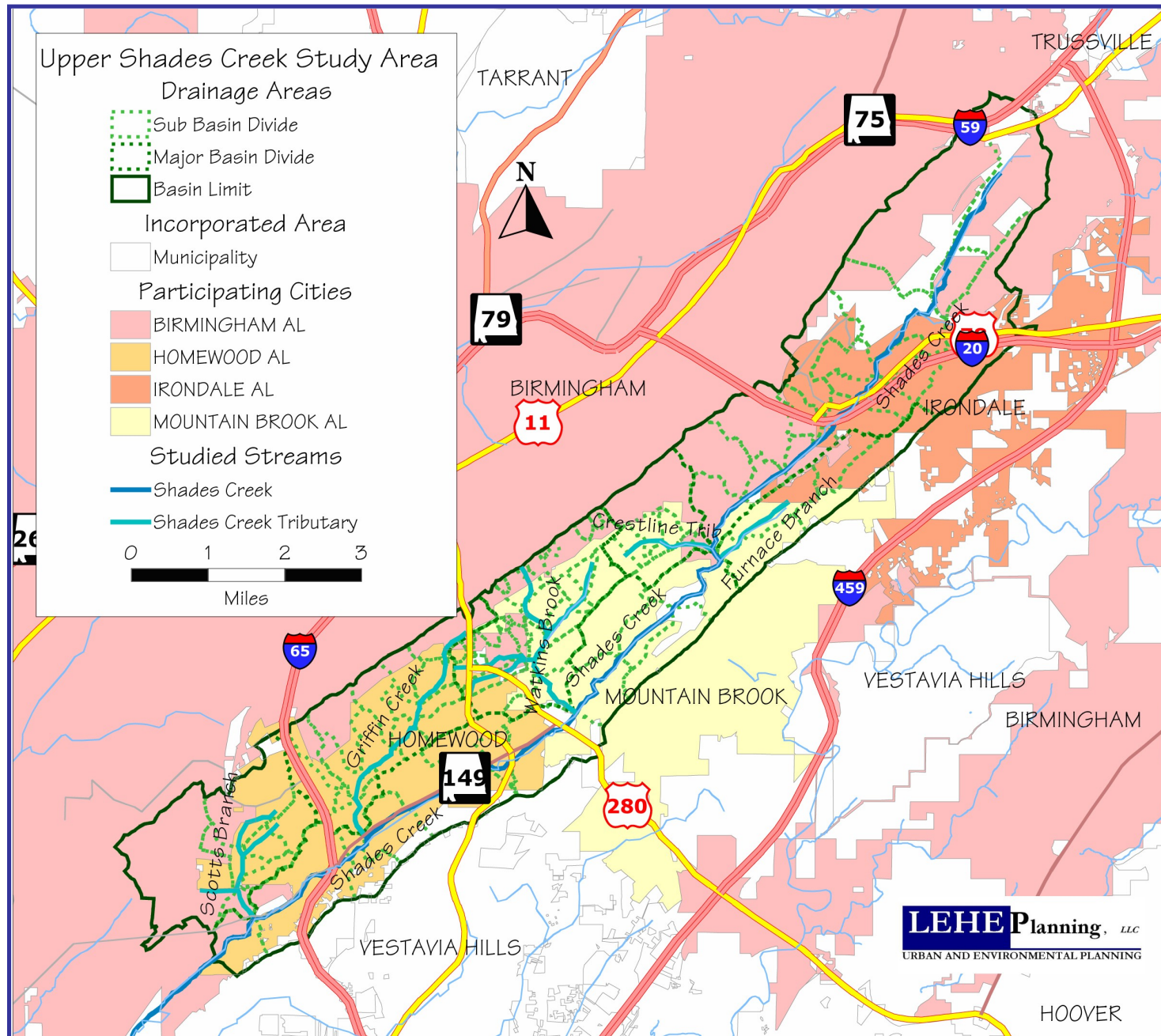
The combination of rock formation, soil type and the sloping banks all contribute to the flooding of the study area when high rainfall and rapid runoff occur simultaneously.

Climate

Jefferson County has a mild, temperate climate. Summers are generally hot and humid with scattered afternoon thunderstorms. Winter weather is influenced by successive cold fronts moving from west to east that draw moisture out of the Gulf and sometimes produce heavy downpours. Rainfall occurs an average of 117 days per year. Snowfall and freezing temperatures are infrequent. The table below provides average temperatures and precipitation amounts for the Jefferson County area.

Table 3-1. Climate Information for Jefferson County

Item	Average
Average Annual Minimum Temperature	51.3 degrees
Average Annual Maximum Temperature	72.7 degrees
Average Annual Temperature	62.0 degrees
Average Annual Rainfall	52.6 inches
Average Annual Snowfall	2.1 inches



Chapter 4:

ASSESSMENT OF FLOOD RISKS

Profile of Flood Events

Flooding is defined as the accumulation of water within a water body and the overflow of excess water onto adjacent flood plain lands. The flood plain is the land adjoining the channel or a river, stream, ocean, lake, or other watercourse or water body that is susceptible to flooding. Riverine flooding occurs when the water overtops the stream's banks and encroaches into the flood plain. Flooding in large rivers usually results from large-scale weather systems that generate prolonged rainfall over wide areas. In addition to a "riverine" flood, "flash flood" is a term widely used by flood experts and the general population. However, there is no single definition and method to distinguish flash flooding from riverine and other floods. Small rivers and streams are susceptible to flooding from localized weather systems that cause intense rainfall over small areas and often are considered "flash floods."



Floods are capable of undermining buildings and bridges, eroding shorelines and riverbanks, tearing out trees, washing out access routes, and causing loss of life and injuries. Floods occur in all 50 states. FEMA estimates that nine million households and \$390 billion in property are at risk from flooding.

Flooding along Upper Shades Creek has significantly increased in recent years due to a number of unusual and recurring rainfall phenomena and can be expected to worsen as the basin

continues to develop. Of particular importance to the increasing flooding on Mountain Brook Village is the development of the U.S. 280 highway corridor. Widening of 280 increased impervious coverage of the highway by 50%; new developments west of Red Mountain Expressway (the Embassy Suites area of Homewood) have significantly increased discharges into Watkins Brook through a minor tributary that flows through the Birmingham Zoo; additional development has also occurred along Montclair Road.

Since the floods brought on by Hurricane Opal in October 1995, a number of “storm bursts” or concentrated downpours of unusually high rainfall amounts over short periods have aggravated the potential for flood damages. These flood-producing storms have become frequent occurrences that far exceed normal statistical frequencies. Hurricane Opal produced 2.77 inches of rain in two hours and 5.86 inches in 24 hours (a 5-10 year statistical frequency). Other recent flooding events include the floods of June 1999 and September 2002.

During the month of June, 1999 three major storm bursts caused flooding:

- On June 2nd, 2.0 inches of rain fell in 1 ½ hours;
- On June 14th, 4.5 inches of rain fell in 2 hours (a 25 year frequency);
- On June 28th, 2.8 inches of rain fell in 3 hours.

Damage reports from the June 14th flood event record the following incidents:

- At Cherokee Bend Condominiums, along Furnace Branch in Mountain Brook, ten residential condominium basements flooded. Three to four feet of floodwaters destroyed heating and air conditioning systems and two storage units.
- Floodwater rose to more than 11 feet in Watkins Brook where 35 Mountain Brook Village businesses flooded
- Park Lane Apartments behind Mountain Brook Shopping Center had 72 units flooded and \$450,000 in damages caused by over two feet of interior flooding.
- Mountain Brook Junior High School had \$145,000 in damages.
- Over 30 homes along Mountandale Road in Birmingham were evacuated, and several were damaged.
- Snakes were found in many homes and businesses.
- The floods destroyed a large number of cars.

The National Climatic Data Center (NCDC) reports the June 14th event, as follows:

Three to six inches of rain fell across portions of Jefferson County in just over one hour. The hardest hit areas were Southside, Leeds, Birmingham, Homewood, Irondale, and Mountain Brook. Numerous roads were flooded and subsequently closed in all locations. A few feet of water flowed

into more than 20 homes and over 19 businesses. Several motorists were trapped in their vehicles and had to be rescued from the high water.

On September 22, 2002 5.25 inches of rain fell in 12 hours with 4.5 inches of that total falling in just 3 hours (a 20 year storm frequency). Again, floodwaters from Watkins Brook caused significant damages to Mountain Brook Village properties. During that storm, 24 units in the Park Lane Apartment complex were flooded; many basements of single family homes in the area were flooded; and at least eleven businesses in the Mountain Brook Mall area sustained flood damages.



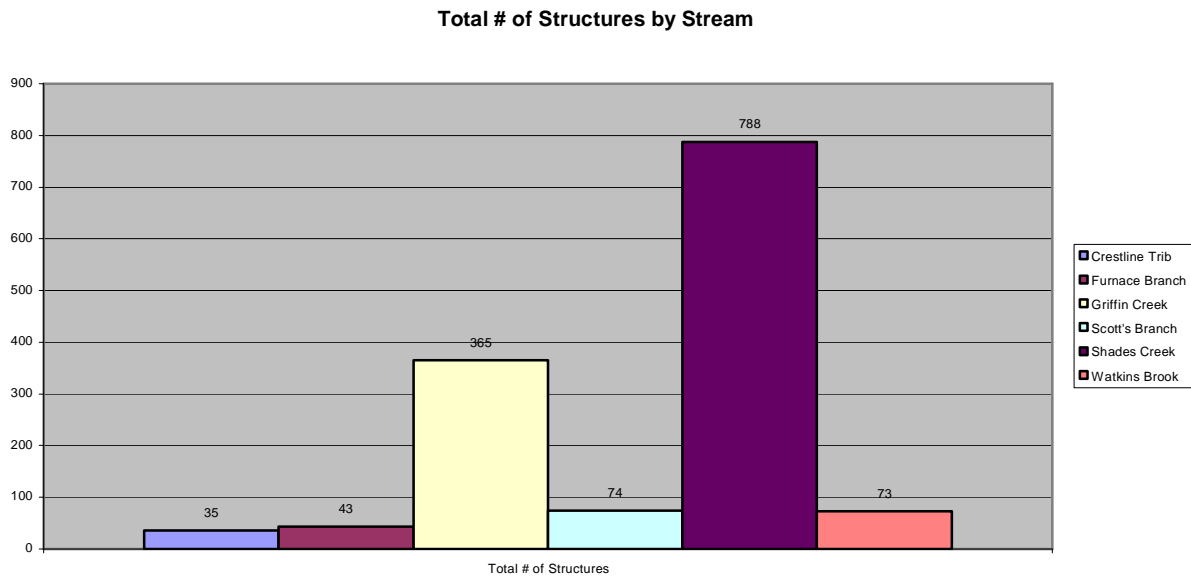
According to an NCDC report of this September flood:

Very heavy rain fell across central Alabama during the early morning hours. The heaviest rain was measured generally from Tuscaloosa to Birmingham to Wedowee. Radar-estimated rainfall amounts averaged from 3 to 5 inches with many localized areas over 7 inches in only a few hours. The hardest hit area was the Birmingham Metropolitan area where the damage stretched from Bessemer to Pelham to Mountain Brook to Vestavia Hills. The following events were reported: numerous high water rescues were performed by area fire departments, one junior high school sustained major damage, one home was totally destroyed, 100 homes suffered varying degrees of damage, 22 apartments were flooded, one bowling alley sustained major damage, at least 20 businesses were damaged, a few bridges were washed out, a few culvert pipes were washed away, trees and power lines fell down due to the saturated ground, numerous roads were temporarily closed and impassable, and over 200 automobiles suffered significant damage in Vestavia Hills. No injuries were reported. Some 24 hour rainfall totals in inches (most of which fell in two to four hours); Logan Martin Dam 10.96, Vincent 8.19, Mitchell Dam 7.64, Wilsonville 7.75, Alabaster 5.60, Childersburg 5.05, Palmerdale 5.03, Helena 4.71, Calera 4.67, and Pinson 4.50.

Vulnerability of Properties

Currently there are 1378 structures located within the 100-year flood plain of the study area. Of those structures, 788 are located along the main channel of Shades Creek, 365 along Griffin Creek, 74 along Scott's Branch, 73 along Watkins Brook, 43 along Furnace Branch, and 35 along Crestline Tributary. (See Figure 4-1).

Figure 4-1. Total Structures Exposed to Flooding



Total values of all structures, contents, and equipment exposed to flood damages are \$1,347,389,000 - \$592,646,000 in structure value, \$498,090,000 in contents value, and \$256,653,000 in equipment value. (See Figure 4-2).

Figure 4-2. Values of Properties Exposed to Flooding

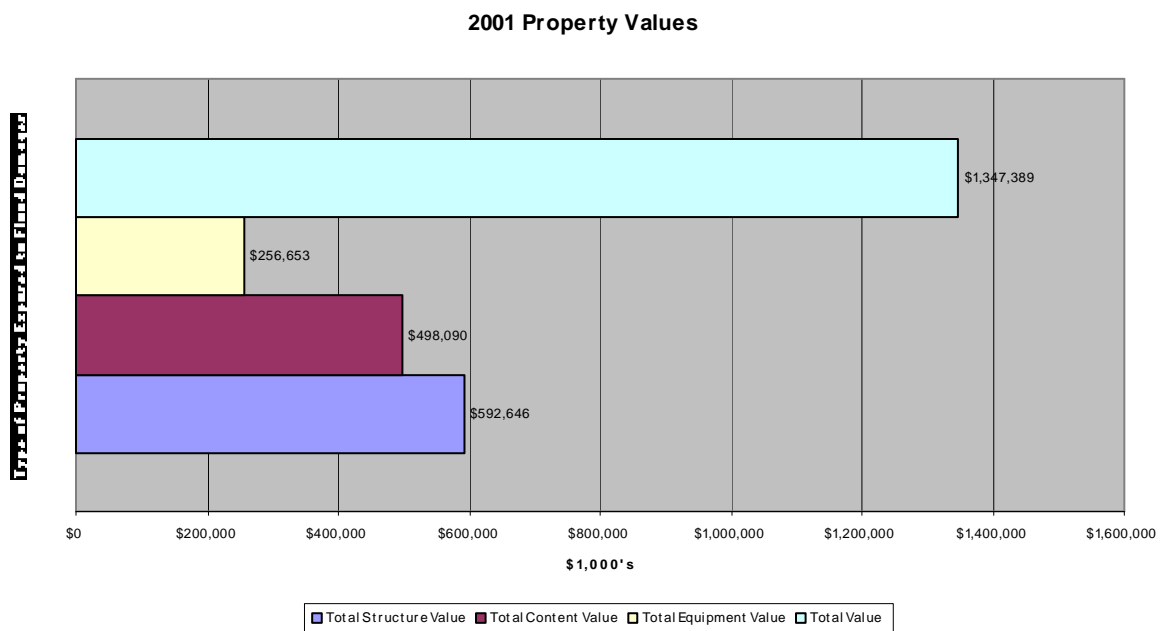
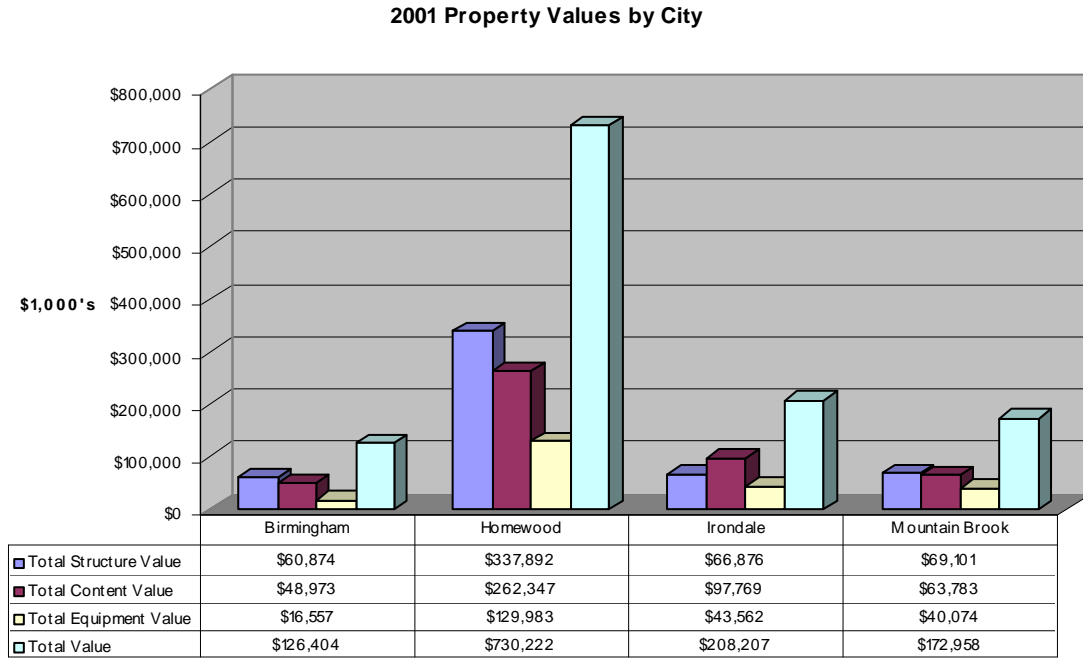
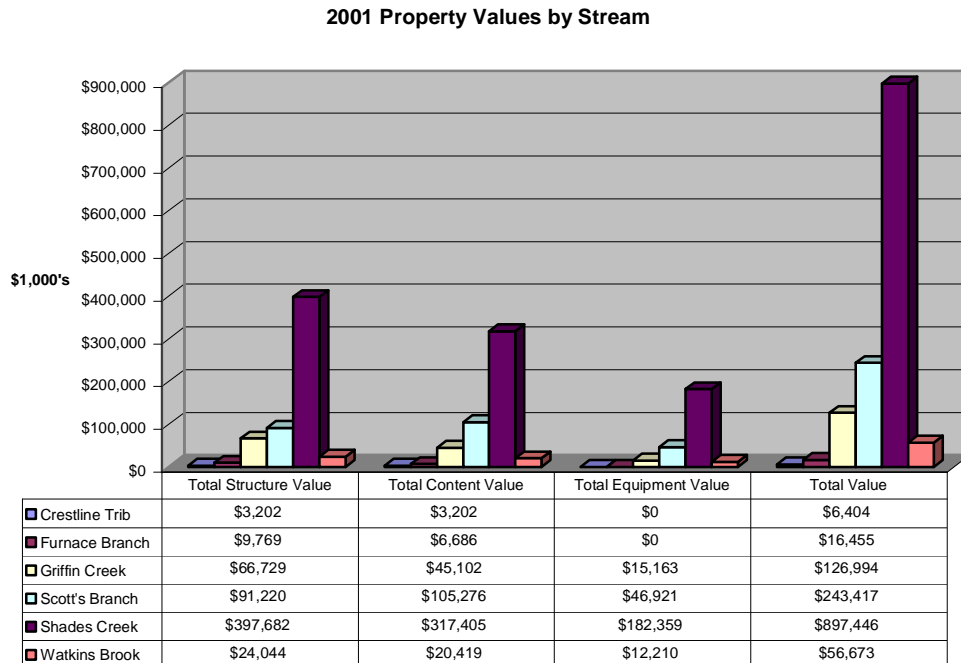


Figure 4-3. Distribution of Property Values by City



Of the total \$1,347,389,000 in property values, \$730,222,000 is within the City of Homewood, \$208,207,000 within Irondale, \$172,958,000 within Mountain Brook and \$126,404,000 within Birmingham. Remaining properties are within unincorporated locations. (See Figure 4-3).

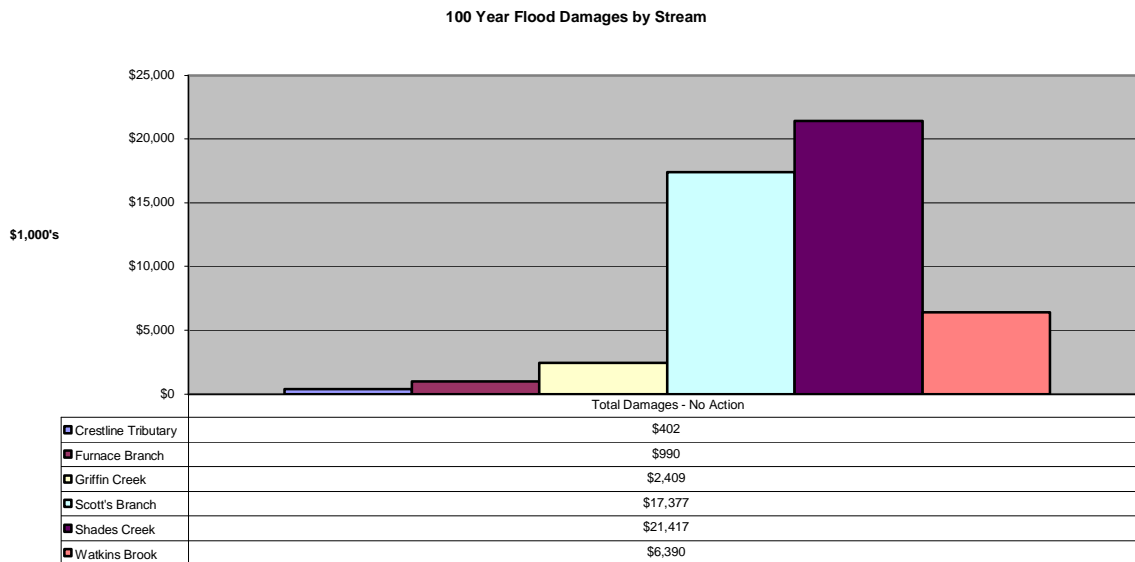
Figure 4-4. Distribution of Property Values by Stream



The stream with the greatest property values is the Shades Creek channel at \$897,446,000. Scott's Branch values are \$243,417,000; Griffin Creek values are \$126,994,000; Watkins Brook values are \$56,673,000; Furnace Branch values are \$16,455,000; and Crestline Tributary values are \$6,404,000. (See Figure 4-4).

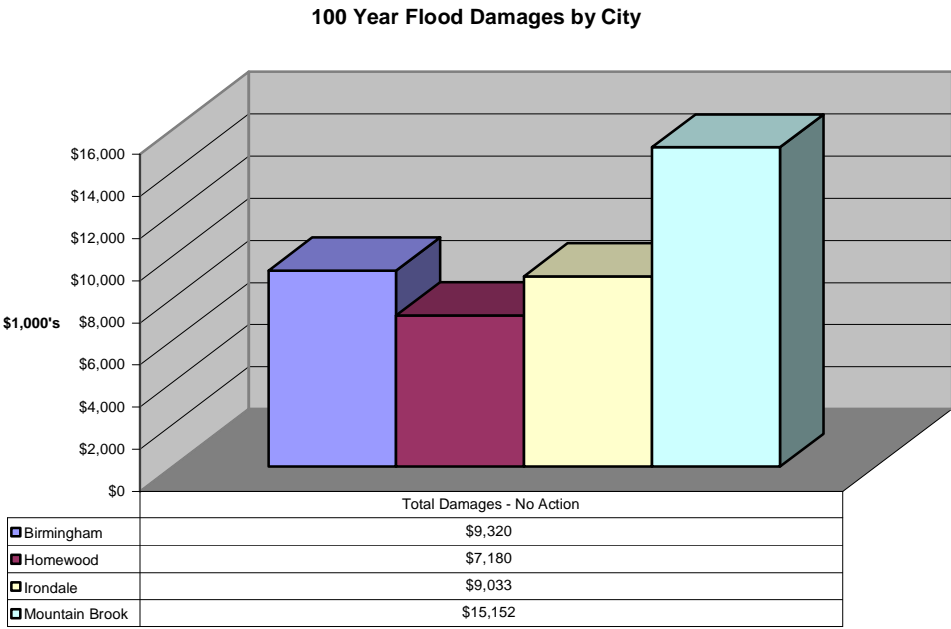
In the event of a 100-year flood occurrence, it is estimated a total of \$48,985,000 worth of damages would occur within the study area. Most damage would occur along Shades Creek with \$21,417,000 damages, \$17,377,000 along Scott's Branch, \$6,390,000 at Watkin's Brook, \$2,409,000 at Griffin Creek; \$990,000 along Furnace and \$402,000 along Crestline Tributary. (See Figure 4-5).

Figure 4-5. Flood Damage Potential by Stream



The 100-year flood event shows most damage occurring in the City of Mountain Brook at \$15,152,000. Birmingham has the potential for \$9,320,000 in damages, \$9,033,000 in Irondale, \$7,180,000 in Homewood and the remaining \$8,300,000 in unincorporated areas. (See Figure 4-6).

Figure 4-6. Flood Damage Potential by City

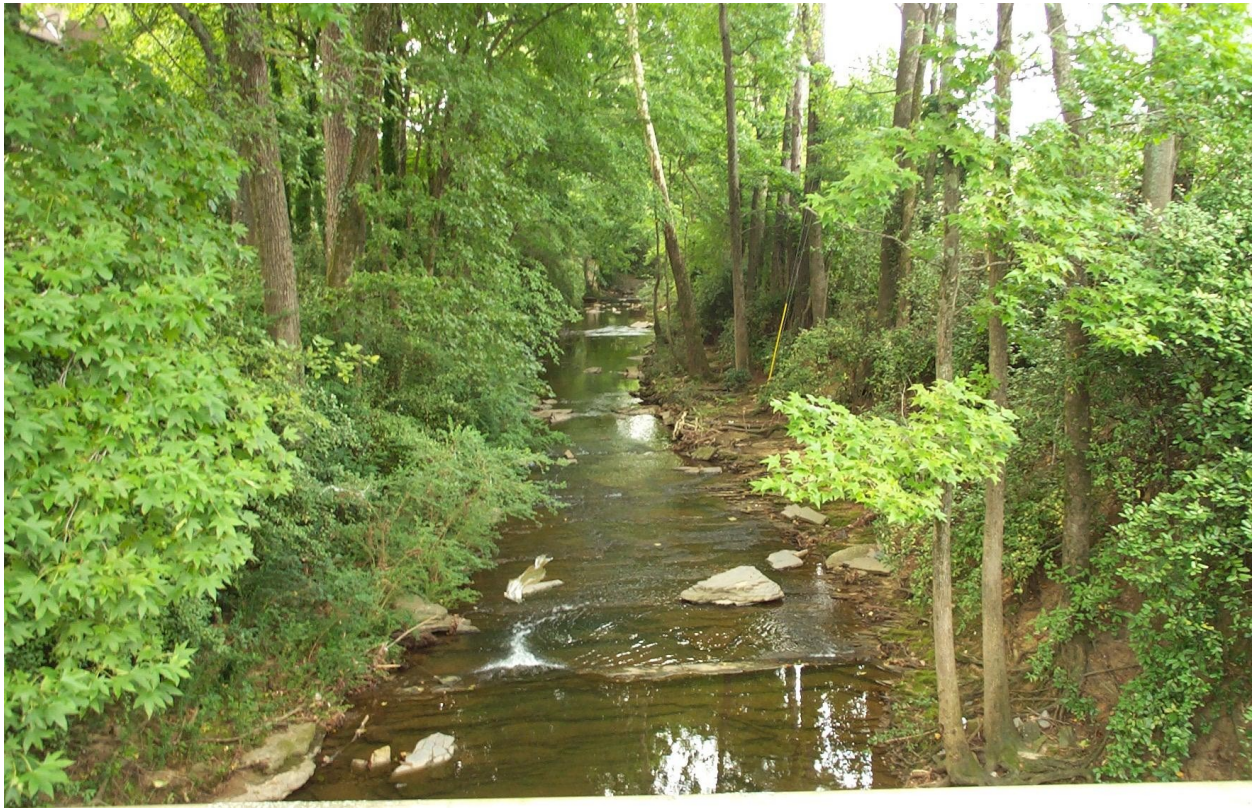


Chapter 5:

ENVIRONMENTAL CONSIDERATIONS

GUIDELINES FOR THE PROTECTION AND ENHANCEMENT OF NATURAL RESOURCES

The Upper Shades Creek Watershed has a rich variety of natural features that should be considered an integral part of any flood mitigation planning effort. These features include Shades Creek and its tributaries and flood plains, wetlands, forested areas, and diverse and unique wildlife habitats, groundwater aquifers. All of these features contribute to the quality of our urban and rural environments. The Shades Creek channel, flood plains and wetlands in particular are essential elements of the Upper Shades Creek natural ecological system. These elements help preserve the quality of the surface water and groundwater, support living resources by providing habitat, and exist as natural storm water and flood management systems.



The Upper Shades Creek basin is blessed with an abundance of valuable natural resources, which contribute to the regions pleasant quality of life. The effects of increased population and physical development have effected the natural environment in many ways including:

- Clearing of trees and natural vegetation;
- Loss of plant and wildlife habitats and populations;

- Loss of wetlands and aquatic habitats;
- Reduced groundwater and surface water quality;
- Disruption of natural drainage systems;
- Increased air pollution;
- Increased amounts of solid wastes and litter; and
- Loss of scenic areas.

Environmental deterioration is not an inevitable consequence of growth. The construction of new homes, businesses, industries, schools, and roads necessary to accommodate growth can occur without unduly threatening the area's environmental quality, if that new development is designed and constructed in an environmentally sensitive manner.

Throughout the Shades Creek watershed there are areas much more susceptible to environmental degradation than others due to their proximity to sensitive natural features. Future development should be directed away from these sensitive areas and guided toward areas where environmental impacts could be less severe. In an effort to provide environmental protection to existing natural resources, all future development within the upper Shades Creek watershed should be subject to minimum performance standards. The following are typical standards, which could be adopted:

Performance Standards for Flood Plain Development

- Identify flood plains and wetlands to provide, if needed, special protection.
- Provide open space, scenic areas and natural breaks in the landscape.
- Protect water quality and wildlife, and conserve natural features that make a significant contribution to the character of the area.
- Limit development in flood plains and associated natural areas.
- Protect water quality by reducing pollution and its effects.
- Conserve fish, wildlife and plant habitats.
- Establish protection measures for sensitive areas including streams and their buffers, 500-year flood plains, steep slopes adjacent to streams and habitats of threatened and endangered species.
- Conserve existing forested areas.
- Exclude development from the 500-year flood-plain areas.
- Develop and enforce local regulations, which encourage the landscape to be preserved in its natural state by minimizing soil and tree removal.
- Ensure that all new development and redevelopment minimize pollutant loadings and runoff from sites through enforcement and implementation of sediment, storm water and erosion control ordinances, plans and practices.
- Encourage public and private conservation of environmentally sensitive lands.

Sensitive Areas

The following areas are considered sensitive:

- Streams and stream buffers;
- 500 year flood-plains;
- Habitats of rare, threatened and endangered species; and
- Steep slopes adjacent to Shades Creek, tributaries and stream buffers.

Sensitive environmental areas extend throughout the basin and the potential for harm exists every time development activities result in land disturbance. Performance standards that protect environmentally sensitive areas should be included in local ordinances and regulations.

Stream and Stream Buffers

Shades Creek and its tributaries offer a great diversity of form and function. First and second order streams are often the most critical in terms of downstream water quality and aquatic species. These resources are usually the most impacted and should be protected.

Shades Creek and its buffers are important resources. Development along the streams' flood plains has resulted in the repeated damage or loss of property. Streams and adjacent areas are home to many plant and animal species. Shades Creek transports nutrients, minerals and sediment downstream to the Cahaba River. The flood plains, wetlands, and wooded slopes along the creeks are important parts of the stream ecosystem.

As development occupies land, the forest cover and natural vegetation along streams are usually disrupted. The cumulative loss of open space and natural vegetation places a greater burden on the remaining land along the creek to mitigate the effects of increased storm water runoff, sedimentation, and nutrient loading. Stream buffers serve as protection zones and serve to filter sediment, nitrogen, phosphorus, and other runoff pollutants, reducing stream damage. The effectiveness of buffers to protect stream water quality is influenced by their width, the type of vegetation within the buffer and buffer maintenance.

Buffers also provide habitat for wetland and upland plants, which are the foundation of healthy biological communities. Animals use the natural vegetation as a source of food and as protection from predators. A natural stream buffer system can provide connections between forested areas to enable wildlife migration. Connecting fairly large forested areas is important to the long-term health of Forest Interior Dwelling Birds (FIDS) and other species.

Riparian buffers provide the following benefits:

- ❑ *Help preserve wetland and flood plains.* Riparian forest buffers help maintain flood plains and wetlands, which reduce flooding and improve water quality.
- ❑ *Stabilize stream banks and limit channel erosion.* By preserving grasses and woody plants along the shoreline, buffers can moderate water temperature and create habitats for aquatic species.
- ❑ *Reduce runoff volume and velocity.* A riparian buffer can reduce runoff by intercepting and absorbing it, reducing the runoff velocity by flowing through natural vegetation before it reaches the stream.

- ❑ *Reduce pollutant loads.* A buffer can remove pollutants contained in runoff. Depending on site conditions, additional pollutant removal can occur from subsurface and groundwater flows.

Flood Plains

Flood plains are an important asset to the community. They perform vital natural functions such as: temporary storage of floodwater, moderation of peak flood flow, maintenance of water quality, groundwater recharge, prevention of erosion, and provision of natural wildlife habitat. Flood plains can also provide recreational opportunities, and contribute an aesthetic quality to natural areas. These functions are best served if flood plains are kept in their natural state.

Several areas within the basin are subject to periodic flooding which pose risks to public health and safety and potential loss of property. Flood losses and flood related losses are created by inappropriately located structures, which are inadequately elevated or otherwise unprotected and vulnerable to floods. While protection of life and property provide the initial basis for protection of flood plains, there has been a growing recognition in recent years that limiting disturbances within flood plains can serve a variety of additional functions with important public purposes and benefits.

Flood plain regulations should preserve and enhance the natural characteristics of the flood plain and their associated wetlands and water bodies. The legal purposes of flood plain regulations are to protect human life and health, minimize property damage, encourage appropriate construction practices to minimize future damage, protect individuals from unwittingly buying land subject to flooding and to protect water quality, sanitary sewage disposal and natural drainage. The prevention of unwise development in areas subject to flooding helps reduce financial burdens to the community and State, and prevents future displacements and suffering of its residents. This protection is achieved through the review of all activities proposed within the identified flood plain and by the issuance of permits for those activities that comply with the objective of the flood plain regulations.

The minimum requirements of the National Flood Insurance Program (NFIP) do not prohibit development within the 100-year flood plain from development. However, due to repeated flooding problems, local requirements should, at a minimum, require new development to stay out of the flood plain if any alternative site exists and meet certain flood protection measures including elevating the first floor of structures a minimum of one or more feet above the 100 year flood elevations and utilizing specified flood proofing construction techniques.

Rare, Threatened and Endangered Species

Biological diversity is important for a number of reasons including the advancement of future health care and numerous societal benefits. Alabama has been ranked as number one in the nation for loss of biodiversity and in the number of threatened and endangered species. These losses are attributed to habitat destruction and degradation. The key to protecting threatened and endangered species is protecting the habitat in which they exist.

Steep Slopes

Steep slopes are considered extreme environments and allow for the accelerated erosion and sediment, debris and pollutant transport. Improved erosion and pollution control is usually achieved through development and implementation of regulations pertaining to steep slopes. These areas represent the greatest opportunity for accelerated soil loss and resultant sedimentation and pollution to streams.

Steep slopes can be areas with a surprising number of different plant and animal species, largely because they offer unique habitats (rock outcrops, bluffs and thin soils) or they have not been disturbed. As a result, they often have a high plant and animal biodiversity, especially when compared with adjacent areas of generally flat or uniform environs. Steep, rocky ridges and narrow valleys often characterize the Upper Shades Creek watershed. Numerous steep sloped areas exist along the creek that may provide habitat to rare or threatened species.

Wetlands

Wetlands have been proven through years of research to be vital to the overall health of the environment. Wetlands provide many valuable physical, hydrological, biological and cultural functions. Some of these functions are listed below:

- Wetlands slow water velocities and reduce sediments in surface waters;
- Wetland plants and bottom sediments are sinks or collectors of numerous pollutants;
- Wetland plants reoxygenate water and increase oxygen availability;
- Wetlands are often located adjacent to streams and act as part of floodways;
- Wetlands store water during floods and release volumes slowly, reducing drastic flood surges;
- Wetland are often groundwater recharge areas;
- Wetland plants and environment are the base of a highly productive food chain;
- Wetlands are an important feeding, resting and nesting habitat for waterfowl and various wildlife species - almost 35 percent of rare, threatened and endangered species are located in wetland areas;
- Wetland areas can provide valuable forest resources;
- Wetlands provide scenic open spaces and often serve as areas for bird and wildlife observation and education.

The US Army Corps of Engineers and the Alabama Department of Environmental Management (ADEM) through a joint permitting process currently regulate wetland activities. Limited development activities are allowed in wetland areas.

GUIDELINES FOR STREAM CHANNEL MAINTENANCE

The objective of this section is to describe measures that will help the stream corridor achieve and maintain its desired function. Channel maintenance includes inspection and monitoring, maintenance and repair issues. All these items require planning and commitment. Many times each situation requires planning flexibility and should be evaluated on a case-by-case basis.



Ideally, long-term channel management will require minimal but regular inspection. However, with the continued development of a changing watershed, rapid and significant physical, chemical and biological changes can occur to the streams' characteristics. Both man-induced and naturally occurring events can cause a stream system to become unbalanced and require maintenance and management.

Inspection and Monitoring

Frequent, periodic inspection of the stream channel network is necessary. Stressed vegetation, stream bank destabilization and erosion, debris dams, and soil and water quality issues may occur and go undocumented unless the stream network is regularly inspected. Most inspection work will require only visual observation by a trained inspector familiar with stream channel conditions.

In many instances, actual repair work may be the responsibility of a utility company or private company. The inspector should document existing conditions and establish a complete record of repair history. All inspections should result in a written inspection report. These reports

are invaluable in maintaining a clear and thorough history of the maintenance requirements and activities. The reports should be complete, clear and concise.

Channel Banks and Structures

Inspections of the stream channel and banks should be conducted regularly especially after high flow events. The stream banks of areas subject to destabilization should be checked during prolonged drought and immediately after high water events. The routine inspections of bank and channel areas should be conducted during low flow periods so the significant portions of the bank and channel can be seen. The principal mechanism of bank destabilization is bank erosion and specifically undercutting at the toe. A low water inspection should involve looking for large sections of displaced, tilted or slumping vegetation, rock or bank materials.

Channel Vegetation Chemical Usage

In situations where mechanical controls are not enough, the application of fertilizers and herbicides to suppress undesirable competing species may be necessary.

Protecting existing stream bank vegetation requires a certain degree of attention and planning. It is important that the creeks be checked regularly to ensure that vegetation is growing satisfactorily. Dead zones should be identified and mapped. The cause of death should be determined as quickly as possible. If the site requires non-native invasive removal, rodent control or other remedial actions, the problems should be detected and resolved immediately or the damage may become severe enough to require extensive channel stabilization efforts. Competition from invasive weeds should be noted since they can easily suppress new native growth. Suppressed native plant growth can cause stream bank stability, flooding, aesthetic and utility maintenance problems. Non-native plants (Kudzu, Privet, Mimosa) capable of invading an area and out competing native species are known to be present along Shades Creek. Any non-native growth should be eradicated immediately.

The effectiveness of bank protection is based largely on the development of stable bank vegetation and their ability to bind soil at moderate flow velocities. The bank protection measures should be inspected regularly and immediately after abnormally high-flow events.

Herbicides can eliminate undesirable species more reliably, but they eliminate desirable species too. Their use near watercourses may also be severely limited by local, state or federal regulations. Several herbicides are approved for near stream application and degrade quickly. Their use should be considered as a last resort. Excessive spray or over spray should be carefully controlled and minimized due to the potential harmful effects.

If herbicide use is both necessary and permitted, the specific choice of should be based on whether the herbicide is absorbed by the leaves or by the roots. The selection of the specific herbicide should be done based on the location and individual needs.

Herbicides and fertilizers may be problematic near surface water. They should be used only if other more natural alternatives are not available.

Infrastructure and Other Features

The flow requirements of portions of Shades Creek may require periodic inspections of features other than the stream and stream bank. These features may be a major focus of the inspection effort. Facilities like culverts, pipes, roads, and utilities must be inspected to ensure they are in satisfactory condition and are not degrading or contributing to degradation of the stream corridor. Access routes required to conduct inspections of these facilities should be checked also. Popular use areas, particularly stream access areas should be checked to determine whether the area is being damaged or eroded. Inspections could reveal whether signs, area closures, and other traffic control measures are in place and effective. Trash and debris dumping, off road vehicle access, vandalism and a wide variety of other detrimental occurrences may be noted during routine inspections.

Maintenance

Maintenance encompasses those repairs of problems noted in regular inspections, scheduled activities or on an emergency basis. Maintenance activities identified by regular inspections are issues that arise that are not urgent yet are not addressed during normal maintenance activities. Normal maintenance includes items that naturally occur on a regular basis. These items include clearing culverts, road repairs, or mowing grass. Emergency maintenance requires immediate response to repair damage or to prevent additional problems. Emergencies may include measures such as, bank stabilization, or immediate threats to human health and safety.

Many maintenance activities will require permits and such requirements should be identified in advance to accommodate the permit processing time. Similarly, access to areas likely to require maintenance should be guaranteed.

Various agencies and utilities may have maintenance responsibilities that involve portions of the stream corridor, such as road and transmission line crossings. This work should be coordinated as required to ensure there are no conflicts with corridor objectives.

Stream Channel and Floodplain

Traditional channel maintenance methods can be incorporated into more progressive maintenance concepts. The removal of wood debris should be considered in the entire context of the stream conditions and flow restrictions. The removal of woody debris should be evaluated to determine if the decision to remove or reposition the debris would affect stream stability, increase the potential for flooding, or create stream safety issues.

Vegetation

Routine maintenance of vegetation includes removal of hazardous trees and branches that threaten safety, buildings, fences and other structures, as well as maintenance of vegetation along road shoulders, paths, and similar features.

Vegetation that is desired may require maintenance such as fertilization, pest control, stabilization, selective pruning or replanting.

Maintenance efforts should anticipate mitigation of erosion, and bank destabilization. Methods of stabilization should include bioengineering as well as hard engineering. The use of fencing, signage, posts or other measures might be necessary to prohibit access to specific locations.

Other Features

A wide variety of other issues may require regular or periodic maintenance. These may include repair or replacement of fencing, signage, access roads, and fire control. Publicly accessible areas may require road upkeep, trails and infrastructure repair. Maintenance of the Shades Creek corridor may be intensive, requiring trash removal, lighting, and other steps. The appropriate administrator should be available to address problems as they develop.

Maintenance may be a time consuming, and areas that are poorly maintained may draw public attention and criticism. The maintenance commitment should be specified as structures and uses are defined. Special wildlife provisions may be necessary in specific areas.

Flooding limitations should be known beforehand. Special equipment may be necessary to maintain structures (levees, drainage structures, etc.) and facilities. Local public works staff should address maintenance needs in those kinds of situations. Not maintaining these features properly can create nuisance or hazardous conditions, have severe detrimental effects on existing resources and fail to produce the desired results.

Mosquito control may also be a necessary maintenance measure in backwater areas, ponds, or depressional storage features near residential areas.

Chapter 6:

PLAN ALTERNATIVES

The Planning Approach

The project team examined each of the available planning approaches to determine the best strategy for mitigating the damage risks to properties throughout the study area. The planning approach presented here follows the six categories of a comprehensive hazard mitigation program. These program categories have been developed by FEMA for managing a successful mitigation program and are used here as guidelines for identifying and selecting among alternative mitigation measures:

1. Prevention. Adopting and administering ordinances, regulations, and programs that manage the development of land and buildings to minimize risks of loss due to natural hazards.
2. Property Protection. Protecting structures and their occupants and contents from the damaging effects of natural hazard occurrences, including retrofitting existing structures to increase their resistance to damage and exposure of occupants to harm; relocating vulnerable structures and occupants from hazard locations; and conversion of developed land to permanent open space through acquisition and demolition of existing structures.
3. Public Education and Outreach. Educating and informing the public about the risks of hazards and the techniques available to reduce threats to life and property.
4. Natural Resources Protection. Preserving and restoring the beneficial functions of the natural environment to promote sustainable community development that balances the constraints of nature with the social and economic demands of the community.
5. Emergency Services. Responding to and recovering from a natural hazard disaster.
6. Structural Projects. Engineering structural modifications to natural systems and public infrastructure to reduce the potentially damaging impacts of a hazard on a community.

Property Acquisition Alternatives

The project team identified three potential acquisition areas. These areas were recognized by high flood risk properties subject to potentially recurring damages and, if acquired, might be reused as open space to increase the storage of floodwaters.

1. Irondale Trailer Park. This property within the City of Irondale encompasses approximately 25 acres and contains 157 mobile home units. Spaces are leased on a monthly basis, and the entire property is in single ownership. This entire park is located within the 100-year flood plain of Shades Creek.
2. Crestline/Mountaindale Neighborhood. Over 400 homes within this neighborhood are located within the FEMA-designated flood plain. The City of Birmingham has acquired six of these homes with recurring flood damages through FEMA's Flood Mitigation Assistance Program for repetitive flood insurance loss properties. Study planners

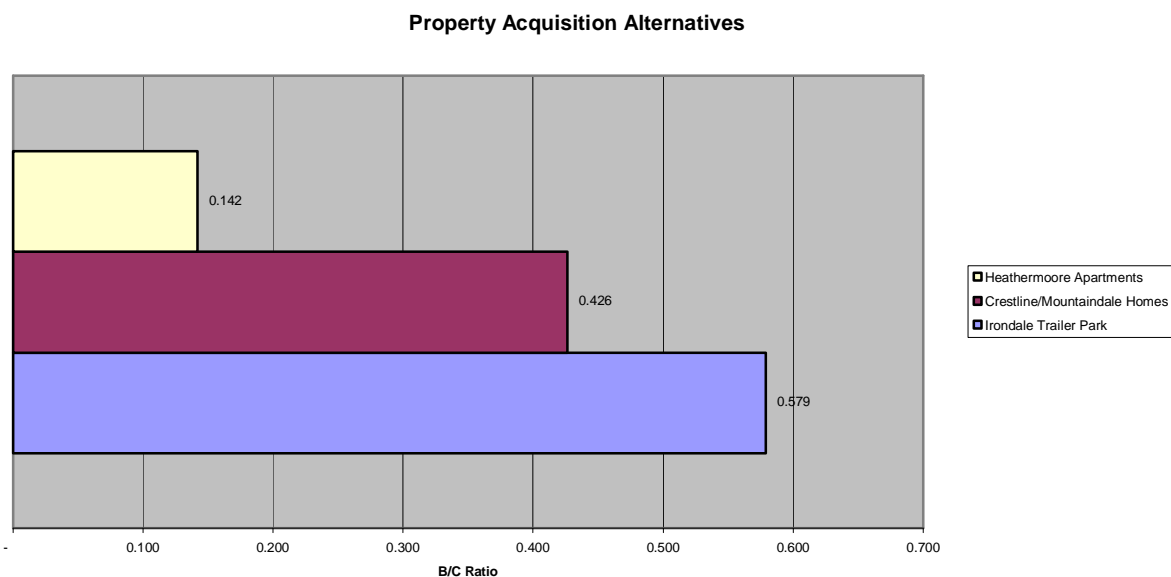
evaluated the remaining homes for potential flood damage risk. Fourteen homes were found to have the lowest finished floor elevated at or below the estimated 10-year flood elevation.

3. Heathermoore Apartments. This apartment complex within the City of Mountain Brook consists of four separate building with two rental units per building. The apartments are located within the Watkins Brook flood plain. Recurring floods have damaged vehicles and yard improvements.

Evaluation of Property Acquisition Alternatives

None of the property acquisitions were determined to be feasible. An acquisition cost estimate was prepared for each of the properties, and property damage reductions were evaluated using the HEC-FDA model. The annualized benefits (damages reduced) compared against the annualized acquisition costs do not yield a positive benefit-cost ratio (B/C ratio). B/C ratios for these projects are shown in Figure 6-1 below:

Figure 6-1. B/C Ratios for Property Acquisition Alternatives



The assessment of the Crestline/Mountaindale neighborhood grouped all fourteen homes into a single project. A property-by-property evaluation might disclose that some individual home acquisitions are feasible.

Structural Plan Alternatives

The project team identified a number of potential structural solutions, including the following types of projects that might reduce flood damages:

- Construction of detention ponds,

- Off-channel flood storage
- Channel construction/modification,
- Raising bridges,
- Enlarging culverts, and
- Replacing culverts.

After a thorough investigation of possible structural projects, study hydrologists selected three structural plans for detailed evaluation. These plans are identified as follows:

1. Scott's Branch Plan (Plan 2)

The primary cause of flooding on Scott's Branch in Homewood is the inadequate size of the three 10-foot diameter corrugated metal pipes that are intended to carry the flow of Scott's Branch under the access road in the back of the Army Reserve Center. Under current conditions, these pipes cause almost 13 feet of additional flooding during the 100-year flood. Scott's Branch Plan (Plan 2) addresses flooding caused by this road crossing. It recommends adding two 10-foot diameter, 240-foot long corrugated metal pipes to be installed at the Army Reserve center at West Oxmoor Road. There is a significant amount of fill for the existing road so it will be necessary to remove about 30 feet of fill to install these pipes.

2. Watkins Brook Plan (Plan 24)

Watkins Brook Plan (Plan 24) addresses flooding along Watkins Brook and the Mountain Brook Village area. This plan proposes a number of structural measures working in combination to reduce flood levels. These measures include:

- Channel improvements from Canterbury Road up to the edge of the Birmingham Country Club golf course (about 2000 feet) to include slight widening, smoothing and deepening up to 2.5 feet in solid rock.
- Replace the long culvert in front of Regions Bank with a larger culvert to coordinate with the channel improvement.
- Replace the Montevallo Road Bridge with a larger bridge to coordinate with the channel improvement.
- Add one barrel to the Canterbury Road Culvert
- Add two barrels to Watkins Road
- Clear and grub the channel from Watkins Road up to Canterbury Road.
- Remove and replace the rock facing on Canterbury Bridge.
- Construct a detention pond at the Country Club golf course.

3. Watkins Brook Alternate Plan (Plan 26)

Watkins Brook Alternate Plan (Plan 26) is similar to Watkins Brook Plan (Plan 24) with a few modifications. The improvements at Watkins Road stated above would not be done creating about one foot of additional flood storage in the area of the middle school soccer field

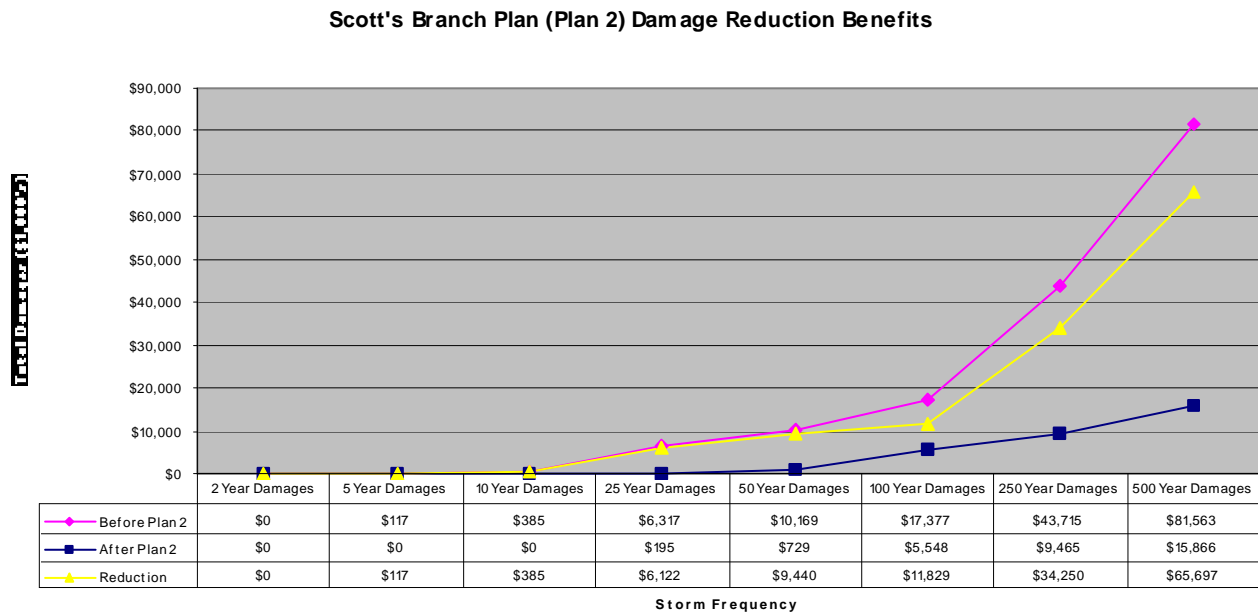
during the 100-year flood. A pond would be constructed at the Botanical Gardens. Heathermoore Apartments and the four homes to the northeast of the apartments would be purchased. The middle school would be retrofitted to prevent flood damage from the additional foot of flood storage. This project was eliminated from further consideration due to its adverse impacts on existing properties and its excess cost in comparison to plan 24.

Evaluation of Structural Plan Alternatives

Each of the plan alternatives were evaluated according to projected urbanization within the basin over the next 25 years, referred to here as “future conditions.” The estimated annual damages from the 100-year flood event that would be reduced should the plan be implemented were compared against the annualized project costs to calculate B/C ratios.

Scott’s Branch Plan (Plan 2). For future conditions, damages without the project are projected to be \$17,377,000 for the 100-year event; damages with the project are projected to be reduced to \$5,548,000 for the 100-year flood—a damage reduction of \$11,829,000 for the 100-year event as shown on Figure 6-2. Damages without the project begin at the 5-year storm event and begin at the 25-year event with the project. The annual benefit/cost ratio for this plan is 65.32 as shown on Figure 6-4, which is well above the minimum 1.0 for a successful project

Figure 6-2. Scott’s Branch Plan (Plan 2) Benefits

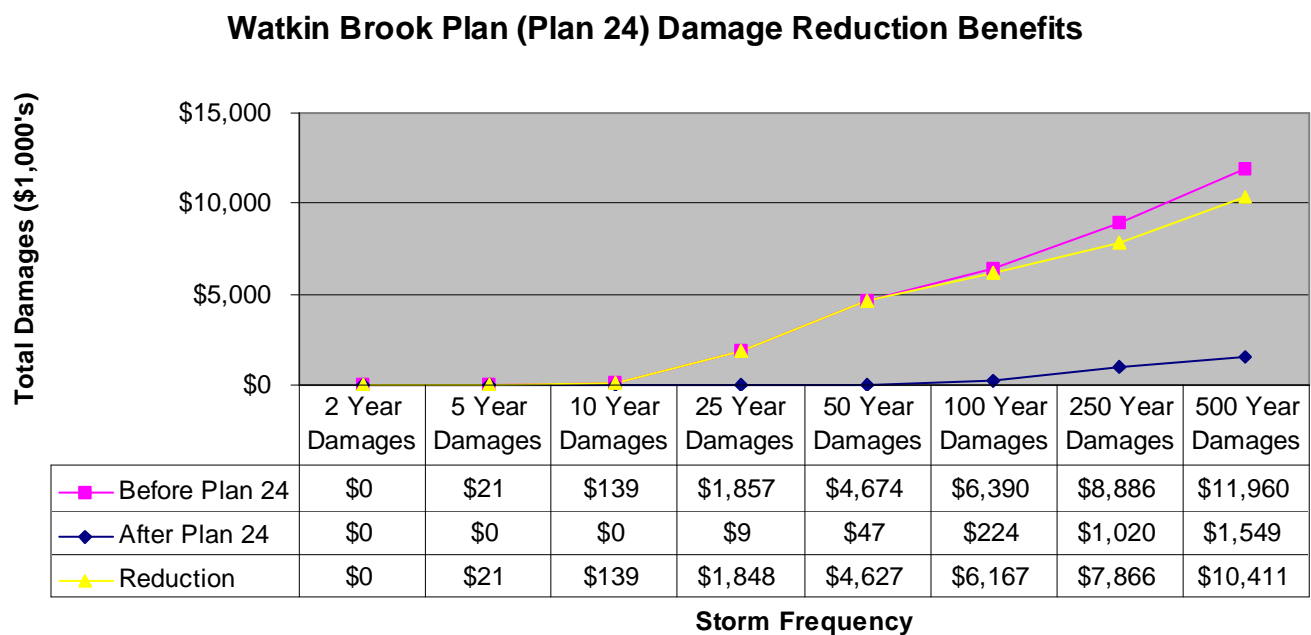


Map 6-1 shows the flood outline for the future conditions, 100-year event. This map shows the substantial reduction in the area flooded during the 100-year event. After the pipes are installed the 100-year flood elevation will drop about 5 feet.

This plan does have some small adverse impacts downstream on the order of 0.07 ft. on the 100-year flood. Further study will need to be done to compensate for these impacts prior to plan implementation.

Watkins Brook Plan (Plan 24). For future conditions, damages without the project are projected to be \$6,390,000 for the 100-year event; damages with the project are projected to be reduced to \$224,000 for the 100-year flood—a damage reduction of \$6,166,000 for the 100-year event as shown on Figure 6-3. Damages without the project begin at the 5-year storm event and at the 25-year event with the project. The annual benefit/cost ratio for this plan is 2.34 as shown on Figure 6-4, which is well above the minimum 1.0 for a successful project.

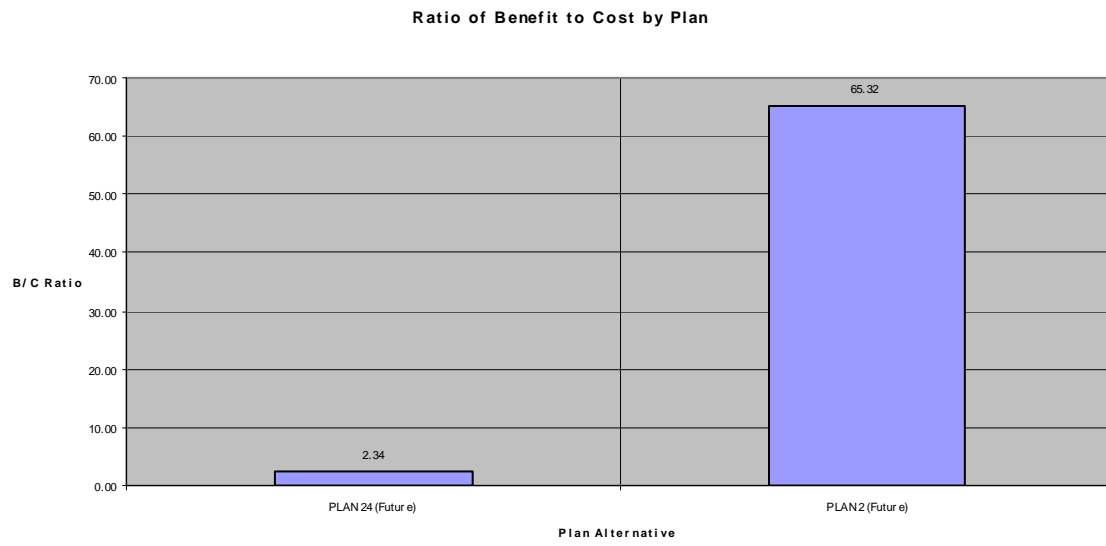
Figure 6-3. Watkins Brook Plan (Plan 24) Benefits



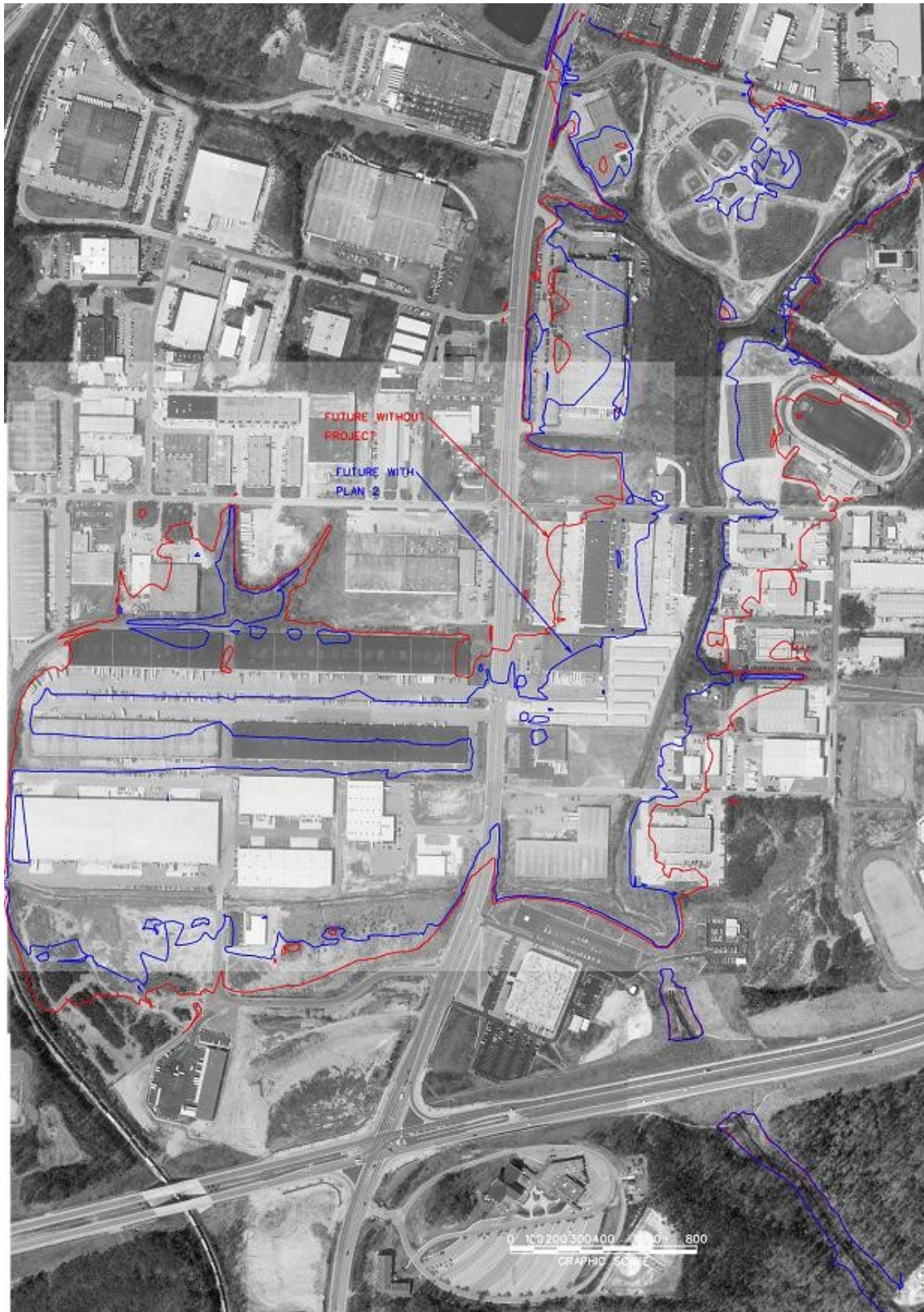
Map 6-2 shows the flood outline for the future conditions, 100-year event. This map shows the substantial reduction in the area flooded during the 100-year event. These improvements would reduce flood elevations in the area from Canterbury Road up to the golf course by up to 5 ½ feet.

This plan does have some small adverse impacts downstream on the order of 0.16 ft. on the 100-year flood. Further study will need to identify methods to compensate for these impacts.

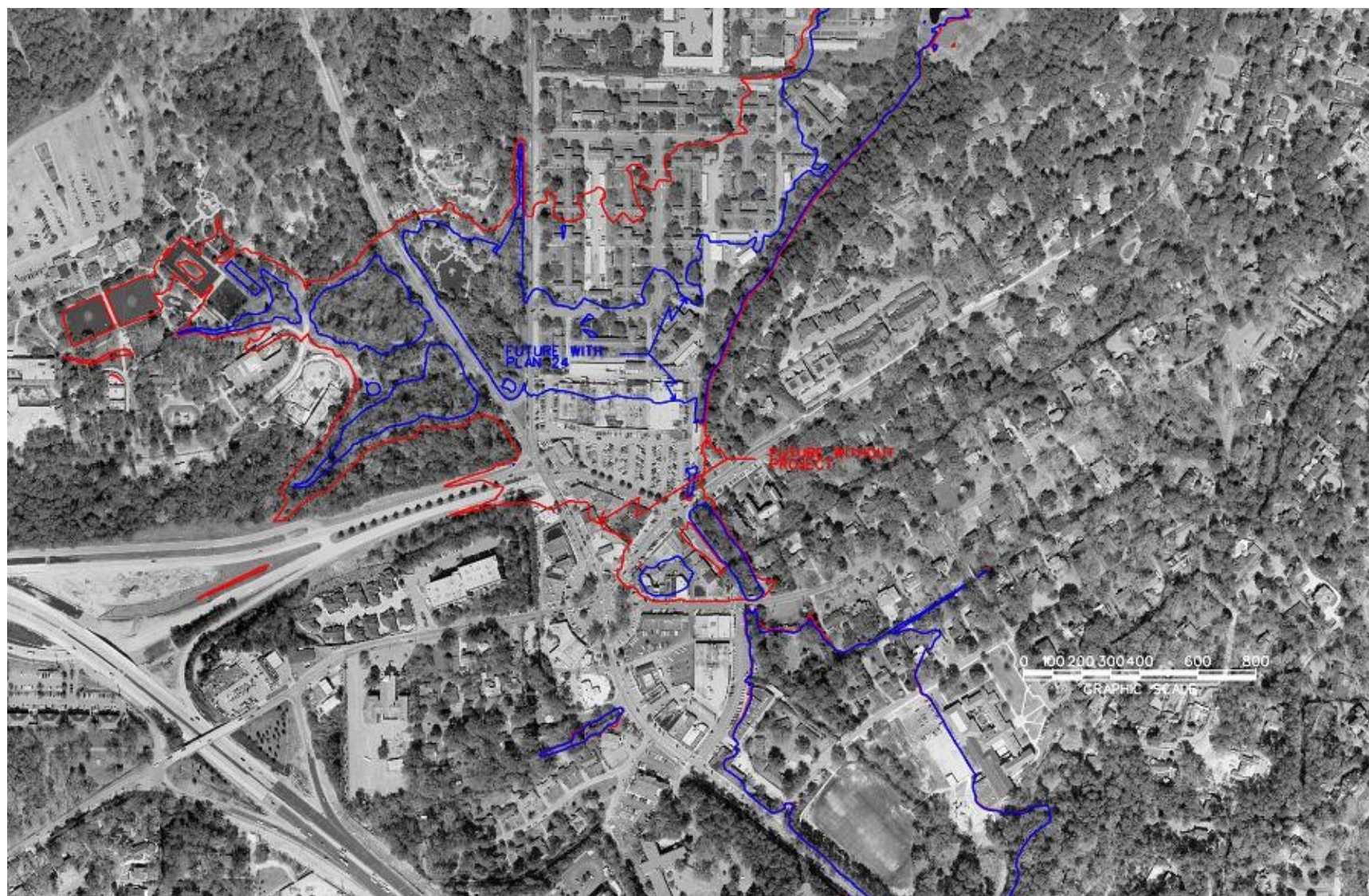
Figure 6-4. B/C Ratios for Preferred Structural Plans



Map 6-1. Scott's Branch Plan (Plan 2): 100-Year Flood Area Comparison



Map 6-2. Watkins Brook Plan (Plan 24): 100-Year Flood Area Comparison



Chapter 7:

FLOOD HAZARD MITIGATION STRATEGY

This strategy provides a blueprint to reduce the potential flood damage losses identified in the risk assessment through a comprehensive program for flood hazard mitigation. Presented here are the long-term goals, objectives, and policies to guide the mitigation efforts of the participating cities.

Goal for Prevention

Manage the development of land and buildings to minimize risks of loss due to flood hazards.

Comprehensive Plans. Establish an active comprehensive planning program that seeks to mitigate the damaging effects of flood hazards, guide future development according to environmental and flood hazard constraints, and duly consider the vulnerability of areas exposed to flood hazards and the conservation of the natural and beneficial functions of the flood plains of Upper Shades Creek.

- Areas that adopt an active comprehensive planning program that fully integrates flood hazard mitigation into its plan policies and zoning ordinances and land development regulations should be able to keep flood damage to a minimum. Each of the cities' comprehensive plans should establish a long-range program for the protection and mitigation of properties from flood damages.
- Those jurisdictions that already have a comprehensive plan should review and amend their existing planning documents to be certain the vulnerability and environmental suitability of lands for future development are clearly addressed. The local plans should address the vulnerability of designated flood hazard areas and encourage open space planning to create amenities for recreation and conservation of fragile resources.
- The Jefferson County Commission has committed \$2 million per year for flood mitigation. The County's Department of Land Development has been charged with planning and administering the newly created program. The program will include a comprehensive plan for acquisitions, updates of Flood Insurance Rate Maps, a model "Higher Regulatory Standards Ordinance," and support for local mitigation projects. All cities should enter into an agreement with Jefferson County to participate in this long-range mitigation program.

Geographic Information Systems (GIS). Maintain a comprehensive database of flood hazard data and maps and apply GIS to planning analysis.

- Jefferson County, the Storm Water Management Authority, and the Regional Planning Commission maintain countywide GIS programs and the City of Birmingham maintains GIS for its jurisdiction. GIS technology should be shared and used as a resource for preparing and updating comprehensive plans.

- FEMA, in conjunction with the National Institute for Building Sciences, has recently developed a new GIS application for analyzing the impacts of natural hazards, including floods, on buildings and public facilities. This new application, *HAZUS-MH* (Hazards U.S. for Multi-Hazards) provides a new opportunity to assess flood hazard risks. The area GIS resource agencies should combine efforts to develop and apply this new technology to the Upper Shades Creek basin.
- GIS offers a method to record and map flood events. This provides historical records of the extents of each flooding event. Previous flood events should be mapped, according to best available records, and as new events occur, those flood areas should be immediately surveyed and documented within GIS.

Flood Hazard Studies. Continue special studies, as needed, to identify flood hazard risks and facilitate the implementation of mitigation measures.

- House Resolution 2497, introduced by U.S. Congressman Spencer Bachus (representing all participating jurisdictions), was adopted on May 9, 1996 in response to the devastating floods incurred during the previous year by Hurricane Opal. This resolution authorized the U.S. Army Corps of Engineers, Mobile District, to conduct a feasibility phase study to secure Federal funding for flood mitigation projects within the Upper Shades Creek Basin. The Corps completed its reconnaissance phase and has presented the City of Mountain Brook with a Cost Sharing Agreement (CSA) to proceed. During the preparation of this FEMA-funded plan, Mountain Brook was identified as the only jurisdiction that might benefit from the Corps funding source. The proposed CSA will require a 50% local contribution in in-kind services and cash to fund the \$1,413,500 feasibility phase study by the Corps. The highest priority recommendation of this plan is that the City of Mountain Brook execute the Corps agreement and continue the feasibility phase study to complete the studies initiated by this plan and secure the Federal funding opportunity made available through H.R. 2497.
- A number of areas are depicted on the Flood Insurance Rate Maps (FIRM) as “Approximate” zones where no detailed studies and flood elevation data exist. These maps should be upgraded to consider all development that has taken place since the maps were last updated. Further, the updated hydrology and stream hydraulics developed by this planning study should form the basis for remapping the corrected flood plain boundaries and republishing the FIRM panels for Upper Shades Creek. Jefferson County is beginning the process to update all flood maps throughout the County, including incorporated areas. Given the degree of flood hazard severity and the availability of data and updated hydrology, the Upper Shades Creek basin should be a priority for remapping.

Flood Hazard Prevention Regulations. Effectively administer and enforce local flood hazard prevention regulations.

- Effective land use controls in vulnerable flood plain areas discourage environmentally incompatible land use and development. Consideration of large lot size restrictions on flood-prone areas designated on Flood Insurance Rate Maps should be made. Developers should avoid flood plains or meet specific flood protection standards that minimize risk of property damages.

- Additional land use restrictions within designated flood zones, such as prohibition of storage of buoyant materials, storage of hazardous materials, restrictive development of flood ways, among others should be evaluated.
- Each of the cities should consider adoption of “Higher Regulatory Standards” within their flood hazard prevention ordinances. Higher standards can be enacted to increase the required flood protection elevation of new and substantially improved buildings, discourage fill or displacement of flood storage, among other restrictions on flood plain development. The Jefferson County Commission’s model ordinance should be adopted by each of the cities.
- Effective administration and enforcement of local floodplain management regulations is critical to mitigation. Training is available to local flood plain managers through programs offered through the State Flood Plain Manager and FEMA’s training center in Emmitsburg, Maryland. Each city should maintain a library of technical assistance and guidance materials to support the local flood plain manager. Additional support is available through membership by the local flood plain managers in the Association of State Flood Plain Managers.

Open Space and Landscape Regulations. Establish minimum zoning standards for open space for parks, conservation areas, and planting areas for trees and vegetation to maintain critical natural features for reduced storm water runoff and improved urban aesthetics.

- Zoning regulations for open space preservation can minimize disturbances of natural land features and help reduce storm water runoff. Such regulations can require maintenance of critical natural features, such as, open space for parks, conservation areas, landscaping, and drainage. Each city should consider zoning requirements for mandatory open space within planned residential developments and maximum impervious surface standards for non-residential developments.
- Each city should consider parking lot landscaping standards be added to their zoning ordinances to encourage infiltration of rainwater where there are large expanses of impervious surfaces.

Storm Water Detention Regulations. Manage the impacts of land development on storm water runoff rates and to natural drainage systems.

- The cities should support the adoption of a uniform storm water management ordinance that maintains pre-development runoff rates on large developments for all storms up to and including the 100-year event.

Community Rating System Program (CRS). Increase participation of all cities in the CRS Program of the National Flood Insurance Program.

- The cities of Irondale and Mountain Brook should apply for and maintain membership in the CRS Program. This program recognizes outstanding flood hazard mitigation efforts of

participating communities and rewards flood insurance policy holders with reduced premiums.

- The cities of Birmingham and Homewood should continually strive to improve its CRS rating. The City of Birmingham is currently a class 7 community, and Homewood is a class 9 CRS community.
- CRS communities should work cooperatively in all aspects of their programs, especially joining together to conduct public outreach programs.

Goal for Property Protection

Protect structures and their occupants and contents from the damaging effects of flood hazards.

Acquisitions. Acquire flood prone buildings and properties and establish permanent open space, where feasible.

- A large number of buildings (residential and non-residential) throughout the flood plains were constructed in flood prone areas before the publication of Flood Insurance Rate Maps (pre-FIRM buildings) and are not protected from flooding. Property acquisition has been the preferred method of permanent protection, although select cases of structural and other non-structural methods have been found to be more appropriate. Although this study has not identified a feasible acquisition project, some properties within the Mountandale neighborhood of the City of Birmingham may be beneficial to acquire. The City of Birmingham should evaluate all residential properties within this neighborhood where the finished floor of homes lies at or below the ten-year flood elevation or where repetitive flood insurance claims have been paid.

Elevation, Retrofitting, Relocation, and Flood Proofing. Protect buildings in hazardous flood areas to safeguard against damages.

- Other means of property protection include elevation, retrofitting, relocation and flood proofing. Depending on the type of structure, raising the building so that it is no longer threatened by floodwaters may be feasible. Buildings, which cannot be elevated or retrofitted, may be able to be relocated out of the floodplain. Flood proofing is another possibility. The City of Mountain Brook should evaluate assistance with retrofitting at-risk commercial properties within Mountain Brook Village and residential properties subject to flooding along Furnace Branch. This type of effort can be addressed by the Corps of Engineers in its feasibility study and might be eligible for Federal funding assistance. The City of Homewood should evaluate retrofits to homes subject to Griffin Creek flooding and offer technical assistance to homeowners. The City of Irondale should evaluate possible retrofits of mobile homes within the Irondale Trailer Park or advise on an improved site layout for the park to avoid damages to units along the creek banks.

Insurance. Encourage homeowners and renters to maintain insurance riders for flood damages.

- Not all property owners and tenants realize that insurance policies do not ordinarily cover flood damages. Moreover, building owners and tenants might not know the property location within the flood plain. Consequently, each city should keep its citizens informed of flood zone boundaries and promote the purchase of insurance coverage by property owners and renters for flood damages in these high-risk areas.

Public Education and Outreach

Educate and inform the public about the risks of hazards and the techniques available to reduce threats to life and property.

Real Estate Disclosure. Encourage real estate agents to disclose flood plain location for property listings.

- Real estate agents are the first line of defense against property damage from flooding when a family sets out to purchase a home. They should disclose floodplain location of a property before it is listed. Agents should be familiar with risks associated with flood hazards and the mitigation measures available for property protection. The cities should encourage disclosure among local agents.

Library. Use local library resources to educate the public on hazard risks and mitigation alternatives.

- Local libraries are available to serve as repositories for information on hazards and methods of protection. Technical assistance materials available through FEMA should be made available to assist property owners on alternative property protection measures.

Environmental Education. Use school resources for public education on flood hazards and mitigation measures.

- School environmental education programs provide excellent opportunities for public education on flood hazard mitigation alternatives. Each city should encourage its local school system to integrate this hazard information into its environmental education programs.

Emergency Services

Improve the efficiency, timing, and effectiveness of response and recovery efforts for natural hazard disasters.

- Monitoring flood hazard events as they happen or, in some cases, forecasting events in advance can aid in reducing the overall costs involved in a flood event. Jefferson County EMA maintains an ALERT gage network to cover high-risk flood areas – the Automated Hazard Mitigation Information System (AHMIS). The system shares direct access to gage readings with the (National Weather Service) NWS and United States Geologic Service (USGS). This comprehensive disaster warning system ties a variety of gages into a single automated network to monitor weather conditions, precipitation, stream stage, and water quality. Installing flood sirens is another means of warning potential flood victims of the possibility of flooding, particularly in mobile home parks. The City of Irondale should consider a siren system within the Irondale Trailer Park. Two gages have been installed along the main channel of Shades Creek. Additional gage sites are necessary, especially to

monitor and alert the Mountain Brook Village area of flood events. The City of Mountain Brook should pursue a gage for this location.

Weather Radios. Improve public access to weather alerts.

- Along with the monitoring devices the government uses, citizens can use weather radios in homes and businesses to provide an inexpensive means for advance warning of a flooding event. The Project Impact program of the Jefferson County EMA has an annual distribution at its severe weather day event. The newly established Alabama Skywarn Foundation offers another program for low-cost acquisition and distribution of weather radios. Each of the cities should establish a program to either freely distribute radios or encourage their use among flood plain occupants and property owners.

Natural Resources Protection

Preserve and restore the natural and beneficial functions of the flood plains to promote sustainable community development that balances the constraints of nature with the social and economic demands of the community.

River/Stream Corridor Restoration and Protection. Restore and protect river and stream corridors.

- The “Guidelines for the Protection and Enhancement of Natural Resources” presented in chapter 5 of this plan should be adopted and implemented by each of the cities.
- Dumping of debris and trash presents an ugly and unhealthy stream environment. Strict enforcement of dumping regulations and volunteer clean up campaigns are the most effective measures to deal with this issue. Signs should be posted to remind individuals of criminal consequences of littering and dumping, and “Adopt a Stream” programs should be encouraged.
- The Cahaba River Society and the Friends of Shades Creek are non-profit groups that promote the natural resource benefits of Shades Creek. Cities should support the environmental enhancement efforts of these groups.
- Erosion and sedimentation due to construction site runoff degrades the quality of stream waters and results in deposit build ups that can restrict the discharge of floodwaters. Effective administration and enforcement of erosion and sedimentation control regulations are necessary for each of the cities.
- The cities of Mountain Brook and Homewood have established public greenways along Shades Creek. Homewood has plans to extend its linear park system. These efforts are outstanding measures for natural resources protection and should be linked to similar systems extending through the Shades Creek flood plains within the cities of Birmingham and Irondale.

Open Space Easements and Acquisitions. Preserve significant natural resources and highly vulnerable flood hazard areas in permanent open space.

- The cities should continue to support the acquisition of open space, the purchase of easements, and acceptance of donated lands within significant stream protection corridors of Upper Shades Creek through the Cahaba-Warrior Land Trust.

Structural Projects

Apply engineered structural modifications to natural systems and public infrastructure to reduce the potentially damaging impacts of hazards, where feasible, cost effective, and environmentally suitable.

Stream Channel Maintenance. Improve maintenance programs for streams and drainage ways.

- The “Guidelines for Stream Channel Maintenance” presented in chapter 5 of this plan should be adopted and implemented by each of the cities. Each city should formally prepare and enact “Standard Operating Procedures for Stream Channel and Drainage System Maintenance.”
- Immediate measures for maintenance should be undertaken by all cities to improve flood water discharge:
 - Remove all sediment buildup and debris, particularly at culvert and bridge locations.
 - Remove fallen trees and limbs from the channel.
 - Remove all Privet, Mimosa, Kudzu, etc., and all intrusive brush below the banks.
 - Limb up trees to prevent hanging branches in the channel during flood stage.
 - Remove all trees from the channel and near the bottom of the banks.

Reservoirs, Channel, and Drainage Modifications. Control flooding through structural measures, where feasible.

- This plan has identified “Scott’s Branch Plan (Plan 2)” as a feasible and relatively low cost structural project to reduce flood damages within the Scotts Branch flood plain. The project, at an estimated cost of approximately \$200,000 would yield a B/C ratio of over 60:1; over \$60 in average annual flood damages could be reduced for each average annual dollar spent for the project. The City of Homewood should pursue this project with local funds.
- “Watkins Brook Plan (Plan 24)” is a potentially feasible project that requires further investigation. The evaluation presented in this plan indicates a positive B/C ratio, however, additional details are required. First, this plan did not take into account the potential damage reduction to the Mountain Brook Mall area; a minor tributary that causes that damage was not included in this study. Additionally, this study indicates some inducement of damage downstream on Shades Creek. The project would, therefore, need to be modified to reduce flows by increasing upstream storage. This will be necessary to obtain the “no impact” requirement for the project. The proposed feasibility phase study by the Corps of Engineers would need to evaluate this project more carefully to close the gaps and complete the solution to the flooding problems within Mountain Brook Village.

Chapter 8:

ACTION PROGRAM

This chapter presents the priority actions to be implemented by the participating cities over the next five years (2003-2008).

Highest Priority Mitigation Actions

1. Execute the Corps of Engineers cost sharing agreement and continue the feasibility phase to complete the studies initiated by this plan and secure this rare Federal funding opportunity made available through H.R. 2497. This authority is about to expire, and no other opportunity for Federal funding of this potential magnitude will likely become available again. The Watkins Brook Plan (Plan 24) is a potentially feasible structural project that requires further investigation. The evaluation presented in this plan indicates a positive B/C ratio, however, additional details are required. First, this plan did not take into account the potential damage reduction to the Mountain Brook Mall area; a minor tributary that causes that damage was not included in this study. Additionally, this study indicates some inducement of damage downstream on Shades Creek. The Watkins Brook Plan would, therefore, need to be modified to reduce flows by increasing upstream storage. This modification will be necessary to obtain the “no impact” requirement for the project. The proposed feasibility phase study by the Corps of Engineers can complete the Watkins Brook Plan solution to flooding within Mountain Brook Village. Moreover, the Corps can identify possible solutions to Furnace Branch flooding problems which have not been identified by this study.

Jurisdiction(s): Mountain Brook
Responsibility: Mayor and City Council, Corps of Engineers
Timeline: 2003-2007
Funding: \$1,413,500 over three fiscal years (\$706,750 Federal, \$116,700 local cash and \$590,000 local in-kind services)

2. Pursue the “Scott’s Branch Plan (Plan 2)” structural project to reduce flooding on Scott’s Branch.

Jurisdiction(s): Homewood
Responsibility: Mayor and City Council, Engineering Department
Timeline: 2004
Funding: \$200,0000 local funds

3. Execute an agreement to participate in the Jefferson County flood mitigation program and adopt its “Higher Regulatory Standards” model ordinance.

Jurisdiction(s): Birmingham, Homewood, Mountain Brook, and Irondale
Responsibility: Jefferson County Department of Land Development, Mayor and City Council, local flood plain manager
Timeline: 2003-2004
Funding: Existing budget

4. Carry out regular stream channel maintenance, to include the following measures to improve the discharge of flood waters:

- Remove all sediment buildup and debris, particularly at culvert and bridge locations.
- Remove fallen trees and limbs from the channel.
- Remove all Privet, Mimosa, Kudzu, etc., and all intrusive brush below the banks.
- Limb up trees to prevent hanging branches in the channel during flood stage.
- Remove all trees from the channel and near the bottom of the banks.

Jurisdiction(s): Birmingham, Homewood, Mountain Brook, and Irondale
Responsibility: Mayor and City Council, local public works department
Timeline: 2004
Funding: Local funds to be determined

5. Install a new stream gage site on Watkins Brook to monitor and alert the Mountain Brook Village area of flood events.

Jurisdiction(s): Mountain Brook
Responsibility: Jefferson County EMA
Timeline: 2004
Funding: \$12,000

High Priority Mitigation Actions

1. Update Flood Insurance Rate Maps based on hydrology and stream hydraulics developed by this planning study and best available topographic data.

Jurisdiction(s): Birmingham, Homewood, Mountain Brook, and Irondale
Responsibility: Jefferson County Department of Land Development
Timeline: 2004-2008
Funding: County funds appropriated

2. Support the adoption of a uniform storm water management ordinance that maintains pre-development runoff rates on large developments for all storms up to and including the 100-year event.

Jurisdiction(s): Birmingham, Homewood, Mountain Brook, and Irondale
Responsibility: Jefferson County Department of Land Development, Mayors and Councils, City Engineers
Timeline: 2004
Funding: Existing budgets

3. Formally prepare and enact “Standard Operating Procedures for Stream Channel and Drainage System Maintenance,” in accordance with the “Guidelines for Stream Channel Maintenance” presented by this plan

Jurisdiction(s): Birmingham, Homewood, Mountain Brook, and Irondale
Responsibility: Mayors and Councils, City Engineers, Public Works Departments
Timeline: 2004
Funding: Existing budgets

4. Retrofit at-risk commercial properties within Mountain Brook Village and residential properties subject to flooding along Furnace Branch. This type of effort can be addressed by the Corps of Engineers in its feasibility study and might be eligible for Federal funding assistance.

Jurisdiction(s): Mountain Brook
Responsibility: Mayor and Council, Corps of Engineers
Timeline: 2008
Funding: To be determined – Federal funds with local match

5. Evaluate each residential property within the Mountaineale neighborhood where the finished floor of homes lies at or below the ten-year flood elevation or where repetitive flood insurance claims have been paid. Pursue acquisitions where the benefit-cost ratio is positive.

Jurisdiction(s): Birmingham
Responsibility: Mayor and Council, Corps of Engineers
Timeline: 2004-2008
Funding: To be determined - Federal funds with local match through FEMA grant programs (HMGP, PDM, and/or FMA)

6. Evaluate possible retrofits of mobile homes within the Irondale Trailer Park and advise on an improved site layout for the park to avoid damages to units along the creek banks.

Jurisdiction(s): Irondale
Responsibility: Building Official, City Engineer
Timeline: 2004
Funding: Existing budget

7. Install a siren system within the Irondale Trailer Park.

Jurisdiction(s): Irondale
Responsibility: Park owner
Timeline: 2004
Funding: City and owner funds, amount to be determined

8. Map previous flood events according to best available records, and, as new events occur, survey and document flood limits within GIS.

Jurisdiction(s): Birmingham, Homewood, Mountain Brook, and Irondale
Responsibility: Jefferson County EMA and Department of Land Development, City Engineers, Flood Plain Managers
Timeline: 2004 and ongoing
Funding: County funds appropriated

9. Apply for and maintain membership in the CRS (Community Rating System) Program of the NFIP.

Jurisdiction(s): Mountain Brook and Irondale
Responsibility: Flood Plain Managers
Timeline: 2004-2005
Funding: Existing budgets

10. Extend the Homewood/Mountain Brook public greenway along Shades Creek through the cities of Birmingham and Irondale.

Jurisdiction(s): Birmingham and Irondale
Responsibility: Flood Plain Managers
Timeline: 2005-2008
Funding: ADECA Outdoor Recreation Grant, ALDOT Transportation Enhancement Funds, Local Funds

Ongoing Mitigation Actions

1. Adopt and promote the “Guidelines for the Protection and Enhancement of Natural Resources” presented in this plan.

Jurisdiction(s): Birmingham, Homewood, Mountain Brook, and Irondale
Responsibility: Mayors and Councils
Timeline: Ongoing
Funding: Existing budgets

2. Establish a long-range program for the protection and mitigation of properties from flood damages. Amend local comprehensive plans to address the vulnerability of designated flood hazard areas and encourage open space planning to create amenities for recreation and conservation of fragile resources. Local plans should include an assessment of the vulnerability and environmental suitability of lands for future development.

Jurisdiction(s): Birmingham, Homewood, Mountain Brook, and Irondale
Responsibility: Mayors and Councils, Planning Commissions, local planning departments, Regional Planning Commission
Timeline: Ongoing
Funding: Existing budgets

3. Establish a mutual sharing agreement for GIS resources among Jefferson County, the City of Birmingham, the Storm Water Management Authority, and the Regional Planning Commission. Develop GIS as a shared resource for ongoing mitigation planning, including the application of FEMA’s new HAZUS-MH application for assessing flood hazard risks within GIS.

Jurisdiction(s): Birmingham, Homewood, Mountain Brook, and Irondale
Responsibility: Mayors and Councils, Planning Commissions, local planning departments, Regional Planning Commission, SWMA, Jefferson County Information Technology, City of Birmingham GIS Division, Jefferson County EMA
Timeline: Ongoing
Funding: Existing budgets

4. Provide training to local flood plain managers through programs offered through the State Flood Plain Manager and FEMA’s training center in Emmitsburg, Maryland. Additional support is available through membership by the local flood plain managers in the Association of State Flood Plain Managers. Maintain a library of technical assistance and guidance materials to support the local flood plain manager.

Jurisdiction(s): Birmingham, Homewood, Mountain Brook, and Irondale
Responsibility: Flood Plain Managers, State Flood Plain Manager, FEMA
Timeline: Ongoing
Funding: Existing budgets

5. Strictly enforce dumping regulations and support volunteer clean up campaigns.

Jurisdiction(s): Birmingham, Homewood, Mountain Brook, and Irondale
Responsibility: Mayors and Councils, Public Works Department
Timeline: Ongoing
Funding: Existing budgets

6. Effectively administer and enforce erosion and sedimentation control regulations.

Jurisdiction(s): Birmingham, Homewood, Mountain Brook, and Irondale
Responsibility: SWMA, City Engineers, Building Officials
Timeline: Ongoing
Funding: Existing budgets

7. Continue to improve CRS ratings.

Jurisdiction(s): Birmingham, Homewood
Responsibility: Flood Plain Managers/ CRS Coordinators
Timeline: Ongoing
Funding: Existing budgets

8. CRS communities should work cooperatively in all aspects of their programs, especially joining together to conduct public outreach programs.

Jurisdiction(s): Birmingham, Homewood, Mountain Brook, Irondale
Responsibility: Flood Plain Managers/ CRS Coordinators
Timeline: Ongoing
Funding: Existing budgets

9. Establish a program to either freely distribute weather radios or encourage their use among flood plain occupants and property owners.

Jurisdiction(s): Birmingham, Homewood, Mountain Brook, and Irondale
Responsibility: Jefferson County EMA, Mayors and Councils, Flood Plain Managers
Timeline: Ongoing
Funding: Existing budgets

10. Keep the public informed of flood zone boundaries and promote the purchase of insurance coverage by property owners and renters for flood damages in these high-risk areas.

Jurisdiction(s): Birmingham, Homewood, Mountain Brook, Irondale
Responsibility: Flood Plain Managers
Timeline: Ongoing
Funding: Existing budgets

11. Local libraries should serve as repositories for information on flood hazards and technical assistance materials available through FEMA to assist property owners on alternative property protection measures.

Jurisdiction(s): Birmingham, Homewood, Mountain Brook, Irondale
Responsibility: Flood Plain Managers
Timeline: Ongoing

Funding: Existing budgets

12. Distribute FEMA handouts at local building inspection offices.

Jurisdiction(s): Birmingham, Homewood, Mountain Brook, Irondale
Responsibility: Building Officials, Flood Plain Managers
Timeline: Ongoing
Funding: Existing budgets

13. Encourage local school systems to integrate flood hazard information into its environmental education programs.

Jurisdiction(s): Birmingham, Homewood, Mountain Brook, Irondale
Responsibility: School Boards, Flood Plain Managers
Timeline: Ongoing
Funding: Existing budgets

14. Encourage real estate agents to disclose floodplain location of a property before it is listed.

Jurisdiction(s): Birmingham, Homewood, Mountain Brook, Irondale
Responsibility: Mayors and Councils, Flood Plain Managers
Timeline: Ongoing
Funding: Existing budgets

15. Continue to support the environmental enhancement efforts of the Cahaba River Society and the Friends of Shades Creek.

Jurisdiction(s): Birmingham, Homewood, Mountain Brook, Irondale
Responsibility: Mayors and Councils
Timeline: Ongoing
Funding: Existing budgets

16. Continue to support the open space conservation efforts of the Cahaba-Warrior Land Trust.

Jurisdiction(s): Birmingham, Homewood, Mountain Brook, Irondale
Responsibility: Mayors and Councils
Timeline: Ongoing
Funding: Existing budgets

Additional Mitigation Actions

1. Evaluate possible retrofits to homes subject to Griffin Creek flooding and offer technical assistance to homeowners.

Jurisdiction(s): Homewood
Responsibility: Mayors and Councils, Building Official, City Engineer
Timeline: Ongoing
Funding: Existing budget

2. Support “Adopt a Stream” programs.

Jurisdiction(s): Birmingham, Homewood, Mountain Brook, Irondale
Responsibility: Mayors and Councils

Timeline: Ongoing
Funding: Existing budgets

3. Post signs to remind individuals of criminal consequences of littering and dumping.

Jurisdiction(s): Birmingham, Homewood, Mountain Brook, Irondale
Responsibility: Public Works Departments
Timeline: Ongoing
Funding: Existing budgets

4. Adopt zoning requirements for mandatory open space within planned residential developments and maximum impervious surface standards for non-residential developments.

Jurisdiction(s): Birmingham, Homewood, Mountain Brook, Irondale
Responsibility: Mayors and Councils, Planning Commissions
Timeline: Ongoing
Funding: Existing budgets

5. Adopt zoning standards for parking lot landscaping to encourage infiltration of rainwater where there are large expanses of impervious surfaces.

Jurisdiction(s): Birmingham, Homewood, Mountain Brook, Irondale
Responsibility: Mayors and Councils, Planning Commissions
Timeline: Ongoing
Funding: Existing budgets

